Local Air Quality Management
Environmental Act 1995

UPDATING AND SCREENING ASSESSMENT REPORT 2003

Mid Devon District Council
Environmental Health Services May 2003

Mid Devon
DISTRICT COUNCIL
Where People Matter

EXECUTIVE SUMMARY

Part IV of the Environment Act 1995 requires local authorities 'from time to time' to review and assess the current, and likely future, air quality in their areas against those objectives in the National Air Quality Strategy. Where objectives are not likely to be met then the local authority is required to designate an Air Quality Management Area (AQMA) at the relevant locations. The local authority must then draw up an action plan setting out the measures it intends to take in pursuit of the air quality objectives within the area covered by the AQMA.

A review and assessment is the initial step in the formal Local Air Quality Management (LAQM) process. The structure of the reviews and assessment are set out in the guidance made under the Act.

Mid Devon District Council, in common with all other local authorities, has already completed the first round of review and assessment between 1998 and 2000. The outcome of the first round in Mid Devon was published in a Stage 3 report completed in December 2000 and concluded that it was not necessary to designate and AQMA in Mid Devon.

The second round of review and assessment commenced in February 2003 and was carried out in accordance with new technical guidance (LAQM.TG(03)) which encompasses details of new emission factors for the UK, revised assessment criteria and tighter formal (or provisional) air quality objectives. The structure of the second round differs from the first round and the process is now carried out in two steps:

Step One is an **Updating and Screening Assessment (USA)** for identifying those aspects that have changed since the first round of reviews and assessment, including by way of lessons learnt from the first round, that may require further assessment. The USA should include an explanation of all conclusions reached as to whether a local authority should proceed to Detailed Assessment or not; and

Step Two, a **Detailed Assessment** of those pollutants and specific locations that have been identified as requiring further work.

In accordance with the statutory timetable for the completion of round two, Step One must be completed by the end of May 2003 and Step Two must be completed by the end of April 2004. This report completes Step One and is therefore an Updating and Screening Assessment of air quality in Mid Devon.

The structure of the report closely follows the pollutant-by-pollutant approach and pollutant-specific checklists contained in the technical guidance LAQM.TG(03).

The pollutants reviewed within this report are benzene, 1,3-butadiene, carbon monoxide, lead, nitrogen dioxide, sulphur dioxide and particles (PM_{10}) and thus covers those pollutants within the formal scope of LAQM.

The report concludes that it is necessary to proceed with detailed assessment for the following:

- Nitrogen dioxide at Exeter Road, Crediton
- Nitrogen dioxide at High Street, Crediton

Both of the above locations have been identified as having predicted nitrogen dioxide concentrations greater than the statutory air quality objective in 2005 (annual mean concentration of 40 $\mu g/m^3$ to be achieved by the 31 December 2005). The most important source of nitrogen dioxide at these locations is likely to be road traffic emissions and concentrations are likely to be affected by the street canyon nature of the roads.

The detailed assessment will determine more thoroughly whether or not a likely exceedence of the nitrogen dioxide air quality objective will occur and therefore if an Air Quality Management Area (AQMA) is required.

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1. INTRODUCTION

1.1 Background

The Environment Act 1995 required the UK Government to produce a national air quality strategy containing standards and objectives for improving ambient air quality. The Act also introduced the system of local air quality management (LAQM). As a result, local authorities are required periodically to review and assess the current and future air quality in their areas against those in the Strategy which have been prescribed in regulations.

1.2 Air Quality Strategy

The most recent Air Quality Strategy[1] was published in January 2000. The Strategy sets air quality standards and objectives for eight key air pollutants to be achieved between 2003 and 2008. For seven of these pollutants local authorities are charged with the task of working towards the objectives in a cost effective way.

The Strategy objectives for particles (PM_{10}), benzene and carbon monoxide were reviewed in 2000/2001 and as a result tighter air quality objectives for these pollutants were adopted in an Addendum[2] to the Strategy. The Addendum also introduced, for the first time, an objective for polycyclic aromatic hydrocarbons (PAHs), however, for the time being local authorities have no statutory responsibilities for the new PAH objective.

The air quality *standards* set out in the Strategy are based purely on medical evidence of the effects of the particular pollutants on health and represent the minimum or no significant risk levels. They are not based upon costs and benefits assessments or on technical feasibility, but on the advice of the Expert Panel on Air Quality Standards (EPAQS) or upon EU limit values derived from World Health Organisation (WHO) guideline values.

However, the air quality *objectives* in the Strategy do take into account the costs and benefits, and the feasibility of achieving the standards. The objectives therefore provide a framework for determining the extent to which air quality policies should aim to improve air quality and also a measure for each particular pollutant of concern against which future progress can be judged.

The most significant judgement local authorities should make is whether the Air Quality Objectives are likely to be met in their area by the relevant deadline. Where objectives are not likely to be met then the local authority is required to designate an Air Quality Management Area (AQMA) at the relevant locations.

1.3 Regulations and Air Quality Objectives

The existing and, where relevant, newly tightened Air Quality Objectives are set out in the Air Quality Regulations (England) (Wales) 2000 and in the Air Quality (England) (Wales) (Amendment) Regulations 2002. The exception is the newly tightened national particles (PM_{10}) objectives for 2010 which are provisional and are not, for the time being, included in the regulations for the purposes of LAQM. The Government will consider the inclusion of the new particles objectives into the regulations after the EU's first Air Quality Daughter Objective (due to be completed during 2004).

The objectives currently included in the regulations for the purposes of Local Air Quality Management are given in Table 1.0 below:

Table 1.0: Objectives included in the regulations for the purpose of Local Air Quality Management

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 µg/m^3	Running annual mean	31/12/2003
	5 µg/m^3	annual mean	31/12/2010
1,3 Butadiene	2.25 µg/m^3	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/m^3	annual mean	31/12/2004
	0.25 µg/m^3	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}) (gravimetric)*	50 µg/m^3 not to be exceeded more than 35 times a year	24-hour mean	31/12/2004
	40 µg/m^3	annual mean	31/12/2004
Sulphur dioxide	350 µg/m^{3}not to be exceeded more than 24 times a year	1-hour mean	31/12/2004
	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
* measured using the European gravimetric transfer sampler or equivalent			

The provisional objectives for particles (PM_{10}) for 2010 are different for London, Wales and the Rest of England. In Scotland tighter objectives for PM_{10} have already be included in the equivalent Scottish Air Quality Regulations. As is applicable to Mid Devon District Council, the provisional objectives for the Rest of England are given in Table 1.1 below:

Table 1.1: Provisional objectives for particles not included in the regulations for the purpose of Local Air Quality Management

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Particles (PM_{10}) (gravimetric)*	50 µg/m^3 not to be exceeded more than 7 times a year	24-hour mean	31/12/2010
	20 µg/m^3	annual mean	31/12/2010
* measured using the European gravimetric transfer sampler or equivalent			

Although local authorities are not yet statutorily required to assess levels of particles for 2010, they are strongly recommended to start this work early. The reasons for doing so are:

- The fact that authorities are likely to need to carry out this work in 2006 (see table 1.2) and subsequent round of reviews and assessments;
- The fact that local authorities have a key role to play in ensuring that the UK delivers the EU limit values for 2010 (approximately equivalent to the above provisional objectives). Thus, the sooner local authorities can identify any potential local exceedances, the better placed they are to be able to tackle them;
- It can assist local authorities in the consideration of the potential impact of new developments.

Therefore, a provisional assessment of particles (PM_{10}) concentrations at relevant locations in Mid Devon has been included as part of this report.

1.4 Local Air Quality Management (LAQM) – Reviews and Assessments of Air Quality

Part IV of the Environment Act 1995 requires local authorities 'from time to time' to review and assess the current, and likely future, air quality in their areas against those objectives in the Strategy. As discussed above, where objectives are not likely to be met then the local authority is required to designate an Air Quality Management Area (AQMA) at the relevant locations. The local authority must then draw up an action plan setting out the measures it intends to take in pursuit of the air quality objectives with the area covered by the AQMA.

A review and assessment is the initial step in the LAQM process, the structure of the reviews and assessment are set out in the guidance made under the Act and deadlines for each round of review and assessment are set out in the regulations.

Mid Devon District Council, in common with all other local authorities, has already completed the first round of review and assessment between 1998 and 2000. The structure of the Round 1 was based upon the relevant existing LAQM guidance (see **LAQM Guidance** below). The outcome of the first round in Mid Devon was published in the following reports:

- Stage 1 Review and Assessment of Air Quality in Mid Devon, Mid Devon District Council (1998)
- Stage 2 Review and Assessment of Air Quality, Consultants in Environmental Sciences Ltd (CES) for Mid Devon District Council (July 1999)
- Dispersion Modelling of Vehicle Emissions of NO_2 and PM_{10} from Four Locations in Mid Devon, Cambridge Environmental Research Consultants Ltd (CERC) on behalf of Mid Devon District Council (May 2000)
- Stage 3 Review and Assessment of Air Quality in Mid Devon, Mid Devon District Council (December 2000)

The first round was completed at the Stage 3 report which concluded that there was no requirement to declare an AQMA in the Mid Devon area. The subsequent statutory review, completed by University of the West of England on behalf of Defra, accepted the findings of the first round of review and assessment and concurred with the Stage 3 report conclusions.

In 2001, on behalf of Defra, Air Quality Consultants Ltd were commissioned to complete a detailed evaluation of the first round of air quality reviews and assessments by local authorities. The evaluation report[3] published in March 2002 set out a number of key recommendations including that the next round should be carried out in two steps:

- Step One is an **Updating and Screening Assessment (USA)** for identifying those aspects that have changed since the first round of reviews and assessment, including by way of lessons learnt from the first round, that may require further assessment. The USA should include an explanation of all conclusions reached as to whether a local authority should proceed to Detailed Assessment or not; and
- Step Two, a **Detailed Assessment** of those pollutants and specific locations that have been identified as requiring further work.

The USA should cover: new monitoring data; new objectives; new sources or significant changes to existing sources and any other changes that may affect local air quality, etc. Where the USA has identified a risk that an air quality objective will be exceeded at a particular location with relevant public exposure (see section 1.8 below), then Detailed Assessment will have to be carried out. The aim of the Detailed Assessment is to identify with reasonable certainty whether or not a likely exceedence will occur and therefore if an existing AQMA needs to continue or if a new AQMA is required.

The above recommendations have been incorporated into new LAQM policy and technical guidance which set out the outline approach local authorities must take to Round 2 of Review and Assessment.

1.5 LAQM Guidance

The following guidance for Round 2 of Review and Assessment has been issued by Defra under section 88(1) of the Environment Act 1995:

- Policy Guidance LAQM.PG(03) (February 2003)[3]
- Technical Guidance LAQM.TG(03) (February 2003)[4]

The above guidance replaces the previous guidance published in 2000 as LAQM.G1, G2, G3 and G4(00) and LAQM .TG4(00). The new guidance sets out the latest statutory, policy and technical framework for the system of LAQM and the completion of both the USA and any required Detailed Assessment that make up Round 2 of Review and Assessment.

The timescale for Round 2 (and subsequent rounds of the Review and Assessment process) is set out in the Regulations as detailed below.

1.6 Timetables for Submission of Reviews and Assessments

In accordance with the latest regulations and guidance, local authorities should carry out their LAQM duties to the recommended timescales given in Table 1.2 below:

Table 1.2: Recommended timescales for submissions of reviews and assessments and progress reports for local authorities

LAQM Activity	Completion Date	Which authorities?
Updating and Screening Assessment (USA)	End of May 2003	All authorities
Detailed Assessment	End of April 2004	Those authorities which have identified the need for one in their May 2003 USA
Progress Report	End of April 2004	Those authorities which identified that there was no need for a Detailed Assessment in their May 2003 USA
Progress Report	End of April 2005	All authorities
USA	End of April 2006	All authorities
Detailed Assessment	End of April 2007	Those authorities which have identified the need for one in their April 2006 USA
Progress Report	End of April 2007	Those authorities which identified that there was no need for a Detailed Assessment in their April 2006 USA
Progress Report	End of April 2008	All authorities
USA	End of April 2009	All authorities
Detailed Assessment	End of April 2010	Those authorities which have identified the need for one in their April 2009 USA
Progress Report	End of April 2010	Those authorities which identified that there was no need for a Detailed Assessment in their April 2009 USA
Timescale surrounded in **bold** above represents Round 2 of Review and Assessment		

1.7 Purpose and Scope of the Report

The purpose of this report is to complete the Updating and Screening Assessment required for Round 2 of LAQM within the administrative boundaries of Mid Devon District Council. This is draft report completed for statutory consultation. A list of statutory and additional consultees is given in section 5.0.

The scope and structure of this USA report is in accordance with that set out in guidance LAQM.PG(03) and LAQM.TG(03). The structure of the report closely follows the pollutant-by-pollutant approach and pollutant-specific checklists contained in the technical guidance LAQM.TG(03).

The subsequent individual review and assessment sections for each pollutant within the report summarise the checklist approach/assessment criteria used along with the findings. More detailed technical information relating to monitoring data or modeling data etc. is contained in the relevant Appendix sections towards the end of the report.

The report has been completed by Mid Devon District Council Environmental Health Services between February and May 2003. The reports author is Simon Newcombe, Environmental Protection Officer.

1.8 Public Exposure

An important consideration in the completion of this report was public exposure to air pollution and an understanding of the general definitions and approach applied to the assessment of this public exposure is also important in order to understand those locations within Mid Devon that have, or have not, been assessed for the purposes of this report.

The regulations make it clear that likely exceedences of the objectives should be assessed in relation to *'the quality of the air at locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present'*. Reviews and assessments are therefore focused on those locations where the public are likely to be regularly present and exposed over the averaging period of the objective. Locations are not considered if relevant public exposure would not be realistic. Further guidance on the approach taken in this report is given in Table 1.3 below:

Table 1.3: Examples of where Air Quality Objectives should/should not apply

Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
Annual mean	All locations where members of the public might be regularly exposed. Building facades of residential properties, schools, hospitals and libraries etc. Exposure must be likely for a cumulative period of at least six months in a year.	Building facades of offices or other places of work where members of the public do not have regular access. Gardens of residential properties. Kerbside sites (as opposed to building facades) or any locations where public exposure is likely to be short-term.
24-hour and 8-hour mean	All locations where the annual mean objective would apply. Gardens of residential properties.	Kerbside sites (as opposed to building facades) or any locations where public exposure is likely to be short-term.
1-hour mean	All locations where the annual and 24-hour and 8-hour mean objectives apply. Kerbside sites (e.g. pavements of busy shopping areas). Those parts of carparks, bus stations and railway stations etc. which are not fully enclosed, where the public	Kerbside sites where the public would not be expected to have regular access or spend 1-hour or more.

	might reasonably be expected to spend 1-hour or more.	
15-min mean	All locations where members of the public might reasonably be exposed for a period of 15 minutes or more	

The above examples are guidance only and are not prescriptive in this matter, therefore at all locations local circumstances and any other relevant factors have been applied using local judgement and professional knowledge.

In the assessment of some pollutants and pollution source locations a more definitive judgement has been applied using specific distances of exposure in relation to the individual source. Guidance contained in LAQM.TG(03) has also been applied where it is prescriptive. All examples of this are detailed in the subsequent review and assessment sections for each individual pollutant.

2.0 REVIEW AND ASSESSMENT

2.1 Introduction

A wide range of LAQM tools have been used in the completion of review and assessment of the pollutants within the scope of this report.

General tools (used for more than one pollutant) include the following:

- Estimated annual mean concentrations for 2001 (and onwards) based on 1km x 1km grid squares for the UK. All such data has been accessed from the internet at the following address www.airquality.co.uk/archive/laqm/tools.php
- Design Manual for Roads and Bridges (DMRB) for modeling of pollutant concentrations using the revised version 1.01 of DMRB (February 2003).
- Emissions Factors Toolkit accessed from the internet at the following address www.stanger.co.uk/airqual/modelhlp
- Miscellaneous emissions estimates, point source information and activity data has been accessed from the internet at the following address www.naei.org.uk/data_warehouse.php
- Traffic statistics have been obtained from the Devon County Council Local Transport Plan and Statistics for 2001[5] or from location specific traffic census information obtained by Mid Devon District Council.

Where pollutant specific tools have been used, such as correction factors to estimate future year concentrations or nomograms, they have been obtained from the relevant section of LAQM.TG(03).

All detailed technical information and data (including AQ/QC and data ratification and validation) relating to monitoring or modeling review and assessment work is provided in full within the Appendices towards the end of the report.

2.2 Review and Assessment of benzene

Objectives

The current objectives for benzene set out in the regulations are:

- 16.25 μg/m^3 as an annual mean concentration to be achieved by the end of 2003
- 5 μg/m^3 as an annual mean concentration to be achieved by the end of 2010

The objective for 2003 is unchanged from the first round of review and assessment whilst the objective for 2010 is newly introduced.

National perspective

The main sources of benzene emissions in the UK are petrol-engined vehicles, petrol refining and the distribution and uncontrolled emissions from petrol station forecourts without petrol vapour recovery systems. A number of policy measures already in place,

or planned for future years, are expected to continue to reduce benzene emissions. Since January 2000, EU legislation has reduced the maximum benzene content of petrol from 5% to 1% with further reductions planned under the European Auto-Oil programme.

Local perspective

The first round of review and assessment concluded that that it was not necessary to declare an AQMA for this pollutant in Mid Devon. Furthermore, no AQMAs were declared nationally in respect of the 2003 air quality objective. Therefore, there is no requirement for local authorities to consider road traffic emissions in the review and assessment of the 2003 objective.

In accordance with guidance, current exceedences of the 2010 objective may exist at some locations. Example locations include; next to petrochemical processes, alongside very busy roads or in close proximity to busy petrol stations and these sources may require review and assessment for the 2010 objective.

Updating and Screening Assessment for benzene

(A) Monitoring data

Since the first round of review and assessment, monitoring for benzene has been completed at three roadside locations detailed below:

(1) Crediton (Exeter Road)

(2) Cullompton (Station Road)

(3) Tiverton (Great Western Way)

All of the monitoring locations are situated in built up areas and are representative of potential exposure at the building facades of residential properties. Monitoring was completed using passive BTX tubes. All monitoring was carried out for minimum of 12 months at each location providing a monthly average for each month within the period and a comparable annual mean.

Full details of the monitoring data are included in Appendix 1 and monitoring locations are shown in Appendix 3.

A summary of the ratified monitoring data results and estimated concentrations using LAQM.TG(03) correction factors is given in Table 2.1 below:

Table 2.1: Benzene passive monitoring tube results

Location	Monitoring Period	Period Mean (µg/m^3)	Estimated Annual Mean 2003 (µg/m^3)	Estimated Annual Mean 2010 (µg/m^3)
Exeter Rd, Crediton	4/99-3/00 11/02-04/03	6.64 3.90	2.09 3.09	1.55 2.90
Station Rd, Cullompton	4/00-6/01	2.87	2.34	1.74
Great Western Way, Tiverton	7/01-10/02	2.68	2.51	1.86

There are no estimated annual mean concentrations greater than16.25 μg/m^3 in 2003 for any of the monitoring locations.

There are no estimated annual mean concentrations greater than5 μg/m^3 in 2010 for any of the monitoring locations.

The review and assessment of the monitoring results shows that there is **no need to proceed with a Detailed Assessment for benzene at the monitoring locations**.

(B) Very busy roads or junctions in built-up areas

For the purposes of assessment, very busy roads and junctions are defined as:

- single carriageway roads (or combined junctions) with greater than 80,000 vpd (vehicles per day)
- dual carriageways (or combined junctions) with greater than 120,000 vpd
- motorways (or combined junctions) with greater than 140,000 vpd.
- locations should be in built up areas and have an estimated background concentration greater than 2 μg/m^3 in 2010.

Within the Mid Devon area there are no roads with traffic flows at or above the 'very busy' criteria and the maximum background concentration within the area at 2010 is 0.14 μg/m^3 (east of Junction 28 of the M5 at Cullompton).

The review of the assessment of roads shows that there is **no need to proceed with a Detailed Assessment for benzene at very busy road and junction locations since no relevant source locations exist within Mid Devon**.

(C) Industrial sources

For the purposes of the assessment, industrial sources that have the potential for significant benzene emissions are:

- large (Part A/A1) petroleum or petrochemical processes
- large (Part A/A1) carbonisation and associated processes
- large (Part A/A1) cement/lime and associated processes
- large (Part A/A1) gasification and associated processes
- smaller (Part B/A2) petrol terminal processes

Within the Mid Devon area (or within 5km of the District boundary) there are no industrial sources that meet the 'significant' criteria.

The review and assessment of processes shows that there is **no need to proceed with a Detailed Assessment for benzene for industrial sources**.

(D) Petrol Stations

For the purposes of assessment, emissions from petrol stations are only likely to have significant emissions of benzene if:

- annual throughput of petrol exceeds 2000m^3 with a nearby busy road (greater than 30,000 vpd, vehicles per day)

Using information contained in Part B Authorisations and site visits, three petrol stations have been identified In Mid Devon as having a throughput of petrol greater than 2000 m^3, detailed below:

(1) Shell Tiverton (Waterloo Cross) at A38/Junction 27 M5

(2) Cullompton Services at Station Rd/Junction 28 M5

(3) Safeway Petrol Filling Station, Kennedy Way, Tiverton

Locations (1) and (2) above are nearby to the M5 motorway and traffic flows are greater than 50,000 vpd (AADT, annual average daily traffic) between the relevant motorway junctions. However, there is no relevant public exposure (within 10m of the forecourt pumps) over the annual averaging period for the objectives.

Location (3) above is not near a busy road and there is no relevant public exposure.

The review and assessment of petrol stations shows that there is **no need to proceed with a Detailed Assessment for benzene at petrol station sites.**

(E) Major fuel storage depots

There are no major fuel storage depots within the district, or within 5km of the district boundary. Therefore there is **no need to proceed with a Detailed Assessment for benzene at major fuel storage depot sites.**

2.3 Review and Assessment of 1, 3-butadiene

Objective

The current objective for 1,3-butadiene set out in the regulations is:

- 2.25 μg/m^3 as an annual running mean concentration to be achieved by the end of 2003

The objective for 2003 is unchanged from the first round of review and assessment.

National perspective

The main source of 1,3-butadiene emissions in the UK is motor vehicle exhausts. 1,3-butadiene is also an important industrial chemical and is handled in bulk at a small number of industrial premises. The increasing numbers of vehicles equipped with three-way catalysts will significantly reduce 1,3-butadiene emissions in future years alongside further expected reductions resulting from improvements in fuel quality and the

European Auto-Oil programme. These measures are expected to deliver the air quality objective for 2003, except potentially at locations in the vicinity of major industrial processes that store or handle 1,3-butadiene.

Local perspective

The first round of review and assessment concluded that that it was not necessary to declare an AQMA for this pollutant in Mid Devon. Furthermore, no AQMAs were declared nationally in respect of the 2003 air quality objective.

Since it is envisaged that existing national measures will achieve the 2003 objective it is considered highly unlikely that any local authority will have to proceed beyond the Updating and Screening Assessment.

Updating and Screening Assessment for 1,3-butadiene

(A) Monitoring data

No monitoring for 1,3-butadiene has been carried before or since the last round of review and assessment. Therefore, there is **no need to proceed with a Detailed Assessment for monitoring data**.

(B) New industrial sources and (C) Industrial sources with substantially increased emissions

For the purposes of the assessment, industrial sources that have the potential for significant 1,3-butadiene emissions are:

- large (Part A/A1) petroleum or petrochemical processes
- large (Part A/A1) manufacture of organic chemicals processes
- smaller (Part B/A2) rubber processes

Within the Mid Devon area (or within 5km of the District boundary) there are no industrial sources that meet the 'significant' criteria.

The review and assessment of processes shows that there is **no need to proceed with a Detailed Assessment for 1,3-butadiene for industrial sources**.

2.4 Review and Assessment of carbon monoxide

Objectives

The current objectives for carbon monoxide set out in the regulations are:

- 10 mg/m^3 as an annual mean concentration to be achieved by the end of 2003

The current objective for 2003 is reduced from that applicable to the first round of review and assessment, where the objective was 11.6 mg/m^3 as an annual mean concentration, also to be achieved by the end of 2003.

National perspective

The main source of carbon monoxide in the UK is road transport, which accounted for 67% of the total releases in 2000 (the most recent year for which estimates are available). Annual emissions of carbon monoxide have been falling steadily since the 1970s, and are expected to continue to do so. Current projections indicate that road transport emissions will decline by a further 42% between 2000 and 2005. This suggests that existing policies will be sufficient reduce daily running 8-hour mean concentrations below 10 mg/m^3 by 2003.

Local perspective

The first round of review and assessment concluded that that it was not necessary to declare an AQMA for this pollutant in Mid Devon. Furthermore, no AQMAs were declared nationally in respect of the previous 2003 air quality objective. Whilst national studies indicate there is little likelihood of the new objective being exceeded it is important that local circumstances are assessed.

Updating and Screening Assessment for carbon monoxide

(A) Monitoring data

No monitoring for carbon monoxide has been carried out since the last round of review and assessment. Therefore, there is **no need to proceed with a Detailed Assessment for monitoring data**.

(B) Very busy roads or junctions in built-up areas

For the purposes of assessment, very busy roads and junctions are defined as:

- single carriageway roads (or combined junctions) with greater than 80,000 vpd (vehicles per day)
- dual carriageways (or combined junctions) with greater than 120,000 vpd
- motorways (or combined junctions) with greater than 140,000 vpd.
- locations should be in built up areas and have an estimated background concentration greater than 1 mg/m^3 in 2003.

Within the Mid Devon area there are no roads with traffic flows at or above the 'very busy' criteria and the maximum background concentration within the area in 2003 is 0.163 mg/m^3 (west of the M5 due south of Cullompton).

The review of the assessment of roads shows that there is **no need to proceed with a Detailed Assessment for carbon monoxide at very busy road and junction locations since no relevant source locations exist within Mid Devon**.

2.5 Review and Assessment of lead

Objectives

The current objectives for lead set out in the regulations are:

- 0.5 µg/m^3 as an annual mean concentration to be achieved by the end of 2004
- 0.25 µg/m^3 as an annual mean concentration to be achieved by the end of 2008

The objectives for 2004 and 2008 are unchanged from the first round of review and assessment.

National perspective

A European level agreement (part of the Auto-Oil programme) has led to the ban on sales of leaded petrol in the UK with effect from 1 January 2000. Emissions of lead are now restricted to various industrial activities such as battery making, metal production, pigmentation of paints and glazes, radiation shielding and tank lining.

Monitoring in the vicinity of 30 key industrial sites around the UK has generally indicated no exceedences of the 2004 or 2008 objectives, although locations in proximity to non-ferrous metal production and foundry processes are deemed to be at risk.

Local perspective

The first round of review and assessment concluded that that it was not necessary to declare an AQMA for this pollutant in Mid Devon. Furthermore, no AQMAs were declared nationally in respect of the 2004 or 2008 air quality objectives. Whilst national studies indicate there is little likelihood of the new objective being exceeded it is important that relevant locations in the vicinity of major industrial processes that emit significant quantities of lead are assessed.

Updating and Screening Assessment for lead

(A) Monitoring data

No monitoring for lead has been carried out before or since the last round of review and assessment. Therefore, there is **no need to proceed with a Detailed Assessment for monitoring data**.

(B) New industrial sources and (C) Industrial sources with substantially increased emissions

For the purposes of the assessment, industrial sources that have the potential for significant lead emissions are:

- large (Part A/A1) iron and steel processes
- large (Part A/A1) combustion processes
- large (Part A/A1) non-ferrous metal processes

- large (Part A/A1) manufacture and use of organic chemicals processes
- large (Part A/A1) carbonisation and associated processes
- large (Part A/A1) cement and lime and associated processes
- large (Part A/A1) inorganic chemical processes
- smaller (Part B/A2) ferrous and non-ferrous metal processes (excluding galvanizing)
- smaller (Part B/A2) lead glass processes

Within the Mid Devon area (or adjacent to the District boundary) there are no industrial sources that meet the 'significant' criteria.

The review and assessment of processes shows that there is **no need to proceed with a Detailed Assessment for lead for industrial sources**.

2.6 Review and Assessment of nitrogen dioxide

Objectives

The current objectives for nitrogen dioxide (NO_2) set out in the regulations are:

- 40 µg/m^3 as an annual mean concentration to be achieved by the end of 2005
- 200 µg/m^3 not to be exceeded more than 18 times per year as a 1-hour concentration also to be achieved by the end of 2005

The objectives for 2005 are unchanged from the first round of review and assessment.

The EU first Air Quality Daughter Directive also sets limit values for nitrogen dioxide, which have not yet been transposed into the Air Quality Regulations 2000 or Air Quality (Amendment) Regulations 2002 for the purposes of LAQM. The Directive includes a 1-hour limit of 200 µg/m^3, not to be exceeded more than 18 times per year, and an annual mean limit value of 40 µg/m^3, both to be achieved by 2010.

Although there is currently no statutory requirement to do so, the review and assessment for nitrogen dioxide has been extended to include the 2010 limit.

National perspective

Nitrogen dioxide (NO_2) and nitric oxide (NO) are both oxides of nitrogen and collectively referred to as nitrogen oxides (NOx). All combustion processes produce NOx emissions, largely in the form of NO, which is then converted to NO_2, mainly as a result of reaction with ozone in the lower atmosphere. It is NO_2 that is associated with adverse effects upon human health.

The principal source of NOx emissions is road transport, which accounted for 49% of total UK emissions in 2000. Within most urban areas the contribution of road transport will be much greater than the national picture.

The contribution of road transport to NOx emissions has declined in recent years as a result of various policy measures, and further reductions are expected up until 2010.

In practice, nationally it is expected to be demanding to meet the annual mean objective by 2005 and the EU Directive limit value by 2010.

Local perspective

The first round of review and assessment concluded that that it was not necessary to declare an AQMA for this pollutant in Mid Devon, however monitoring data showed elevated concentrations close to the annual mean objective for 2005. Nationally, over 100 AQMAs were declared for NO_2 following the first round of review and assessment, the vast majority of which are specifically related to road traffic emissions where attainment of the annual mean objective is considered unlikely. Exceedences of the objective have been identified in major conurbations, within smaller town centres with congested traffic, and alongside dual carriageways and motorways in more rural areas.

Analysis of national monitoring data indicates than exceedences of the annual mean objective are only likely within about 10m of the kerbside of single carriageway roads (including those with relatively low traffic flows) if they are within congested town centres. This conclusion is especially significant, as many market towns have narrow streets or road 'canyons' with residential properties within 5m or so of the kerb. Despite higher traffic flows, exceedences of the annual mean objective are only likely within about 5m of the kerbside or hard shoulder of dual carriageways/motorways outside of major conurbations.

Therefore, it is critical for local authorities to focus upon those areas where expected pollutant concentrations are likely to be the highest (so called 'hot spots'). 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.

Updating and Screening Assessment for nitrogen dioxide

(A) Monitoring data outside an AQMA

Since the first round of review and assessment, monitoring for nitrogen dioxide has been completed at eleven roadside locations as detailed below:

(1) Crediton (Exeter Road)

(2) Crediton (High Street)

(3) Cullompton (Station Road)

(4) Silverton (The Square)

(5) Tiverton (William Street)

(6) Tiverton (Great Western Way)

(7) Tiverton (Westexe South)

(8) Tiverton (Bampton Street)

(9) Tiverton (Leat Street)

(10) Tiverton (Howden Road)

(11) Willand (Somerville Close)

All of the monitoring locations in built up areas at roadside locations and are situated within 3m (15m for M5 motorway – Willand site) of the kerbside and within 0-2m of the building facades of residential properties (or are at equivalent locations to nearby residential properties if a suitable monitoring position was not available) and therefore there is relevant public exposure. Monitoring was completed using passive NO_2 diffusion tubes (all prepared using 50% TEA in water and supplied/analysed by Gradko).

All monitoring was carried out for minimum of 12 months at each location using tubes exposed for one-month periods, providing a monthly average for each month within the period, which is then used to calculate an annual mean.

A summary of the ratified monitoring data results and predicted future concentrations is given in Table 2.2 below. Tubes were occasionally lost during some months at a number of sites, however, all annual mean results are based upon a minimum of nine months data for years up to 2002 and the reported results below have been adjusted by a default factor of 1.39 to allow for known under-read of the Gradko tubes prepared with 50% TEA/water. This factor was derived from the report of the study of diffusion tube collocation studies completed by Air Quality Consultants in November 2002[6] on behalf of Defra. The application of this factor results in an adjustment of the previously unreported potential under-read of the tubes and is intended to produce annual mean results that are closer to the true concentration. For future ratification purposes, Mid Devon will use its own adjustment factor based on a collocation study that commenced in April 2003 using a real-time chemiluminescent NO_2 analyser and triplicate NO_2 tubes sited at Exeter Road, Crediton.

Full details of the monitoring data, including data ratification and AQ/QC are included in Appendix 1 and monitoring locations are shown in Appendix 3.

Table 2.2: Nitrogen dioxide diffusion tube monitoring results

Location	Site Code	Site Classification	Adjusted Annual Mean (µg/m^3)	Predicted Annual Mean 2005 (µg/m^3)	Predicted Annual Mean (µg/m^3) 2010
Crediton, Exeter Rd	N8	Roadside, street canyon	46.07 (1999) 56.52 (2000) 53.02 (2001) 52.89 (2002) *59.84 (2003)*	38.22 (1999) 48.80 (2000) 47.29 (2001) 48.69 (2002) *56.73 (2003)*	31.46 (1999) 40.16 (2000) 38.92 (2001) 40.06 (2002) *46.68 (2003)*
Crediton, High St	N9	Roadside, street canyon	45.76 (1999) 46.16 (2000) 49.30 (2001) 43.09 (2002) *56.98 (2003)*	37.97 (1999) 39.86 (2000) 43.97 (2001) 39.67 (2002) *54.01 (2003)*	31.25 (1999) 32.80 (2000) 36.18 (2001) 32.64 (2002) *44.45 (2003)*
Cullompton, Station Rd	N7	Roadside, part street canyon	29.18 (1999) 39.19 (2000) 40.57 (2001) 37.86 (2002) *46.76 (2003)*	24.22 (1999) 33.85 (2000) 36.19 (2001) 34.86 (2002) *44.33 (2003)*	19.93 (1999) 27.85 (2000) 29.78 (2001) 28.68 (2002) *36.46 (2003)*

Silverton, The Square	N11	Roadside	15.18 (1999) 21.05 (2000) 19.83 (2001) 17.71 (2002) *25.52 (2003)*	12.93 (1999) 18.64 (2000) 18.01 (2001) 16.52 (2002) *24.18 (2003)*	10.37 (1999) 14.96 (2000) 14.55 (2001) 13.41 (2002) *19.90 (2003)*
Tiverton, William St	N1	Roadside	26.01 (1999) 29.55 (2000) 25.65 (2001)	21.58 (1999) 25.52 (2000) 22.88 (2001)	17.76 (1999) 21.00 (2000) 18.83 (2001)
Tiverton, Great Western Way	N2	Roadside	30.85 (2001) 23.28 (2002)	27.52 (2001) 21.43 (2002)	22.64 (2001) 17.64 (2002)
Tiverton, Westexe South	N3	Roadside	19.81 (1999) 24.37 (2000) 23.78 (2001) 24.26 (2002) *34.28 (2003)*	16.43 (1999) 21.05 (2000) 21.22 (2001) 22.35 (2002) *32.51 (2003)*	13.52 (1999) 17.32 (2000) 17.45 (2001) 18.37 (2002) *26.74 (2003)*
Tiverton, Bampton St	N4	Roadside, street canyon	*41.10 (2002-2003)**	*38.96 (2002-2003)*	*32.07 (2002-2003)*
Tiverton, Leat St	N5	Roadside, street canyon	*50.33 (2002-2003)**	*47.71 (2002-2003)*	*39.25 (2002-2003)*
Tiverton, Howden Rd	N6	Roadside	*22.19 (2002-2003)**	*21.05 (2002-2003)*	*17.31 (2002-2003)*
Willand, Somerville Cl	N10	Roadside, adjacent M5	29.49 (2001) 33.27 (2002) *40.19 (2003)*	26.32 (2001) 30.62 (2002) *38.08 (2003)*	21.65 (2001) 25.20 (2002) *31.34 (2003)*

*Monitoring at these sites commenced in October 2002 and mean is for period October 2002-April 2003.

Figures in italics represent mean of January-April 2003 at sites currently being monitored and predictions for 2005 and 2010 in adjacent columns. Due to seasonal variations the results reported may not represent likely mean for complete year.

Figures in red exceed the statutory 2005 annual mean Air Quality Objective of 40 (µg/m^3).
Figures in blue exceed the non-statutory 2010 annual mean EU Daughter Directive objective of 40 (µg/m^3).

The following monitored locations have been identified as having a predicted NO_2 annual mean concentration greater than 40 µg/m^3 in 2005, based upon full annual mean monitoring data between 1999-2002:

(i) Crediton (Exeter Road)

(ii) Crediton (High Street)

Both (i) and (ii) above also show predicted exceedences of the 2010 annual mean EU Daughter Directive objective of 40 µg/m^3, although for the High Street monitoring location this is based upon more limited 2003 data only (January-April 2003, four months).

The following monitored locations have been identified as having a predicted NO_2 annual mean concentration greater than 40 µg/m^3 in 2005, based upon short-term mean monitoring data between for 2002-2003 (October 2002-April 2003, seven months) or 2003 (January-April 2003, four months):

(iii) Cullompton (Station Road) – 2003

(iv) Tiverton (Leat Street) – 2002-2003

The monitoring data for (iii) and (iv) above does not fully account for seasonal variations over a full year and is less than the minimum nine months normally used to calculate an equivalent annual mean. For these reasons, there is insufficient evidence to conclude that a detailed assessment of NO_2 is required for these locations, however, future data will allow for more representative predictions of annual mean concentrations in 2005 and 2010 to be made. For the purposes of LAQM, these predictions are likely to be reported in a subsequent Progress Report.

There is sufficient data to conclude that there **is a requirement to proceed with a Detailed Assessment for nitrogen dioxide for the monitoring locations at both Exeter Road and the High Street in Crediton**.

(B) Monitoring data inside an AQMA

Mid Devon has not declared an AQMA in its area and therefore there is **no need to proceed to Detailed Assessment for monitoring data inside an AQMA.**

(C) Narrow congested streets with residential properties close to the kerb

Local knowledge was applied in the first round of review and assessment to assess these types of locations as potential 'hot spots'. Typically, assessed locations were street canyons (relatively narrow carriageway with buildings on both sides, where the height of the buildings is generally greater than the width of the road) where traffic congestion is common and traffic flows are stop/start with low average speeds. At all locations assessed there are residential properties close to the kerbside.

Results of these assessments are fully reported in the relevant Stage 2 and 3 reports of the first round of review and assessment. Assessment for NO_2 was carried out using DMRB modelling in combination with short-term continuous real-time monitoring and long-term diffusion tube monitoring.

Relevant locations previous assessed were:

(i) Crediton (Charlotte Steet and Exeter Road)

(ii) Cullompton (Station Road, College Road and Fore Street)

(iii) Tiverton (Gold Street, Bampton Street and Leat Street)

The first round of review of review and assessment concluded that at none of the above locations, on the basis of existing information, were at risk of exceeding the short-term or long-term air quality objectives. However, diffusion tube monitoring has continued, or has been recommenced, at those street canyon locations *most at risk* of exceeding the objectives, the results of which are discussed in section *(A)* above.

Therefore, review and assessment shows that there is **no need to proceed with a Detailed Assessment for nitrogen dioxide at narrow congested streets (street canyons) other than for those sites already identified from monitoring data**.

(D) Busy junctions

For the purposes of assessment, busy junctions are defined as:

- Junctions with one or more 'link' roads with a traffic flow greater than 10,000 vpd (vehicles per day)

Using 2001 traffic statistics and growth predictions, the following junctions have been identified as having a combined traffic flow greater than 10,000 vpd and have relevant public exposure (within 10m of the kerbside):

(i) Junction of A3072/A377 at Crediton

(ii) Junction of Station Rd/B3181 at Cullompton

Although junction (ii) above is a near a long-term diffusion tube monitoring site (Station Road, Cullompton) the NO_2 concentrations measured may not be applicable to potential public exposure on the opposite (B3181) side of the junction. Junction (i) above was not previously assessed in the first round of review and assessment. Therefore, a screening assessment of both junctions has been completed using the DMRB methodology and the results are given in Table 2.3 below:

Full details of the DMRB modelling including input and output data are included in Appendix 2 and modelled locations are shown in Appendix 3.

Table 2.3: Nitrogen dioxide DMRB results for busy junctions

Location	Site Code	DMRB Predicted Annual Mean 2005 (µg/m^3)	DMRB Predicted Annual Mean (µg/m^3) 2010
Junction A3072/A377, Crediton	DM6	30.2*	22.6*
Junction Station Rd/B3181, Cullompton	DM4	39.1*	30.7*
*Due to the street canyon nature of these locations (either all or part) then the 'road traffic component' of the DMRB output has been multiplied by a factor of 2 to avoid underestimating concentrations and this figure including in the reported predicted results for 2005 and 2010			

Neither of the modelled locations has predicted NO_2 annual mean concentration greater than 40 µg/m^3 in 2005 or 2010. However, at the junction of Station Road and B3181 in Cullompton the predicted concentration is close to the objective 2005, with predicted results marginally higher than the forward predicted NO_2 diffusion tube results for the nearby monitoring location (see Station Road site in section *A* above).

Therefore, the review and assessment shows that there is **no need to proceed with a Detailed Assessment for nitrogen dioxide at busy road junctions**.

(E) Busy streets where people may spend 1-hour or more close to traffic

For the purposes of assessment, these locations are defined as:

- Street locations where the public may spend 1-hour or more within 5m of the kerb of busy roads with a traffic flow greater than 10,000 vpd (vehicles per day)

Local knowledge was applied in the first round of review and assessment to assess these types of locations as potential 'hot spots'. Typically, assessed locations were town centre shopping locations, which were also street canyons (relatively narrow carriageway with buildings on both sides, where the height of the buildings is generally greater than the width of the road). At these locations traffic congestion is common and traffic flows are stop/start with low average speeds. Traffic flows at these locations were typically less than 10,000 vpd and therefore would not necessarily require assessment under the provisions of the latest technical guidance (LAQM.TG(03))

Results of these assessments are fully reported in the relevant Stage 2 and 3 reports of the first round of review and assessment. Assessment for NO_2 was carried out using DMRB and ADMS-Urban modelling which, at some locations, was combined with short-term continuous real-time monitoring and long-term diffusion tube monitoring.

Relevant locations previously assessed were:

(i) Crediton (High Street)

(ii) Cullompton (Fore Street)

(iii) Tiverton (Gold Street and Bampton Street)

The first round of review and assessment concluded that at none of the above locations, on the basis of existing information, were at risk of exceeding the short-term air quality objective (as is relevant for 1-hour exposures). However, diffusion tube monitoring has continued, or has been recommenced, at those roadside locations, excluding Fore Street, Cullompton, *most at risk* of exceeding the objectives, the results of which are discussed in section *(A)* above.

In order to provide an up to date assessment of Fore Street, Cullompton a screening assessment has been completed using the latest DMRB methodology and the results are given in Table 2.4 below:

Full details of the DMRB modelling including input and output data are included in Appendix 2 and modelled locations are shown in Appendix 3.

Table 2.4: Nitrogen dioxide DMRB results for busy streets where people may be exposed for 1-hour or more within 5m of the kerbside

Location	Site Code	DMRB Predicted Annual Mean 2005 (µg/m^3)	DMRB Predicted Annual Mean (µg/m^3) 2010
Fore Street, Cullompton	DM5	23.10*	17.5*
*Due to the street canyon nature of this location then the 'road traffic component' of the DMRB output has been multiplied by a factor of 2 to avoid underestimating concentrations and this figure including in the reported predicted results for 2005 and 2010			

The DMRB results at Fore Street, Cullompton, show that the predicted NO_2 annual mean concentration less than 40 µg/m^3 in 2005 and 2010. As a result, there should be less than 18 hours greater than the short-term objective of 200 µg/m^3.

Therefore, the review and assessment shows that there is **no need to proceed with a Detailed Assessment for nitrogen dioxide at locations where people may spend 1-hour or more close to traffic**.

(F) Roads with a high flow of buses and/or HGVs

For the purposes of assessment, roads with a high flow of buses and/or HGVs are defined as:

- Roads where the flow of heavy duty vehicles (HDVs) is greater than 2500 vpd (vehicles per day) and with relevant exposure within 10m of the kerbside

A review of the latest traffic statistics (2001) indicates that the following locations within Mid Devon have a traffic flow of HDVs greater than 2500 vpd currently (or will do so by 2005 or 2010 based upon traffic growth predictions) and potential public exposure:

(i) A30(T) near Cheriton Bishop

(ii) M5 Motorway near Willand

(iii) A361(T) near Sampford Peverell

(iv) Parking areas alongside A361(T) betweem J27 M5 and Gornhay, near Tiverton

(v) A361(T) near Cowley Moor, Tiverton

(vi) A361(T) near Worth Lodge/Lower Farleigh near Tiverton

Site visits indicate that at locations (i) – (iii) above there is no relevant exposure within 20m of the source road and therefore no further assessment of these locations is required.

However, at location (iv) has potential exposure for 1-hour or more within 5m at up to eight lay-by parking areas along a 10km stretch of the A361 from northwest of the junction with the M5 (J27) to Gornhay, Tiverton. Location (v) above also has potential exposure for 1-hour or more at residential garden locations within 10-12m at Marguerite Road and Banksia Close in the Cowley Moor area. Finally, location (vi) above has potential exposure for 1-hour or more at residential garden locations within 10-12m at Worth Lodge and a number of properties at nearby Lower Farleigh.

As a result a screening assessment has been completed for the relevant locations using the DMRB methodology and the results are given in Table 2.5 below:

Full details of the DMRB modelling including input and output data are included in Appendix 2 and modelled locations are shown in Appendix 3.

Table 2.5: Nitrogen dioxide DMRB results for roads with a high flow of buses and/or HGVs

Location	Site Code	DMRB Predicted Annual Mean 2005 (µg/m^3)	DMRB Predicted Annual Mean (µg/m^3) 2010
Public parking areas alongside A361(T) between J27 M5 and Gornhay near Tiverton	DM1	22.67	18.05
A361(T) near Cowley Moor, Tiverton	DM2	21.58	16.61
A361(T) near Worth Lodge/Lower Farleigh near Tiverton	DM3	18.14	14.31

The DMRB results at the above locations show that all the predicted NO_2 annual mean concentrations are less than 40 µg/m^3 in 2005 and 2010. As a result, at all locations there should be less than 18 hours greater than the short-term objective of 200 µg/m^3.

Therefore, the review and assessment shows that there is **no need to proceed with a Detailed Assessment for nitrogen dioxide at roads with a high flow of buses and/or HGVs**.

(G) New roads constructed or proposed since the first round and review and assessment

For the purposes of assessment, significant new or proposed roads are defined as:

- New roads or those with planning approval where is greater than 10,000 vpd (vehicles per day)
- New roads or those with planning approval that have resulted in an increase on existing roads previously identified as having 2005 annual mean concentrations greater than 36 µg/m^3 or more than 15 1-hour exceedences of 200 µg/m^3.

No new roads within the above criteria have been constructed or proposed within Mid Devon since the last round of review and assessment. Therefore, there is **no need to proceed with a Detailed Assessment for new or proposed roads**.

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

For the purposes of assessment, relevant roads close to the objective are defined as:

- Roads where predicted annual mean concentrations in 2005 were above 36 µg/m^3 but below 40 µg/m^3 which have not been reassessed using the new emissions factors

During the first round of review and assessment, there were no locations where predicted annual mean concentrations in 2005 were above 36 µg/m^3 but below 40 µg/m^3.

All highest predicted annual mean concentrations during the first round of review and assessment were between 30 - 32 µg/m^3. At all of these locations further assessment

has been carried out using NO_2 diffusion tubes to provide monitoring data or using the latest emissions factors within version 1.01 of the DMRB screening methodology. These assessment results are reported in sections *A-F* above.

Therefore, there is **no need to proceed with a Detailed Assessment for nitrogen dioxide at roads significantly close to the 2005 annual objective in the first round of review and assessment**.

(I) Roads with significantly changed traffic flows

For the purposes of assessment, relevant roads with significantly changed traffic flows are defined as:

- Roads with traffic flows greater than 10,000 vpd (vehicles per day) which have experienced an increase in traffic flow of more than 25%

A review of the latest traffic statistics (2001) and growth predictions indicates that for all busy roads within Mid Devon, the highest recorded increase is 21% along a stretch of the A30(T) which runs through a short section of the district near Cheriton Bishop (annual average daily traffic flow (AADT) of 26380 in 2001). Therefore, there are no relevant locations which require further assessment and **there is no need to proceed with a Detailed Assessment for nitrogen dioxide at any roads with significantly changed traffic flows**.

(J) Bus stations

For the purposes of assessment, relevant bus station locations that require review and assessment are defined as:

- Open (and opposed to enclosed) stations that have a flow of greater than 1000 buses per day

Within Mid Devon there are no relevant bus stations that meet the above criteria. Therefore, there is **no need to proceed with a Detailed Assessment for nitrogen dioxide at bus station locations**.

(K) New industrial sources

For the purposes of the assessment, industrial sources that have the potential for significant nitrogen dioxide emissions are:

- large (Part A/A1) iron and steel processes
- large (Part A/A1) petroleum processes
- large (Part A/A1) combustion processes
- large (Part A/A1) non-ferrous metal processes
- large (Part A/A1) carbonisation and associated processes
- large (Part A/A1) cement and lime and associated processes

- large (Part A/A1) ceramic production processes
- large (Part A/A1) inorganic chemical processes
- large (Part A/A1) chemical fertiliser processes
- large (Part A/A1) incineration processes
- smaller (Part B/A2) lead glass processes

Within the Mid Devon area (or within 5km of the District boundary) there are no industrial sources that meet the 'significant' criteria.

Three potentially significant new industrial scale combustion plant have been assessed and granted approval under the planning process since the first round of review and assessment and are detailed below:

(i) A combined heat and power (CHP) plant at John Heathcoat & Co Ltd, Tiverton. The primary fuel for this plant is natural gas and the plant has been in operation since 2000.

(ii) Boiler and steam raising plant at the new Community Hospital in Tiverton. The primary fuel for this plant is natural gas and the plant is due to come into operation in late 2003.

(iii) Landfill gas engine plant at Broadpath Landfill site near Uffculme. This plant will take local landfill gas for the purposes of electricity generation and is due to become operational between 2003-2004

The plant at locations (i) and (ii) above subject to D1 and Technical Memorandum emissions dispersion assessment in order to ensure adequate dispersion of resultant NO_2 emissions. Modelled emissions from both plant were low and very unlikely to produce measurable increases in local background annual mean concentrations.

The proposed plant at location (iii) above is small (4-5 MW) and is currently under site-specific environmental impact assessment as part of the site licence and planning condition requirements. The results of this assessment are currently therefore unavailable. However, the assessment being carried out is sufficient for review and assessment purposes and the gas engines have specified for compliance with EA Draft Guidance on the Management of Landfill Gas (2002). Additionally, the gas engines will be compliant with the 2004 NO_2 emission standards set out in the EA Draft Guidance on the Monitoring of Landfill Gas Emissions (2002). Therefore, the resultant emissions from this plant is expected to be low and is not expected to significantly impact on local annual mean concentrations.

Therefore, the review and assessment shows that there is **no need to proceed with a Detailed Assessment for nitrogen dioxide at new industrial sources**.

(L) Industrial sources with substantially increased emissions

For the purposes of assessment, relevant industrial sources are:

- Any significant industrial sources identified during the first round of review and assessment that have increased emissions by greater than 30%

During the first round of review and assessment, no significant industrial sources of NO_2 were identified within the Mid Devon area (or within 5km of the District boundary). Further assessment of has been completed by direct liaison with relevant regulatory authorities and case officers alongside a review of recent emissions information contained on Part A/A1 and Part B process public register entries.

Therefore, the review and assessment shows that there is **no need to proceed with a Detailed Assessment for nitrogen dioxide at industrial sources with significantly increased emissions**.

(M) Aircraft

For the purposes of assessment, relevant airport locations are:

- Any airport locations with greater than 1 million passengers per annum (mppa) or 100,000 tonnes of freight in 2005 with relevant exposure within 1km of the airport boundary

There are no operational airports or airfields within the Mid Devon area (or within 1km of the District boundary), therefore, there is **no need to proceed with a Detailed Assessment for nitrogen dioxide for aircraft**.

2.7 Review and Assessment of sulphur dioxide

Objectives

The current objectives for sulphur dioxide (SO_2) set out in the regulations are:

- 125 µg/m^3 not to be exceeded more than 3 times per year as a 24-hour concentration to be achieved by the end of 2004
- 350 µg/m^3 not to be exceeded more than 24 times per year as a 1-hour concentration also to be achieved by the end of 2004
- 266 µg/m^3 not to be exceeded more than 35 times per year as a 15-min concentration also to be achieved by the end of 2005

The objectives for 2004 and 2005 are unchanged from the first round of review and assessment.

National perspective

The main source of sulphur dioxide in the UK is power stations, which accounted for more than 71% of emissions in 2000. Other industrial combustions sources also have significant emissions. Domestic sources now only account for 4% if emissions and road transport currently accounts for less than 1%.

Concentrations of sulphur dioxide have fallen across the UK in recent years, however local exceedences (principally of 15-min mean objective) of the objectives may occur in the vicinity of small combustion plant (less than 20 MW) which burn oil or coal and in

areas where solid fuels are the predominant form of domestic heating and in the vicinity of major ports.

Local perspective

The first round of review and assessment concluded that that it was not necessary to declare an AQMA for this pollutant in Mid Devon. Nationally, a small number of AQMAs have been declared from the first round of review and assessment. These relate to emissions at a cellophane process and a food processing plant, a coal fired boiler at a hospital, domestic coal burning and shipping at a major port.

The conclusions from the first round of review and assessment indicate therefore that there is a relative diversity of source locations that have the potential to result in exceedences of the objectives and it is important that local circumstances are assessed.

Updating and Screening Assessment for sulphur dioxide

(A) Monitoring data outside an AQMA

No monitoring for sulphur dioxide has been carried out since the last round of review and assessment. Therefore, there is **no need to proceed with a Detailed Assessment for monitoring data**.

(B) Monitoring data inside an AQMA

Mid Devon has not declared an AQMA in its area and therefore there is **no need to proceed to Detailed Assessment for monitoring data inside an AQMA.**

(C) New industrial sources

For the purposes of the assessment, industrial sources that have the potential for significant sulphur dioxide emissions are:

- large (Part A/A1) iron and steel processes
- large (Part A/A1) petroleum processes
- large (Part A/A1) combustion processes
- large (Part A/A1) non-ferrous metal processes
- large (Part A/A1) carbonisation and associated processes
- large (Part A/A1) cement and lime and associated processes
- large (Part A/A1) ceramic production processes
- large (Part A/A1) tar and bitumen processes
- large (Part A/A1) chemical fertiliser processes
- large (Part A/A1) other mineral fibre processes
- smaller (Part B/A2) combustion plant and reheat furnace processes
- smaller (Part B/A2) ferrous and non-ferrous metal processes

- smaller (Part B/A2) heavy clay goods processes
- smaller (Part B/A2) glass and lead glass processes
- smaller (Part B/A2) roadstone coating processes

It is likely that large coal burning boilers and combustion plant at industrial processes may be significant. New regulations limiting the sulphur content of fuel oil to less than 1% from 1 January 2003, mean that sources burning fuel oil are unlikely to be significant.

Within the Mid Devon area (or within 5km of the District boundary) there are no industrial sources that meet the 'significant' criteria. Existing potentially significant boiler plant and a roadstone coating plant do operate within the district and these locations are reviewed and assessed the subsequent sections below.

Therefore, the review and assessment shows that there is **no need to proceed with a Detailed Assessment for nitrogen dioxide at new industrial sources**.

(D) Industrial sources with substantially increased emissions

For the purposes of assessment, relevant industrial sources are:

- Any significant industrial sources identified during the first round of review and assessment that have increased emissions by greater than 30%

During the first round of review and assessment, no significant industrial sources of SO_2 were identified within the Mid Devon area (or within 5km of the District boundary) excluding the roadstone coating process at Westleigh Quarry near Burlescombe. Further assessment has been completed by direct liaison with relevant regulatory authorities and case officers alongside a review of recent emissions information contained on Part A/A1 and Part B process public register entries.

The roadstone coating process at Westleigh uses waste oil to coat stone and was assessed during the first round of review and assessment using the Envrionment Agency method 'Guidance for estimating the Air Quality Impact of Stationary Sources'. This assessment concluded that resultant emissions would produce no background exceedences of air quality objective and the maximum 15-min concentrations were 40µg/m^3, well below the 15-minute objective of 266 µg/m^3. This process is directly regulated by Mid Devon District Council as a Part B process under the Pollution Prevention and Control (PPC) Act 1999 and emissions are controlled via the process permit. An assessment of quarterly theoretical and predicted SO_2 emissions data between 2000 and 2003 (based upon waste oil analysis) on the public register shows that there was no statistical increase or decrease in emissions over the period with the sulphur content of the waste oil averaging between 0.3-0.7%.

Therefore, the review and assessment shows that there is **no need to proceed with a Detailed Assessment for sulphur dioxide at industrial sources with significantly increased emissions**.

(E) Areas of domestic coal burning

For the purposes of the assessment, areas of domestic coal burning that have the potential for significant sulphur dioxide emissions are:

- Any areas of approximately 500m x 500m where there may be significant coal burning (approximately 100 houses) as the primary source of heating or those areas known to be affected by coal burning odours on winter evenings

Obtaining definitive information on the actual usage of domestic coal is difficult and any usage will vary depending on the weather conditions and the individual occupants of residential properties at any one time.

However, an assessment of population and housing densities within the district, including information from the NAEI data warehouse, indicates that the vast majority of relatively dense housing areas (greater than 200 properties per 500m x 500m) are within the main towns and large settlements in the district (Credition, Cullompton, Tiverton and Willand) which are all served by mains natural gas. As result, coal burning in the town areas is very limited. In essentially rural and village areas of the district, housing densities are typically low and although properties are largely without mains gas supply, fuels such as low-sulphur heating oil and bottled/tank liquid petroleum gas have, in addition to electric heating, largely replaced coal (including coke and anthracite) as the primary sources of heating. This assumption is confirmed by the knowledge of district housing officers and limited house condition surveys and assessments.

Professional judgement and experience also indicates that there are no areas within the district that are affected by the distinctive coal burning odours on winter evenings.

Therefore, no areas within the district have been identified as having a likely density of coal burning houses exceeding 100 per 500m x 500m area and professional judgement indicates that there is **no need to proceed with a Detailed Assessment for sulphur dioxide in areas of domestic coal burning**.

(F) Boilers greater than 5 MW $_{(thermal)}$

For the purposes of assessment, boiler plant that have the potential for significant sulphur dioxide emissions are:

- All boiler plant greater than 5 MW $_{(thermal)}$ that burn coal or fuel oil with a relevant exposure within 500m of the source

Using existing records, Clean Air Act approvals and local knowledge, over thirty potentially significant boiler plant were identified and assessed. The locations of boiler plant ranged from large educational and institutional buildings to commercial and miscellaneous industrial premises. The majority of plant assessed were determined as not significant, due to thermal capacities being less than 0.5 MW and/or the plant is gas-fired. At locations with more than one boiler plant aggregate figures were used and at all locations a consideration was made of other known local sources in order to ensure that any combined impacts of several sources were fully taken into account.

However, two potentially significant boiler plant were identified:

(i) Thomas Hardy Services Ltd. Tiverton (a brewery bottling/packaging process)

(ii) Milk Link Processing, Crediton (a dairy process)

For both processes (i) and (ii) above, all relevant information on boiler plant, stack details, specific fuel usage, building locations and estimated annual SO_2 emissions has been collated and assessed for the purpose of establishing the effective stack height and for comparison with maximum permitted emissions taken from the LAQM.TG(03) SO_2 nomogram.

A summary of the assessment and nomogram results are given in Table 2.6 below. Full details of the assessment data and nomogram input and assessment data are included in Appendix 2 and the assessed locations are shown in Appendix 3.

Table 2.6: Sulphur dioxide assessment and nomogram results for boiler plant greater than 5 MW (thermal)

Location	Estimated actual annual SO_2 emission in 2002 (tonnes)	Maximum SO_2 nomogram predicted emission rate*	Actual emission less than maximum nomogram emission?
Thomas Hardy Services Ltd,Tiverton	11.2	167	Yes
MilkLink Processing, Crediton	40.0	179	Yes
*Maximum emission rate threshold for the site specific stack that results in 99.9th percentile of local 15-min mean ground level concentrations being less than 133 µg/m^3 (compared to 266 µg/m^3 for the Air Quality objective)			

The assessment results for the above plant show that estimated actual emissions in 2002 are all less than the maximum nomogram predicted SO_2 emission rate that would give rise to local 15-min concentrations of 133 µg/m^3 SO_2. As a result, at all locations there should not be an exceedence the short-term 15-min objective of 266 µg/m^3 for 2005.

Therefore, the review and assessment shows that there is **no need to proceed with a Detailed Assessment for sulphur dioxide for relevant boiler plant**.

(G) Shipping

For the purposes of assessment, relevant port locations are:

- Any port locations with greater than 5000 movements of large ships in 2005 with relevant exposure within 1km of the port berths and main areas of maneuvering

Mid Devon is land-locked and 'shipping' is limited to small canal and limited pleasure boat craft along the Grand Western Canal. Therefore, there are no ports within the Mid Devon area (or within 1km of the District boundary) and there is **no need to proceed with a Detailed Assessment for sulphur dioxide for shipping**.

(H) Railway locomotives

For the purposes of assessment, relevant railway locations are:

- Any locations where diesel locomotives are regularly stationary with engines running for periods of more than 15 minutes or more and where there is potential for regular exposure to the public within 15m

Within the Mid Devon area there are two operational public railway lines:

(i) The Southwest mainline (Bristol-Penzance) which intersects the district between White Ball in the east and near Silverton in the south.

This section of the line has a single station at Tiverton Parkway and no operational goods stops or depots.

(ii) The Northcoast branch line (Exeter-Barnstaple) which splits from the Southwest mainline just outside of Exeter and intersects the district near Cowley in the southwest and Eggesford in the northwest.

This section of the line has station stops at Fordton Mills near Crediton, Yeoford, Copplestone, Down St Mary, Lapford Cross and Eggesford. There are no operational goods stops or depots along this section of the line.

For both railway lines the majority of the route is through open countryside with no public exposure to stationary locomotive engines, including at signals. Consultation with Network Rail (who have responsibility for the line infrastructure) and train operators (Virgin Trains and Great Western Trains) alongside observation and timetable assessments has indicated that there are no relevant exposure locations within the district.

Train operators have indicated that there are some locomotive idling periods of up to 10 minutes in duration at some stations, notably Tiverton Parkway. In all cases, idling is less than 15 minutes and is less than twice per day at a given location. Furthermore, platform configurations at Tiverton Parkway are such that under normal circumstances stationary locomotives are positioned more than 10m from public platform areas.

Therefore, no significant risk of exceedences of the 15-minute objective has been identified and review and assessment shows that there is **no need to proceed with a Detailed Assessment for sulphur dioxide for railway locomotives**.

2.8 Review and assessment of PM_{10}

The current objectives for fine particles (PM_{10}) set out in the regulations are:

- 40 µg/m^3 as an annual mean concentration to be achieved by the end of 2004
- 50 µg/m^3 not to be exceeded more than 35 times per year as a 24-hour mean concentration also to be achieved by the end of 2004

The objectives for 2004 are unchanged from the first round of review and assessment.

The Government have also set provisional limit values for PM_{10}, which have not yet been transposed into the Air Quality Regulations 2000 or Air Quality (Amendment) Regulations 2002 for the purposes of LAQM. The provisional objectives (for England excluding London) include an annual mean limit value of 20 µg/m^3 and a 24-hour limit of 50 µg/m^3 not to be exceeded more than 7 times per year, both to be achieved by 2010.

Although there is currently no statutory requirement to do so, the review and assessment for PM_{10} has been extended to include the 2010 limit.

National perspective

There are a wide range of emission sources that contribute to PM_{10} concentrations in the UK. These sources can be broadly divided into 3 main categories. *Primary particle* emissions derived directly from combustion sources including road transport, power generation and industrial processes etc. *Secondary particles* which are formed in atmospheric chemical reactions and comprise principally of sulphates and nitrates. *Coarse particles* which derive from a wide range of sources including resuspended dusts from road traffic, construction works, quarries, wind-blow dusts and soils, sea salt and biological particles.

The expected reduction in particle emissions for each source is different e.g. road traffic and industrial primary particles emissions are governed by existing and new legislation whilst secondary particle emissions will largely be governed by controls on power stations and coarse particles are largely uncontrolled and in general are not expected to decline in future. Additionally, coarse particle emissions are often subject to wide variation due to metrological conditions.

There has been significant progress in recent years in reducing UK emissions of particles from both the transport and industrial sectors. Road transport emissions will be further tightened as a result of the Euro III and Euro IV emission standards. Within the industrial sector, particles are further controlled the Integrated Pollution Prevention and Control regime and through Local Air Pollution Control. In addition, the EU legislation on the Acidification Strategy should further reduce emissions of those pollutants which lead to the formation of secondary particles.

For the different source categories of PM_{10}, the exact regional or local contribution to annual mean background concentrations is variable and will depend on the precise location, whilst at the same time a significant proportion of annual mean concentrations is derived from regional (including long distance transport from Europe) background sources.

The focus of LAQM and the review and assessment of PM10 is towards a *local* level and an assessment of the contribution of local emission sources.

Local perspective

The first round of review and assessment concluded that that it was not necessary to declare an AQMA for this pollutant in Mid Devon, however predicted concentrations at some locations were close to the 2004 24-hour mean objective. Nationally, over 50% of all AQMA declared have included exceedences of the 2004 24-hour mean objective,

typically in conjunction with NO_2 exceedences. The spatial extent of particle exceedences is smaller than those for NO_2. In addition, some industrial processes, a quarry and domestic coal burning have also resulted in the declaration of AQMAs for particles.

Therefore, given the potential for objective exceedence and the wide diversity of sources, it is critical for local authorities to focus upon those areas where expected pollutant concentrations are likely to be the highest (so called 'hot spots'). 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.

Updating and Screening Assessment for PM_{10}

(A) Monitoring data outside an AQMA

Since the first round of review and assessment, monitoring for PM_{10} has been completed at two roadside locations and one urban background/suburban location as detailed below:

(1) Cullompton (Station Road) - roadside

(2) Tiverton (Great Western Way) - roadside

(3) Silverton (The Green) – urban background/suburban

The roadside monitoring locations in built up town areas at roadside locations and are situated within 4m of the kerbside and within 2m of the building facades of residential properties (or are at equivalent locations to nearby residential properties if a suitable monitoring position was not available) and therefore are representative of relevant public exposure over the 24-hour and annual mean objective periods. These sites were chosen as potential 'hot spots' of pollution concentrations. Monitoring at these locations was completed for approximately twelve months.

The urban background/suburban monitoring location is within a large village and is greater than 10m from any road and greater than 20m from a busy road with the nearest residential building façade approximately 6m away. The site was chosen as representative of urban background or suburban concentrations and also potentially representative of typical domestic solid fuel burning areas within the village areas of the district. The site is also potentially representative of the urban plume from nearby Exeter which is southwest of the monitoring location. Monitoring at this location was completed for six-months.

Monitoring at location (1) above was completed using a single, continuous real-time BAM 1020 beta-attenuation monitor. This monitor is type approved for use at national AUN/ARN (automatic urban and rural networks) monitoring sites and has a moving filter tape without a heated manifold. The monitor was situated within a J-type a air-conditioned enclosure Therefore, measurements taken are equivalent to gravimetric PM_{10}.

Monitoring at locations (2) and (3) above was completed using two co-located analysers, the BAM monitor discussed above and a TEOM analyser. The TEOM analyser is also type approved for use at national AUN/ARN sites but is not directly comparable to the

gravimetric measurements of PM_{10} due to its heated manifold. As a result, the default adjustment factor of 1.3 has been applied to the monitoring data in order to ensure the data has gravimetric equivalency. Monitoring at these locations was also completed using the J-type enclosure.

Both PM_{10} monitors have type-approved Graseby Andersen 10µm sampling heads.

A summary of the ratified monitoring data results and predicted future concentrations is given in Table 2.6 below.

Full details of the monitoring data, including data ratification and AQ/QC are included in Appendix 1 and monitoring locations are shown in Appendix 3.

Table 2.6: PM_{10} continuous monitoring results

Location	Cullompton, Station Rd	Tiverton, Great Western Way	Silverton, The Green
Site Code	MS2	MS1	MS3
Site Classification	Roadside, part street canyon	Roadside	Urban background/ Suburban
Monitoring period	17/3/00-14/3/01	22/10/01-01/10/02	02/10/02-14/3/03
Mean PM_{10} µg/m^3 (gravimetric) for monitoring period	25.71	18.49*	18.04**
No. of 24-hour mean exceedences of 50 µg/m^3 for monitoring period	18	2	1
Predicted Annual Mean PM_{10} µg/m^3 (gravimetric) 2004	25.07	17.72	17.57
Predicted no. 24-hour mean exceedences of 50 µg/m^3 2004	13	1	1
Predicted Annual Mean PM_{10} µg/m^3 (gravimetric) 2010	23.14	16.69	16.57
Predicted no. 24-hour mean exceedences of 50 µg/m^3 2010	8	<1	<1

*Average of co-located BAM and TEOM analyser reported as PM_{10} (gravimetric)
** Adjusted mean to give annual mean equivalent due to <9 months data based on average of co-located analysers as above. Adjustment completed in accordance with LAQM.TG(03)

Figures in red exceed the provisional 2010 annual mean objective of 20 µg/m^3 and 24-hour mean objective of 50 µg/m^3 not be exceeded more than 7 times per year

None of monitored locations above have been identified as having predicted PM_{10} annual mean concentrations greater than 40 µg/m^3 in 2004 or having more than 35 predicted exceedences of the 24-hour mean of 50 µg/m^3 in 2004.

The Cullompton, Station Road monitoring location has predicted exceedences of both the annual mean and 24-hour mean provisional 2010 objectives. Monitoring has recommenced at this location (from 1 April 2003) using the BAM monitor and will continue for a minimum period of twelve months. Future data will then be used to provide a refined estimate of any predicted exceedences of both the 2004 and 2010 objectives. This location will continue to be treated as a potential 'hot spot'.

A further potential 'hot spot' location at Exeter Road, Crediton (roadside, street canyon site) was previously identified and monitored in 1999 using the BAM monitor, the results of which are reported in the first round of review and assessment. Elevated concentrations were measured in 1999, however, predictions for 2004 using ratified data indicated no exceedences of the objectives. Monitoring has also recommenced at this location (from 1 April 2003) using the TEOM analyser in a new enclosure (alongside the chemiluminescent NO_2 analyser) discussed in the review and assessment of NO_2 above.

For the purposes of LAQM, monitoring data obtained since 1 April 2003 and predictions for objective exceedences in 2004 and 2010 are likely to be reported in a subsequent Progress Report.

Therefore, the review and assessment of monitoring data obtained between 2000 and March 2003 shows that there is **no need to proceed with a Detailed Assessment for PM_{10} at the monitored locations, however potential exceedences of the provisional (non-statutory) objectives for 2010 have been identified and new monitoring data will be used for further review and assessment**.

(B) Monitoring data inside an AQMA

Mid Devon has not declared an AQMA in its area and therefore there is **no need to proceed to Detailed Assessment for monitoring data inside an AQMA.**

(C) Busy roads in Scotland

This LAQM.TG(03) review and assessment item is not applicable.

(D) Busy junctions

For the purposes of assessment, busy junctions are defined as:

- Junctions with one or more 'link' roads with a traffic flow greater than 10,000 vpd (vehicles per day)

Using 2001 traffic statistics and growth predictions, the following junctions have been identified as having a combined traffic flow greater than 10,000 vpd and have relevant public exposure (within 10m of the kerbside):

(i) Junction of A3072/A377 at Crediton

(ii) Junction of Station Rd/B3181 at Cullompton

Although junction (ii) above is a near to the long-term continuous monitoring site (Station Road, Cullompton) discussed in section *(A)* above, the PM_{10} concentrations measured may not be applicable to potential public exposure on the opposite (B3181) side of the junction. Junction (i) above was not previously assessed in the first round of review and assessment. Therefore, a screening assessment of both junctions has been completed using the DMRB methodology and the results are given in Table 2.7 below:

Full details of the DMRB modelling including input and output data are included in Appendix 2 and modelled locations are shown in Appendix 3.

Table 2.7: PM_{10} DMRB results for busy junctions

Location	Junction A3072/A377, Crediton	Junction Station Rd/B3181, Cullompton
Site Code	DM6	DM4
Site Classification	Busy junction, part street canyon	Busy junction, part street canyon
DMRB Predicted Annual Mean PM_{10} µg/m^3 (gravimetric) 2004	21.21	24.04
DMRB Predicted no. 24-hour mean exceedences of 50 µg/m^3 2004	5	10
DMRB Predicted Annual Mean PM_{10} µg/m^3 (gravimetric) 2010	18.00	19.97
DMRB Predicted no. 24-hour mean exceedences of 50 µg/m^3 2010	1	3

Neither of the modelled locations has predicted PM_{10} annual mean concentration greater than 40 µg/m^3 in 2004 or having more than 35 predicted exceedences of the 24-hour mean of 50 µg/m^3 in 2004. However, at the junction of Station Road and B3181 in Cullompton the predicted concentration is close to the annual mean provisional objective for 2010, with predicted results marginally lower than the forward predicted PM_{10} continuous monitoring results for the nearby monitoring location (see Station Road site in section *A* above).

Therefore, the review and assessment shows that there is **no need to proceed with a Detailed Assessment for PM_{10} at busy road junctions**.

(E) Roads with a high flow of buses and/or HGVs

For the purposes of assessment, roads with a high flow of buses and/or HGVs are defined as:

- Roads where the flow of heavy duty vehicles (HDVs) is greater than 2500 vpd (vehicles per day) and with relevant exposure within 10m of the kerbside

A review of the latest traffic statistics (2001) indicates that the following locations within Mid Devon have a traffic flow of HDVs greater than 2500 vpd currently (or will do so by 2005 or 2010 based upon traffic growth predictions) and potential public exposure:

(i) A30(T) near Cheriton Bishop

(ii) M5 Motorway near Willand

(iii) A361(T) near Sampford Peverell

(iv) Parking areas alongside A361(T) betweem J27 M5 and Gornhay, near Tiverton

(v) A361(T) near Cowley Moor, Tiverton

(vi) A361(T) near Worth Lodge/Lower Farleigh near Tiverton

On-site assessments indicate that at all locations (i) – (iii) above there is no relevant exposure within 20m of the source road and therefore no further assessment of these locations is required.

However, assessments at locations (v) and (vi) above indicate borderline potential exposure against the 24-hour criteria at residential garden locations within 10-12m at Marguerite Road and Banksia Close in the Cowley Moor area and at residential garden locations within 10-12m at Worth Lodge and a number of properties at nearby Lower Farleigh.

As a result a screening assessment has been completed for the relevant locations using the DMRB methodology and the results are given in Table 2.8 below:

Full details of the DMRB modelling including input and output data are included in Appendix 2 and modelled locations are shown in Appendix 3.

Table 2.8: PM_{10} DMRB results for roads with a high flow of buses and/or HGVs

Location	Site Code	DMRB Predicted no. 24-hour mean exceedences of 50 µg/m^3 2004	DMRB Predicted no. 24-hour mean exceedences of 50 µg/m^3 2010
A361(T) near Cowley Moor, Tiverton	DM2	3	1
A361(T) near Worth Lodge/Lower Farleigh near Tiverton	DM3	2	<1

Neither of the modelled locations has more than 35 predicted exceedences of the 24-hour mean of 50 µg/m^3 in 2004 or more than 7 predicted exceedences of the 24-hour mean of 50 µg/m^3 in 2010.

Therefore, the review and assessment shows that there is **no need to proceed with a Detailed Assessment for PM_{10} at roads with a high flow of buses and/or HGVs**.

(F) New roads constructed or proposed since the first round and review and assessment

For the purposes of assessment, significant new or proposed roads are defined as:

- New roads or those with planning approval where is greater than 10,000 vpd (vehicles per day)
- New roads or those with planning approval that have resulted in an increase on existing roads previously identified as having more than 30, 24-hour exceedences of 50 µg/m^3 in 2004

No new roads within the above criteria have been constructed or proposed within Mid Devon since the last round of review and assessment. Therefore, there is **no need to proceed with a Detailed Assessment for new or proposed roads**.

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

For the purposes of assessment, relevant roads close to the objective are defined as:

- Roads having more than 30 but fewer than 36, 24-hour exceedences of 50 µg/m^3 in 2004µg/m^3 which have not been reassessed using the new emissions factors

Previous continuous monitoring using a BAM 1020 monitor at Exeter Road, Crediton in 1999 (see section *A* above) initially resulted in >30 exceedences of the 24-hour mean objective of 50 µg/m^3 in 2004 being reported at Stage 2 of the first round of review and assessment. However, independent dispersion modeling of this street canyon location using ADMS-Urban (with integrated street canyon model) by CERC (CERC report 2001[7]) for detailed assessment in Stage 3, and further ratification work on the monitoring data using a co-located reference gravimetric reference method Partisol 2025 analyser, reduced the number of predicted exceedences to well below 30.

Further independent assessment of the Mid Devon BAM monitoring data was carried out by Stanger in 2002 (Stanger report 2002[8]). The assessment concluded that that findings of Stage 3 were valid and that during 1999 the BAM monitor was over-reading by a probable 58%. This over-read was possibly due to excess condensation on the filter sample tape during wet and/or humid weather conditions during some periods during the monitoring. Relocation of the monitor within the monitoring enclosure (closer to the filtered air-conditioning inlet) and better control on internal enclosure temperatures has eliminated condensation build-up.

However, due to continued elevated NO_2 monitoring data at Exeter Road, Crediton (see NO_2 review and assessment section *A*) and the assumed common potential road traffic local source of both NO_2 and primary particles (and potentially coarse particles due to the re-suspension of road dust) i.e. road traffic, then this site remains a potential 'hot-spot' for PM_{10} concentrations. This is especially relevant given the tighter provisional PM_{10} objectives for 2010.

Therefore, it has been considered prudent to reassess this location applying 2001 traffic statistics (and growth predictions) using the latest DMRB screening methodology.
and the results are given in Table 2.9 below:

Full details of the DMRB modelling including input and output data are included in Appendix 2 and modelled locations are shown in Appendix 3.

Table 2.9: PM_{10} DMRB results for roads previously close to the 2004 objective

Location	Site Code	Site Classification	DMRB Predicted Annual Mean PM_{10} µg/m^3 (gravimetric) 2004	DMRB Predicted no. 24-hour mean exceedences of 50 µg/m^3 2004	DMRB Predicted Annual Mean PM_{10} µg/m^3 (gravimetric) 2010	DMRB Predicted no. 24-hour mean exceedences of 50 µg/m^3 2010
Crediton, Exeter Rd	DM7	Street canyon close to previous objective	19.87	3	17.11	<1

The Exeter Road modelled location does not have a predicted annual mean of greater than 40 µg/m^3 or more than 35 predicted exceedences of the 24-hour mean of 50 µg/m^3 in 2004. Additionally, the location does not have a predicted annual mean of greater than 20 µg/m^3 or more than 7 predicted exceedences of the 24-hour mean of 50 µg/m^3 in 2010.

As discussed in section *A* above, monitoring using a TEOM analyser has recommenced at this location (from 1 April 2003) and predictions for objective exceedences, based on ratified 2003/04 monitoring data, in 2004 and 2010 are likely to be reported in a subsequent Progress Report.

Therefore the review and assessment must conclude that there is **no need to proceed with a Detailed Assessment for PM_{10} at roads close to the previous objective based on the current information, however, Exeter Road in Crediton remains a potential 'hot spot' (especially against provisional 2010 objectives) and new monitoring data will be used for further review and assessment**.

(H) Roads with significantly changed traffic flows

For the purposes of assessment, relevant roads with significantly changed traffic flows are defined as:

- Roads with traffic flows greater than 10,000 vpd (vehicles per day) which have experienced an increase in traffic flow of more than 25%. This only applies to the 2004 objectives

A review of the latest traffic statistics (2001) and growth predictions indicates that for all busy roads within Mid Devon, the highest recorded increase is 21% along a stretch of the A30(T) which runs through a short section of the district near Cheriton Bishop (annual average daily traffic flow (AADT) of 26380 in 2001). Therefore, there are no relevant locations which require further assessment and **there is no need to proceed with a Detailed Assessment for PM_{10} at any roads with significantly changed traffic flows**.

(I) New industrial sources

For the purposes of the assessment, industrial sources that have the potential for significant PM_{10} emissions are:

- large (Part A/A1) iron and steel processes
- large (Part A/A1) petroleum processes
- large (Part A/A1) combustion processes
- large (Part A/A1) non-ferrous metal processes
- large (Part A/A1) carbonisation and associated processes
- large (Part A/A1) cement and lime and associated processes
- large (Part A/A1) ceramic production processes
- large (Part A/A1) chemical fertiliser processes
- large (Part A/A1) other mineral fibre processes
- smaller (Part B/A2) combustion plant (20-50 MW) processes
- smaller (Part B/A2) reheat furnace processes
- smaller (Part B/A2) coal and coke etc. processes
- smaller (Part B/A2) quarry, china clay, ceramic and roadstone coating processes
- smaller (Part B/A2) coating powder and coil coating processes
- smaller (Part B/A2) rubber processes

Within the Mid Devon area (or within 5km of the District boundary) there are no new industrial sources that meet the 'significant' criteria. Existing potentially significant quarry processes and a roadstone coating plant do operate within the district and these locations are reviewed and assessed the subsequent sections below.

(J) Industrial sources with substantially increased emissions

For the purposes of assessment, relevant industrial sources are:

- Any significant industrial sources identified during the first round of review and assessment that have increased emissions by greater than 30%

During the first round of review and assessment, no significant industrial sources of PM_{10} were identified within the Mid Devon area (or within 5km of the District boundary) excluding the quarry proceeses and a roadstone coating process at Westleigh Quarry near Burlescombe. Further assessment of has been completed by direct liaison with relevant regulatory authorities and case officers alongside a review of recent emissions information contained on Part A/A1 and Part B process public register entries.

The roadstone coating process at Westleigh uses waste oil to coat stone and was assessed during the first round of review and assessment using the Envrionment Agency method 'Guidance for estimating the Air Quality Impact of Stationary Sources' and using the ADMS-Screen. This assessment covered all quarry processes and the roadstone plant and concluded that resultant emissions would produce no background exceedences of air quality objective with predicted annual mean concentrations of

between 19-20 μg/m^3, well below the objective of 40 μg/m^3 in 2004. The quarry processes are discussed in more detail in section *L* below.

The roadstone coating process is directly regulated by Mid Devon District Council as a Part B process under the Pollution Prevention and Control (PPC) Act 1999 and emissions are controlled via the process permit. An assessment of formal annual total particulate emissions monitoring data between 2000 and 2003 on the public register shows that there was no statistical increase or decrease in emissions over the period. This is further substantiated by the regular review and continuous indicative monitor results during each site inspection.

Therefore, the review and assessment shows that there is **no need to proceed with a Detailed Assessment for PM_{10} at industrial sources with significantly increased emissions**.

(K) Areas of domestic solid fuel burning

For the purposes of the assessment, areas of domestic solid fuel burning that have the potential for significant PM_{10} emissions are:

- Any areas of approximately 500m x 500m where there may be significant solid fuel burning (approximately 50 houses) as the primary source of heating or those areas known to be affected by coal burning odours or other solid fuel derived smoke on winter evenings

As with domestic coal burning (discussed for the review and assessment of sulphur dioxide), obtaining definitive information on the actual usage of domestic solid fuel is difficult and any usage will vary depending on the weather conditions and the individual occupants of residential properties at any one time.

However, an assessment of population and housing densities within the district, including information from the NAEI data warehouse, indicates that the vast majority of relatively dense housing areas (greater than 200 properties per 500m x 500m) are within the main towns and large settlements in the district (Credition, Cullompton, Tiverton and Willand) which are all served by mains natural gas. As result, coal and other solid fuel burning (e.g. wood) in the town areas is very limited.

In essentially rural and village areas of the district, housing densities are typically low and although properties are largely without mains gas supply, liquid or gaseous fuels such as low-sulphur heating oil and bottled/tank liquid petroleum gas have, in addition to electric heating, largely replaced coal (including coke and anthracite) as the primary sources of heating. This assumption is confirmed by the knowledge of district housing officers and limited house condition surveys and assessments. This is reduction is driven by comparative convenience and low cost and efficiency of liquid or gaseous fuels in comparison to solid fuels.

Professional judgement and experience also indicates that there are no areas within the district that are affected by the distinctive coal or wood burning odours on winter evenings.

Therefore, no areas within the district have been identified as having a likely density of solid fuel burning houses exceeding 50 per 500m x 500m area and professional judgement indicates that there is **no need to proceed with a Detailed Assessment for PM_{10} in areas of domestic solid fuel burning**.

(L) Quarries/landfill sites/opencast coal etc sources of fugitive particles

For the purposes of the assessment, relevant sources that have the potential for significant fugitive PM_{10} emissions are:

- Quarry, landfill, opencast coal and other sources such as external industrial stockpiles that have relevant public exposure 'near' to the sources of dust emissions

Within LAQM.TG(04), guidance is only given for the assessment of 2004 objectives (excluding in Scotland) and therefore no assessment can be made for 2010 objectives at this stage.

'Near' is defined as:

- Within 1000m if the estimated background 2004 annual mean concentration is greater than or equal to 27 $\mu g/m^3$
- Within 400m if the estimated background 2004 annual mean concentration is greater than or equal to 26 $\mu g/m^3$
- Within 200m if the estimated background 2004 annual mean concentration is less than 26 $\mu g/m^3$

Using local knowledge, knowledge obtained from complaint investigation and other sites visits (including Authorised process/Permitted installation inspections) the following sites have been identified in Mid Devon as potentially significant:

(i) Westleigh Quarry, near Burlescombe

(ii) Hill Head Quarry, near Uffculme

(iii) Broadpath Landfill, near Uffculme

(iv) Larfarge Tile Works, near Burlescombe

The estimated background concentrations for PM_{10} at the above sites in 2004 alongside relevant 'near' exposure assessment is given in Table 2.10 below:

Table 2.10: Background PM_{10} and 'near' exposure at potentially significant fugitive emission sources

Location	Estimated background PM10 in 2004 (µg/m^3)	Near exposure within 1000m?	Near exposure within 400m?	Near exposure within 200m?
Westleigh Quarry, nr Burlescombe	16.9 and 16.7*	No	No	Yes
Hill Head Quarry, nr Uffculme	16.7 and 16.8*	No	No	Yes
Broadpath Landfill, nr Uffculme	16.7 and 16.8*	No	No	Yes
Larfarge Tile Works, nr Burlescombe	16.9	No	No	Yes
*Site/potential receptors covered by more than one 1kmx1km grid square background concentration, figures on left are for east grid square and figures on right are for west grid square				

All of the assessed source locations above have potential 'near' exposure within 200m due to <26 µg/m^3 background concentrations. In reality, actual exposure to on-site fugitive sources only occurs at two of the sites: Westleigh Quarry and Larfarge Tile Works.

Both Westleigh Quarry and the Larfarge Tile Works are directly regulated by Mid Devon District Council as a Part B process under the Pollution Prevention and Control (PPC) Act 1999 and fugitive emissions are controlled via the process permit. Inspection experience and compliance and history indicates that both sites are very well managed and fugitive emissions are well controlled. Additionally, Westleigh Quarry, which has the greater larger number of potential sources, operates a formal environmental management system (ISO 14001) and is an industry award-winning environmentally well-managed quarry process. No directly attributable dust complaints have been received regarding either process for more than 18 months.

The most important source of fugitive particle emissions at Westleigh Quarry, in terms of receptor locations, vehicle dust drag-out and other vehicle raised emissions at the site entrance/exit, boundary unpaved roadways and secondary stone crushing and screening plant. All of these processes areas, including boundary roadways, are equipped with water sprays and other dust suppression measures (process containment, vegetation screens, wheel wash pits etc), which are in permanent use or are switched on during relevant operational periods. Visual inspections have found no evidence of significant dust beyond the relevant process areas and no evidence of dust beyond the process boundary.

The most important source of fugitive particle emissions at the Larfarge Tile Works is the large external sand and other fine mineral stock storage bays. These bays are located well within the site boundary and are only just within 200m of the nearest relevant receptor location. All materials within the stock bays are kept damp when required using a water spray system and stock levels are maintained below the top level of the storage

bays. Visual inspections have found no evidence of significant dust beyond the relevant process areas and no evidence of dust beyond the process boundary.

Therefore, the review and assessment shows that there is **no need to proceed with a Detailed Assessment for PM_{10} at sources of fugitive particle emissions**.

3.0 CONCLUSIONS

Updating and screening assessment has been completed against the statutory air quality objectives for all pollutants within the scope of Local Air Quality Management. This assessment has been completed in accordance with the checklist approach laid out for each pollutant in LAQM.TG(03).

The updating and screening for the Mid Devon area concludes that the following pollutants *will require detailed assessment* in order to identify with reasonable certainty whether or not a likely exceedence of the relevant air quality objective will occur and therefore if an Air Quality Management Area (AQMA) is required.

- **Nitrogen dioxide at Exeter Road, Crediton**
- **Nitrogen dioxide at High Street, Crediton**

Both of the above locations have been identified as having a **predicted NO_2 annual mean concentration greater than 40 µg/m^3 in 2005**.

In addition to the statutory air quality objectives, provisional objectives for 2010 have also been assessed and the report concludes that there is a risk of an exceedence of the relevant air quality objective for the following pollutants.

- Nitrogen dioxide at Exeter Road, Crediton
- Nitrogen dioxide at High Street, Crediton
- Particles (PM_{10}) at Station Road, Cullompton

For nitrogen dioxide the identified risk is a predicted exceedence of the provisional EU Daughter Directive objective of an annual mean concentration of 40 µg/m^3 in 2010. These locations at Crediton will be subject to a detailed assessment against the statutory 2005 annual mean objective, as described above.

For PM_{10} the identified risk is predicted exceedences of the provisional 2010 objectives of an annual mean of 20 µg/m^3 and 24-hour mean of 50 µg/m^3 not be exceeded more than 7 times per year.

From the 1 April 2003, monitoring for PM_{10} has recommenced at Station Road, Cullompton using the BAM monitor and at Exeter Road in Crediton using the TEOM analyser and will continue for a minimum period of twelve months. Future data will then be used to provide a refined estimate of any predicted exceedences of both the statutory 2004 objective and the provisional 2010 objective. Therefore, these locations will continue to be treated as a potential 'hot spots' although no identified risks of exceeding the current statutory 2004 air quality objectives for PM_{10} have been identified.

The report also concludes that there is no risk in Mid Devon of exceeding statutory or provisional air quality objectives for benzene, 1,3-butadiene, carbon monoxide, lead or sulphur dioxide.

4.0 REFERENCES AND GLOSSARY

4.1 References

1. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. Working Together for Clean Air, January 2000 (The Stationary Office Limited)
2. The Air Strategy for England, Scotland, Wales and Northern Ireland: Addendum, February 2003 (The Stationary Office Limited)
3. Part IV of the Environment Act 1995 Local Air Quality Management. Policy Guidance LAQM.PG(03), February 2003 (The Stationary Office Limited)
4. Part IV of the Environment Act 1995 Local Air Quality Management. Technical Guidance LAQM.TG(03), February 2003 (The Stationary Office Limited)
5. Devon Local Transport Plan 2001-2005. Travel and Transportation Statistics for Devon 2001, September 2002 (Devon County Council)
6. Compilation of Diffusion Tube Collocation Studies carried out by Local Authorities, November 2002 (Air Quality Consultants Limited, AQC)
7. Dispersion Modelling of Vehicle Emissions of NO_2 and PM_{10} from Four Locations in Mid Devon. Final Report prepared for Mid Devon District Council, May 2000 (Cambridge Environmental Research Consultants Limited, CERC)
8. Validation Assessment of Ambient PM_{10} Monitoring Mid Devon District Council, March 2002 (Stanger Limited)
9. UK NO_2 Diffusion Tube Network Instruction Manual. Version 1.4, November 2000 (AEA Technology plc)

4.2 Abbreviations and Glossary

AADT	Annual Average Daily Traffic (vehicles per day)
ADMS	Atmospheric Dispersion Modelling System
AQMA	Air Quality Management Area
AUN	Automatic Urban (air quality monitoring) Network
ARN	Automatic Rural (air quality monitoring) Network
BAM	Beta Attenuation Monitor (PM_{10} monitoring technique)
BTX	benzene, toluene and xylene
CO_2	carbon dioxide
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges Screening Model (v1.01)
HDV	Heavy Duty Vehicles (includes rigid and articulated Heavy Goods Vehicles and Buses and Coaches)
HFO	Heavy Fuel Oil
LAQM	Local Air Quality Management
LAQM.TG(03)	LAQM Technical Guidance 2003 (see ref. 4. in section 4.1 above)

LDV	Light Duty Vehicles (includes passenger cars and other vehicles <3.5t gross vehicle weight)
m	metre
mg/m^3	milligrams per cubic metre of air (this unit is one thousand times larger than µg/m^3 unit listed below)
Mid Devon	Mid Devon District Council
MW	mega watt
ng	nanogram (one billionth of a gram)
NO	nitrogen monoxide (also termed nitric oxide)
NO_2	nitrogen dioxide
NOx	nitrogen oxides
PM_{10}	particulate matter with an (equivalent aerodynamic) diameter of ten microns (10 µm) or less
SO_2	sulphur dioxide
t	tonnes
TEOM	Tapered Element Oscillating Microbalance (PM_{10} monitoring technique)
µg/m^3	microgrammes per cubic metre in air (a concentration of 1 µg/m^3 means that one cubic metre of air contains on microgram (millionth of a gram) of pollutant)
UKAS	United Kingdom Accreditation Service
USA	Updating and Screening Assessment
WASP	Workplace Analysis Scheme for Proficiency

5.0 Consultees

The external consultation requirements of Updating and Screening Assessment reports are set out in Schedule 11 of the Environment Act 1995 and for Mid Devon are as detailed below.

External Consultees

(i) Defra

(ii) Devon County Council (Highways Authority)

(iii) All neighbouring local authorities (West Somerset DC, Taunton Deane BC, East Devon DC, Exeter City Council, Teighbridge DC, North Devon DC, West Devon)

(iv) Environment Agency Devon Area Office

(v) Dartmoor National Park Authority

Additional, non-statutory consultation is as follows.

Internal Consultees

(i) Community Services Committee

(ii) Planning and Development Control (Forward Planning)

(iii) Policy Unit

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APPENDIX 1: DETAILS OF MONITORING DATA

A1.1 Benzene monitoring

(A) Description of monitoring technique

Monitoring for benzene has been completed using the following specification of passive BTEX thermal desorption tubes:

- Standard environmental monitoring tenax sorbent tubes
- Chromasorb 106 absorbent
- Update rate (ng/ppm/min) of benzene: 1.28 (over a four week period)
- Supplier and analysing laboratory: Gradko International Ltd

These tubes were exposed for one-month periods in accordance with LAQM.TG (03) guidance and in addition to benzene are also analysed for toluene and xylene, which is valuable for determining the reliability of reported benzene concentrations.

(B) Laboratory AQ/QC

Gradko International Ltd are a experienced and long-standing supplier and analysing laboratory for passive air quality monitoring tubes in the UK.

Laboratory procedures include for system blanks and calibration runs at prescribed intervals. The laboratory is specifically UKAS accredited for the analysis of benzene tubes (testing no. 2187) using documented in-house reference method GLM4. A copy of the UKAS accreditation schedule is included in section *F* below.

Gradko also participate in independent proficiency testing (inter-laboratory round-robin exercises) via the WASP scheme.

The WASP scheme is carried out quarterly using an accurately doped tube (of known concentration to WASP). The doped tube is analysed ‘blind’ by the laboratory and the reported results then compared by WASP against the true concentration and comparisons are also made with other laboratories participating in the survey. The WASP results indicate the laboratory results are acceptable in terms of accuracy and precision (performance category 2 using the Running Performance Index criteria). A copy of the WASP performance results the two most recent rounds is included in section *F* below.

(C) Tube handling procedures

Prior to sampling, the BTEX tubes are stored in cool location within the supplied packaging until use. All handling is carried out in a clean, well ventilated environment away from major solvent sources and emissions (such as from photocopiers). The tube brass storage caps are not removed until the tube has been placed at the monitoring location at the start of the monitoring period.

Once sampling is completed, tubes are recapped with the storage caps and return as quickly as possible to the clean storage requirement. All tubes are then re-enclosed in the supplied packaging and returned to Gradko for analysis within 24 hours.

(D) Data ratification

All reported results are well within the documented limit of detection and uncertainty of the measurement technique and all results are laboratory blank corrected.

The ratio of reported concentrations of benzene, toluene and xylene (BTX) on each tube has been used to assess the reliability of the results. The ratio of concentrations of BTX in ambient air is typically in the order of:

(benzene:toluene:m/p-xylene:o-xylene) = 1:3.5:2:1

i.e. if benzene is 1 µg then toluene will be 3.5 µg

Local, relatively small variations on the above ratio are normal and expected, however, if the results of the analysis of a tube show significant variations in the measured ratios or elevated concentrations then the result is considered suspect further investigation is carried out before the result is accepted. For example, elevated concentrations of all measured components may indicate a local BTX source, however, a single elevated component or unusual ratios between all components indicates the result is likely to be faulty and the result should be rejected.

Table A1.1 below gives the mean BTX ratios for the relevant monitoring data used in this report. This data is also indicative of performance since tubes are actually studied on a month-by-month basis.

Table A1.1 BTX ratios in Mid Devon passive monitoring tubes 1999-2003

Location	Monitoring Period	Mean BTX ratio
Crediton, Exeter Road	4/99-3/00	1:3:1.5:0.6
Cullompton, Station Road	4/00-6/01	1:3.7:1.9:0.9
Tiverton, Great Western Way	7/01-10/02	1:2.8:1.5:0.6
Crediton, Exeter Road	11/02-04/03	1:2.9:1.7:0.7

The ratio analysis above indicates that the Mid Devon tube results are sufficiently consistent with the typical ambient air ratio expected and that they show no significant variations. Additionally, no elevated group or single component analyte results are present to suggest faulty data. Thus the tube results can be considered as representative of the locations monitored subject to the normal accuracy of this technique of monitoring.

A further ratification step can be carried out with local benzene BTEX tube data by means of comparison with reported concentrations in the UK Hydrocarbon Network. This network is currently employs both automatic (continuous data) and non-automatic monitoring techniques. However, this approach is best employed if comparisons can be made between similar monitoring techniques at relatively local sites. At present, there are no UK Hydrocarbon Network sites within 50 miles of the Mid Devon monitoring locations, the nearest being Cardiff and Bristol urban automatic sites. Therefore, no

applicable comparisons can be made. A new UK Hydrocarbon network site has recently been commissioned in Plymouth using non-automatic, pumped sorbent tubes. Insufficient data is currently available to enable this site to be used as a comparison, however, data may be used for ratification purposes in the future.

(E) Data presentation

Benzene monitoring data used in this report represents the ratified means of each monthly monitoring period. Full results are shown in the graphs and data tables in section *G* below. Where the monitoring periods are close to twelve months in duration then the period means have been assumed to be equivalent to annual means for the purposes of forward predicting concentrations levels.

All the monitoring periods overlap two years, therefore, for the purposes of forward correcting the monitoring data to give a prediction of likely concentrations in the relevant air quality objective year (2003 and 2010) then the correction factor (Box 3.3 of LAQM.TG(03)) that applies to the year that contains the majority of the monitoring data has been used. For example, the monitoring period for benzene at Great Western Way, Tiverton was from July 2001 to October 2002. Since the majority of the data was collected in 2002 then the 2002 correction factor (0.934) was used to forward correct the data for 2003 and 2010.

This approach was confirmed as acceptable by the Updating & Screening Helpdesk by e-mail communication in April 2003.

The most recent data reported (Exeter Road, Crediton) does not represent an annual mean for since only six months data is currently available, however the data does provide useful, up to date, information for assessment against the objectives. Since the majority of the data for this location was collected in 2003 then no future correction factor has been applied for assessment against the 2003 air quality objective and the measured mean has been compared directly. For assessment against the 2010 objective then the 2003 correction factor (0.875) has been used.

(F) Gradko UKAS accreditation and WASP results

See pages overleaf.

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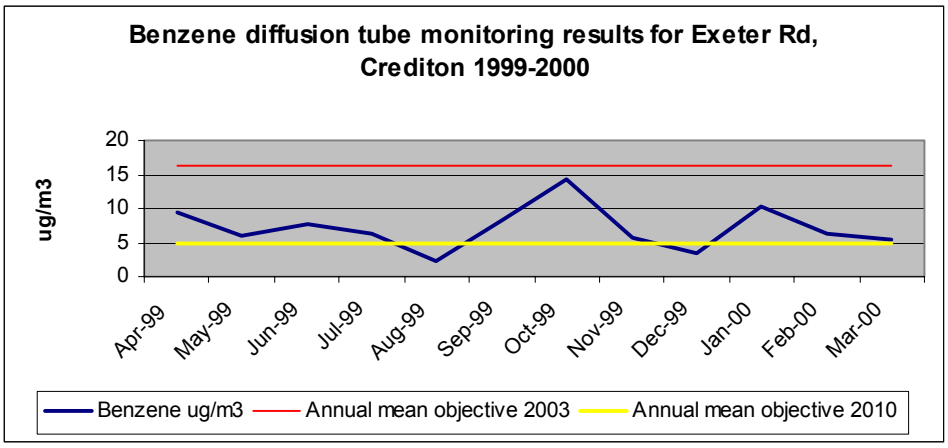
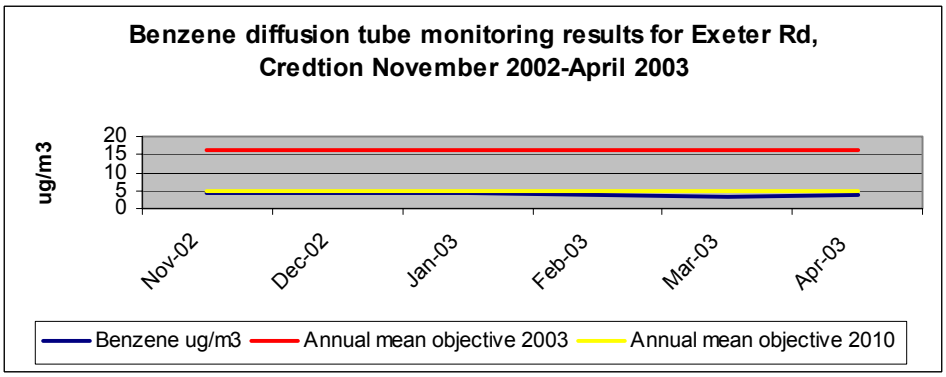
(G) Benzene monthly monitoring results

Crediton: Exeter Road (site code B3)

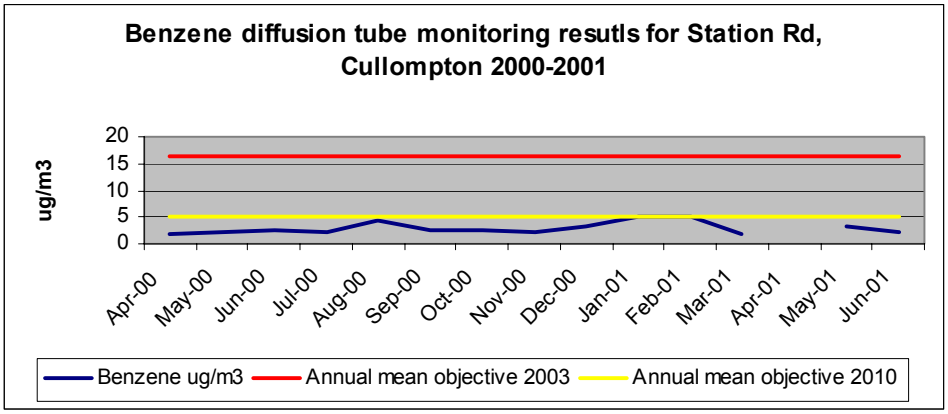


	Apr 1999	May 1999	Jun 1999	Jul 1999	Aug 1999	Sep 1999	Oct 1999	Nov 1999	Dec 1999	Jan 2000	Feb 2000	Mar 2000
Benzene ($\mu g/m^3$)	9.56	5.95	7.57	6.31	2.21	8.32	14.40	5.59	3.48	10.34	6.27	5.40



	Nov 2002	Dec 2002	Jan 2003	Feb 2003	Mar 2003	Apr 2003
Benzene ($\mu g/m^3$)	4.23	4.10	4.36	3.97	3.07	3.70

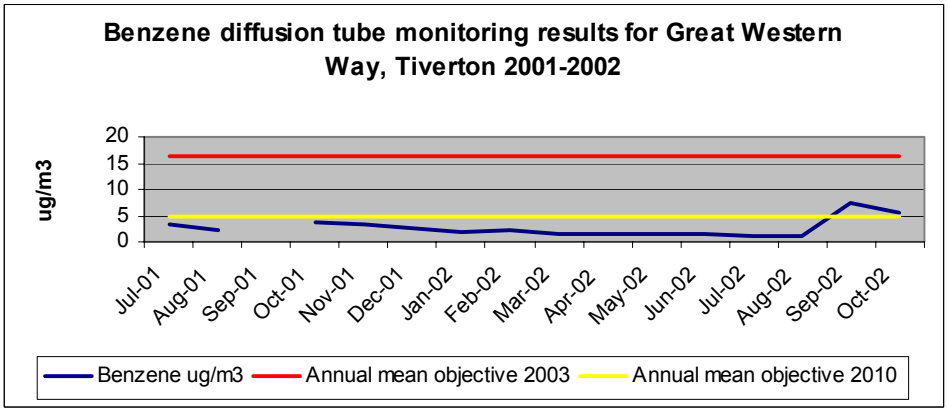
Cullompton: Station Road (site code B2)



	Apr 2000	May 2000	Jun 2000	Jul 2000	Aug 2000	Sep 2000	Oct 2000	Nov 2000	Dec 2000	Jan 2001	Feb 2001	Mar 2001
Benzene ($\mu g/m^3$)	1.72	2.21	2.67	2.02	4.39	2.47	2.70	2.08	3.35	4.94	5.04	1.89

	Apr 2001	May 2001	Jun 2001
Benzene ($\mu g/m^3$)	miss	3.22	2.21

Tiverton: Great Western Way (site code B1)



	Jul 2001	Aug 2001	Sep 2001	Oct 2001	Nov 2001	Dec 2001	Jan 2002	Feb 2002	Mar 2002	Apr 2002	May 2002	Jun 2002
Benzene ($\mu g/m^3$)	3.51	2.05	miss	3.67	3.35	2.47	1.98	2.08	1.56	1.53	1.50	1.50

	Jul 2002	Aug 2002	Sep 2002	Oct 2002
Benzene ($\mu g/m^3$)	1.27	1.20	7.38	5.56

A1.2 Nitrogen dioxide monitoring

(A) Description of monitoring technique

Monitoring for benzene has been completed using the following specification of passive diffusion tubes:

- Standard environmental monitoring nitrogen dioxide tubes
- Tube preparation method: 50% Triethanolamine (TEA) in deionised water
- Supplier and analysing laboratory: Gradko International Ltd

These tubes were exposed for one-month periods in accordance with LAQM.TG (03) guidance.

(B) Laboratory AQ/QC

Gradko International Ltd are a experienced and long-standing supplier and analysing laboratory for passive air quality monitoring tubes in the UK.

Laboratory procedures include for system blanks and calibration runs at prescribed intervals. The laboratory is specifically UKAS accredited for the analysis of benzene tubes (testing no. 2187) using documented in-house reference methods GLM3 and 6. A copy of the UKAS accreditation schedule is included in section *F* below.

Gradko also participate in independent proficiency testing (inter-laboratory round-robin exercises) via the WASP scheme.

The WASP scheme is carried out quarterly using an accurately doped tube (of known concentration to WASP). The doped tube is analysed 'blind' by the laboratory and the reported results then compared by WASP against the true concentration and comparisons are also made with other laboratories participating in the survey. The WASP results indicate the laboratory results are good in terms of accuracy and precision (performance category 1 using the Running Performance Index criteria). A copy of the WASP performance results the two most recent rounds is included in section *F* below.

(C) Tube handling procedures

The Mid Devon NO_2 diffusion tube monitoring is completed in full accordance with the UK NO_2 Diffusion Tube Network Instruction Manual[9] (Section 6), although results are not completed as part of the UK network.

Prior to sampling, the NO_2 tubes are stored in cool location within the supplied packaging until use. All handling is carried out in a clean, well ventilated environment. The tube end caps are not removed until the tube has been placed at the monitoring location at the start of the monitoring period.

Once sampling is completed, tubes are recapped with the storage caps and returned as quickly as possible to the clean storage requirement. All tubes are then re-enclosed in the supplied packaging and returned to Gradko for analysis within 24 hours.

A 'field' blank tube is analysed with each monthly batch of tubes. The field blank is an unexposed tube from the same batch as the exposed tubes and undergoes the same handling and transport (including travel to and from the monitoring sites). The purpose of this tube is to determine any inadvertent NO_2 contamination of the tubes, before and after exposure. Any resultant contamination found on the analysed field blank is then used to 'blank correct' the reported results for the exposed tubes.

(D) Data ratification

All reported results are well within the documented limit of detection and uncertainty of the measurement technique and all results are laboratory blank corrected.

All results are examined on a monthly basis to identify any spurious data (e.g. very high or very low data) and any suspect data is investigated further. NO_2 monitoring data tends to follow a comparable trend across a number of local monitoring sites, with concentration trend, but not concentration level, similar across all monitoring locations. Therefore, all results are inter-compared for trend, thus providing further evidence of a suspect individual result if other monitoring locations are following a comparable trend excluding the result in question.

At all times, monitoring sites are regularly assessed to identify changes that may positively or negatively affect the monitoring results. Examples include roadworks, local new combustion sources, road closures and vegetation cover. Site conditions during the relevant monitoring periods are always taken into account during data ratification.

NO_2 diffusion tubes provide a cost-effective means of monitoring a wide range of monitoring locations. However, the accuracy of tubes is variable depending on the tube handling procedures, the specific tube preparation/adsorbent mixture and the analysing laboratory.

A recent study by Air Quality Consultants in Novemeber 2002[6] on behalf of Defra looked at the various common NO_2 tube preparations (10%, 20% and TEA in either water or acetone, analysed by GMSS or Gradko) and statistically examined the results of NO_2 diffusion tube/chemiluminescent analyzer co-location studies completed by 23 local authorities across the UK (covering 44 years worth of annual comparisons). The study concluded that, of the preparation methods studied, all NO_2 tubes under read and that it was possible to establish a default correction factor specific to the laboratory and preparation method. The recommended correction factor for the Gradko/50% TEA in water combination of tubes (as used by Mid Devon) was 1.39. Therefore, for data ratification purposes this correction factor has been applied to all Mid Devon NO_2 diffusion data following completion of the preliminary ratification steps outlined above.

(E) Data presentation

Nitrogen dioxide monitoring data used in this report represents the ratified means of each monthly monitoring period. Full results are shown in the graphs in section *G* below. The majority of monitoring sites reported are long-term sites enabling full year-specific annual means to be calculated for the purposes of forward predicting concentrations levels.

The most recent data reported (Bampton Street, Leat Street and Howden Road in Tiverton) does not represent an annual mean for since only six months data is currently available, however the data does provide useful, up to date, information for assessment against the objectives. Since the majority of the data for these locations was collected in 2003 then the 2003 correction factor (0.941) has been used for assessment against the 2005 and 2010 objectives. This approach was confirmed as acceptable by the Updating & Screening Helpdesk by e-mail communication in April 2003.

(F) Gradko UKAS accreditation and WASP results

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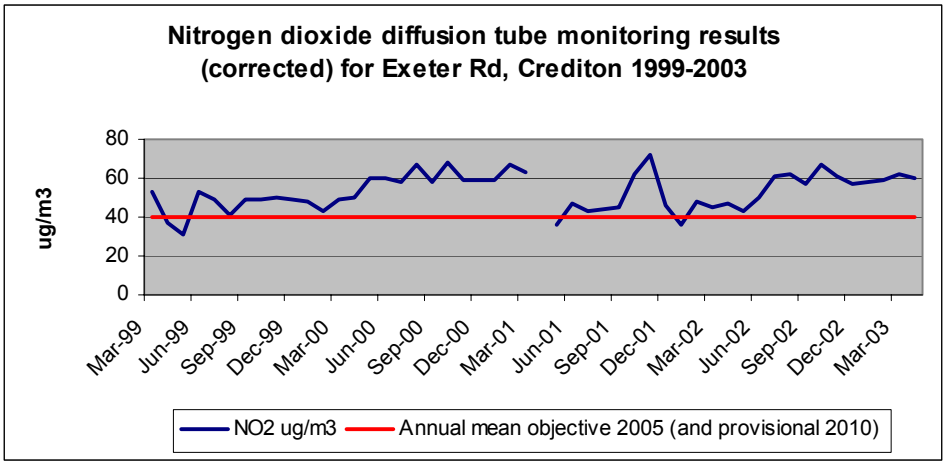
(G) Nitrogen dioxide monthly monitoring results

Crediton: Exeter Road (site code N8)



	Mar 1999	Apr 1999	May 1999	Jun 1999	Jul 1999	Aug 1999	Sep 1999	Oct 1999	Nov 1999	Dec 1999	Jan 2000	Feb 2000
NO_2 ($\mu g/m^3$)	53.12	37.30	30.88	52.99	49.12	41.47	48.51	48.53	50.18	48.46	47.92	42.61

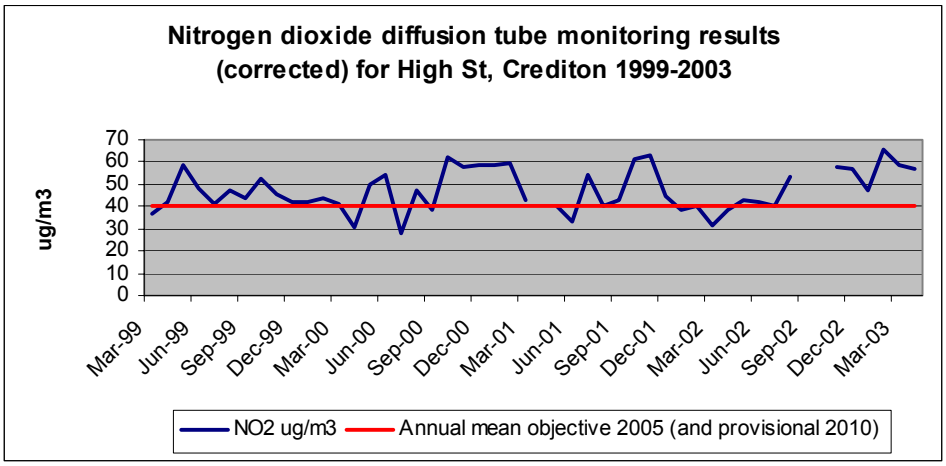
	Mar 2000	Apr 2000	May 2000	Jun 2000	Jul 2000	Aug 2000	Sep 2000	Oct 2000	Nov 2000	Dec 2000	Jan 2001	Feb 2001
NO_2 ($\mu g/m^3$)	48.74	50.36	59.95	60.32	58.14	66.58	57.82	67.89	58.99	59.07	59.08	66.64

	Mar 2001	Apr 2001	May 2001	Jun 2001	Jul 2001	Aug 2001	Sep 2001	Oct 2001	Nov 2001	Dec 2001	Jan 2002	Feb 2002
NO_2 ($\mu g/m^3$)	63.32	miss	36.16	46.65	42.61	43.86	44.60	62.36	72.19	45.88	36.13	47.97

	Mar 2002	Apr 2002	May 2002	Jun 2002	Jul 2002	Aug 2002	Sep 2002	Oct 2002	Nov 2002	Dec 2002	Jan 2003	Feb 2003
NO_2 ($\mu g/m^3$)	45.40	47.10	42.74	50.04	61.33	62.26	56.68	66.80	60.64	57.27	58.14	59.61

	Mar 2003	Apr 2003
NO_2 ($\mu g/m^3$)	62.10	59.74

Crediton: High Street (site code N9)



	Mar 1999	Apr 1999	May 1999	Jun 1999	Jul 1999	Aug 1999	Sep 1999	Oct 1999	Nov 1999	Dec 1999	Jan 2000	Feb 2000
NO_2 ($\mu g/m^3$)	37.06	42.03	58.28	48.27	41.20	47.50	44.02	52.06	45.16	42.19	42.13	43.43

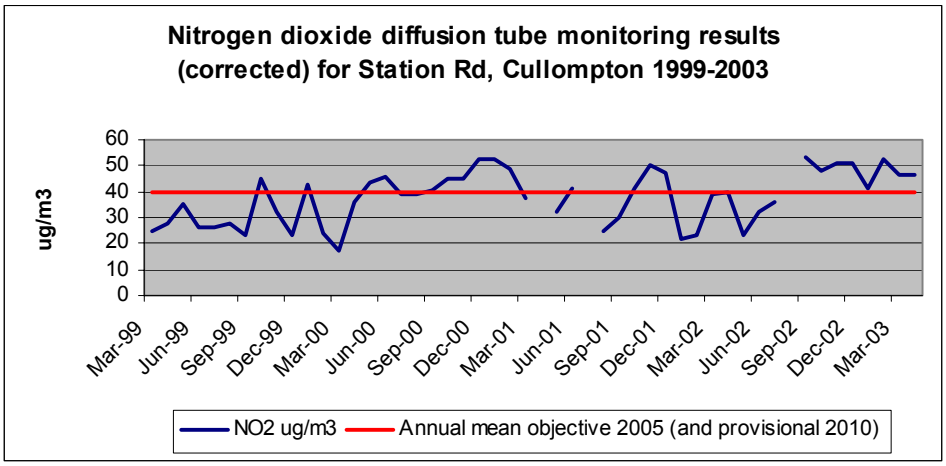
	Mar 2000	Apr 2000	May 2000	Jun 2000	Jul 2000	Aug 2000	Sep 2000	Oct 2000	Nov 2000	Dec 2000	Jan 2001	Feb 2001
NO_2 ($\mu g/m^3$)	40.73	30.93	50.18	54.37	28.20	47.15	38.81	61.99	57.66	58.46	58.49	59.87

	Mar 2001	Apr 2001	May 2001	Jun 2001	Jul 2001	Aug 2001	Sep 2001	Oct 2001	Nov 2001	Dec 2001	Jan 2002	Feb 2002
NO_2 ($\mu g/m^3$)	42.93	Miss	40.59	33.64	54.61	40.49	43.06	60.93	63.43	44.23	38.47	40.67

	Mar 2002	Apr 2002	May 2002	Jun 2002	Jul 2002	Aug 2002	Sep 2002	Oct 2002	Nov 2002	Dec 2002	Jan 2003	Feb 2003
NO_2 ($\mu g/m^3$)	31.83	38.63	42.74	41.71	39.82	53.22	miss	miss	57.35	56.66	46.67	65.60

	Mar 2003	Apr 2003
NO_2 ($\mu g/m^3$)	58.62	56.58

Cullompton: Station Road (site code N7)



	Mar 1999	Apr 1999	May 1999	Jun 1999	Jul 1999	Aug 1999	Sep 1999	Oct 1999	Nov 1999	Dec 1999	Jan 2000	Feb 2000
NO_2 ($\mu g/m^3$)	24.56	27.45	35.31	26.42	26.74	27.77	23.42	45.32	32.26	22.96	42.96	23.76

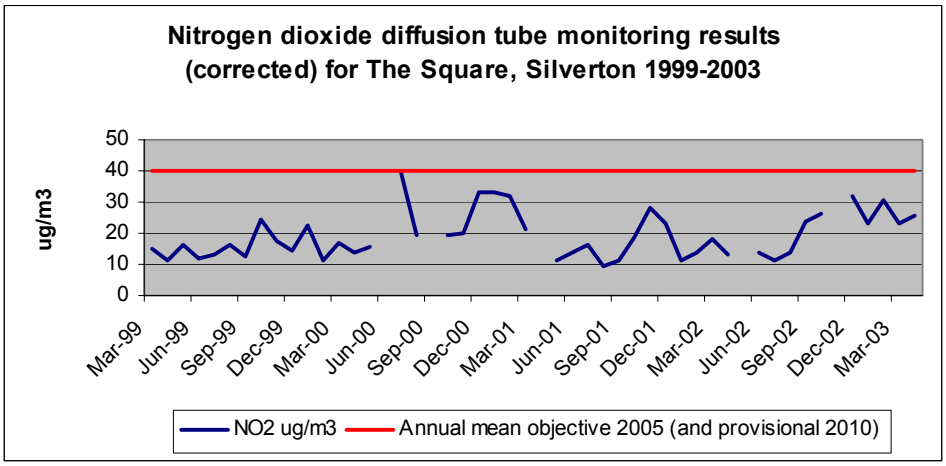
	Mar 2000	Apr 2000	May 2000	Jun 2000	Jul 2000	Aug 2000	Sep 2000	Oct 2000	Nov 2000	Dec 2000	Jan 2001	Feb 2001
NO_2 ($\mu g/m^3$)	17.20	35.89	43.22	45.88	39.35	38.66	40.49	45.03	45.21	52.43	53.10	48.90

	Mar 2001	Apr 2001	May 2001	Jun 2001	Jul 2001	Aug 2001	Sep 2001	Oct 2001	Nov 2001	Dec 2001	Jan 2002	Feb 2002
NO_2 ($\mu g/m^3$)	37.27	miss	32.47	41.27	miss	24.61	30.37	41.58	49.94	47.52	21.58	22.94

	Mar 2002	Apr 2002	May 2002	Jun 2002	Jul 2002	Aug 2002	Sep 2002	Oct 2002	Nov 2002	Dec 2002	Jan 2003	Feb 2003
NO_2 ($\mu g/m^3$)	38.87	39.85	22.91	32.34	35.84	miss	52.89	47.89	50.79	50.63	41.31	52.12

	Mar 2003	Apr 2003
NO_2 ($\mu g/m^3$)	46.86	46.81

Silverton: The Square (site code N11)



	Mar 1999	Apr 1999	May 1999	Jun 1999	Jul 1999	Aug 1999	Sep 1999	Oct 1999	Nov 1999	Dec 1999	Jan 2000	Feb 2000
NO_2 ($\mu g/m^3$)	14.81	11.10	16.49	11.95	12.93	16.54	12.53	24.29	17.20	14.07	22.30	11.47

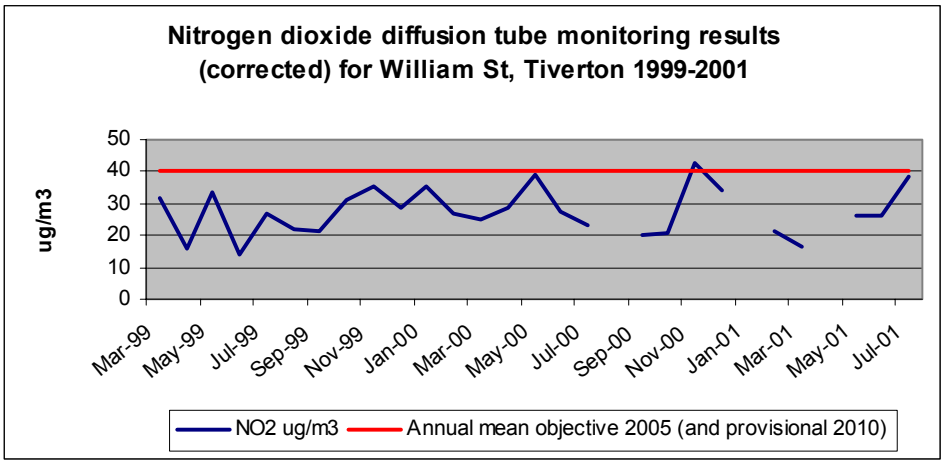
	Mar 2000	Apr 2000	May 2000	Jun 2000	Jul 2000	Aug 2000	Sep 2000	Oct 2000	Nov 2000	Dec 2000	Jan 2001	Feb 2001
NO_2 ($\mu g/m^3$)	16.62	13.46	15.35	miss	39.35	19.46	miss	19.19	20.07	33.16	32.88	32.04

	Mar 2001	Apr 2001	May 2001	Jun 2001	Jul 2001	Aug 2001	Sep 2001	Oct 2001	Nov 2001	Dec 2001	Jan 2002	Feb 2002
NO_2 ($\mu g/m^3$)	21.04	miss	11.07	13.57	16.38	9.45	11.55	18.44	28.33	22.94	11.47	13.57

	Mar 2002	Apr 2002	May 2002	Jun 2002	Jul 2002	Aug 2002	Sep 2002	Oct 2002	Nov 2002	Dec 2002	Jan 2003	Feb 2003
NO_2 ($\mu g/m^3$)	18.27	13.27	miss	13.56	11.15	13.94	23.60	26.31	miss	31.94	22.94	30.56

	Mar 2003	Apr 2003
NO_2 ($\mu g/m^3$)	23.07	25.52

Tiverton: William Street (site code N1)

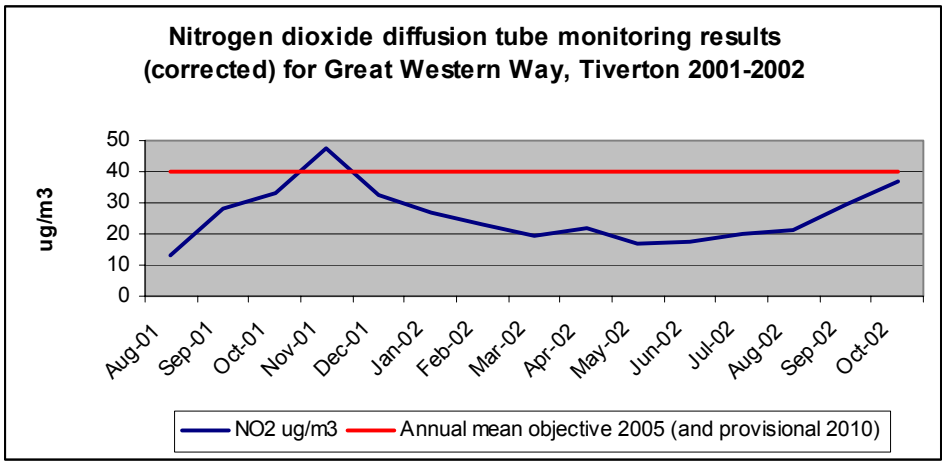


	Mar 1999	Apr 1999	May 1999	Jun 1999	Jul 1999	Aug 1999	Sep 1999	Oct 1999	Nov 1999	Dec 1999	Jan 2000	Feb 2000
NO_2 ($\mu g/m^3$)	31.83	15.74	33.40	13.78	26.71	21.72	21.50	31.35	35.36	28.86	35.52	27.03

	Mar 2000	Apr 2000	May 2000	Jun 2000	Jul 2000	Aug 2000	Sep 2000	Oct 2000	Nov 2000	Dec 2000	Jan 2001	Feb 2001
NO_2 ($\mu g/m^3$)	25.22	28.91	39.03	27.19	23.22	miss	19.83	20.66	42.61	33.92	miss	21.48

	Mar 2001	Apr 2001	May 2001	Jun 2001	Jul 2001
NO_2 ($\mu g/m^3$)	16.59	Miss	25.96	25.95	38.23

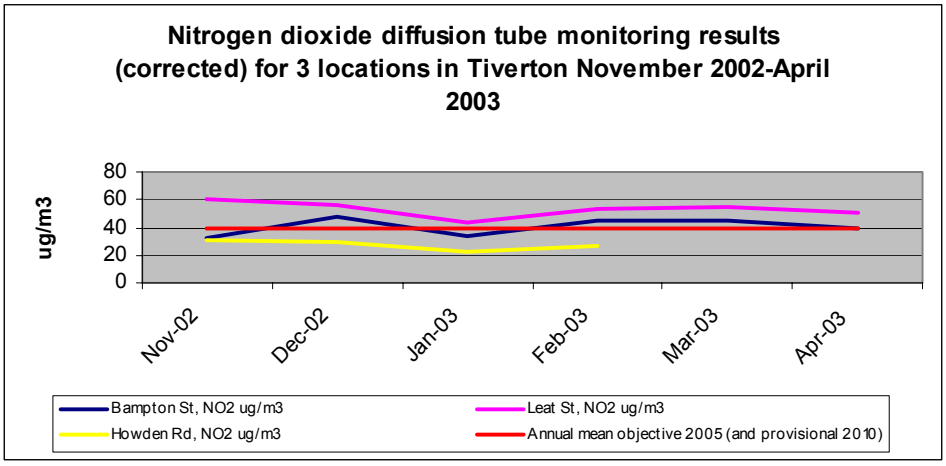
Tiverton: Great Western Way (site code N2)



	Aug 2001	Sep 2001	Oct 2001	Nov 2001	Dec 2001	Jan 2002	Feb 2002	Mar 2002	Apr 2002	May 2002	Jun 2002	Jul 2002
NO_2 ($\mu g/m^3$)	13.06	28.22	32.97	47.23	32.76	27.00	22.94	19.19	21.74	16.73	17.73	19.91

	Aug 2002	Sep 2002	Oct 2002
NO_2 ($\mu g/m^3$)	21.29	29.28	37.12

Tiverton: Bampton Street (site code N4), Leat Street (site code N5) and Howden Road (site code N6)



Bampton Street

	Nov 2002	Dec 2002	Jan 2003	Feb 2003	Mar 2003	Apr 2003
Benzene ($\mu g/m^3$)	31.14	48.21	33.26	44.95	44.68	39.66

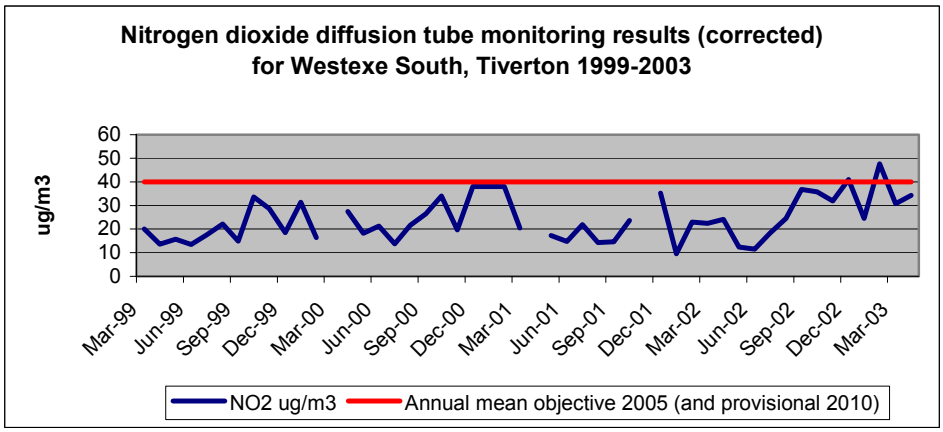
Leat Street

	Nov 2002	Dec 2002	Jan 2003	Feb 2003	Mar 2003	Apr 2003
Benzene ($\mu g/m^3$)	60.64	56.66	42.82	53.02	55.17	50.07

Howden Road

	Nov 2002	Dec 2002	Jan 2003	Feb 2003	Mar 2003	Apr 2003
Benzene ($\mu g/m^3$)	31.32	28.94	22.19	26.94	Miss	Miss

Tiverton: Westexe South (site code N3)



	Mar 1999	Apr 1999	May 1999	Jun 1999	Jul 1999	Aug 1999	Sep 1999	Oct 1999	Nov 1999	Dec 1999	Jan 2000	Feb 2000
NO_2 ($\mu g/m^3$)	20.04	13.59	15.64	13.46	17.50	22.19	14.87	33.61	28.67	18.50	31.38	16.38

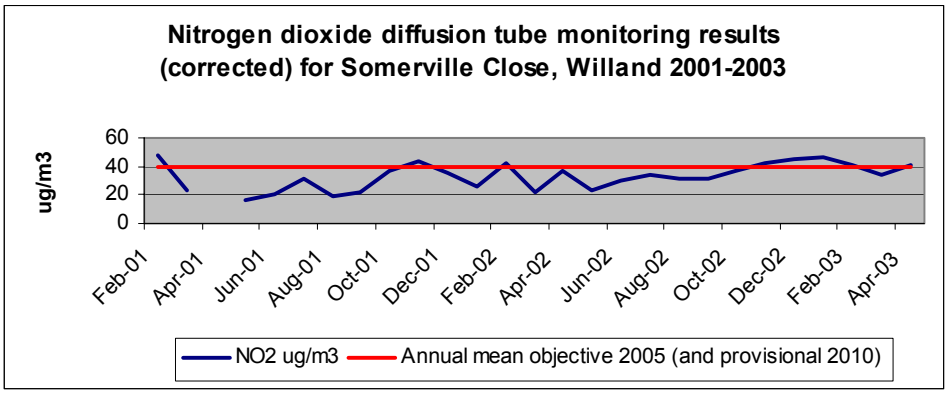
	Mar 2000	Apr 2000	May 2000	Jun 2000	Jul 2000	Aug 2000	Sep 2000	Oct 2000	Nov 2000	Dec 2000	Jan 2001	Feb 2001
NO_2 ($\mu g/m^3$)	miss	27.43	18.13	21.24	13.78	21.69	26.44	33.96	19.67	37.97	37.66	37.94

	Mar 2001	Apr 2001	May 2001	Jun 2001	Jul 2001	Aug 2001	Sep 2001	Oct 2001	Nov 2001	Dec 2001	Jan 2002	Feb 2002
NO_2 ($\mu g/m^3$)	20.39	miss	17.34	14.76	21.85	14.18	14.60	23.66	miss	35.23	9.45	22.94

	Mar 2002	Apr 2002	May 2002	Jun 2002	Jul 2002	Aug 2002	Sep 2002	Oct 2002	Nov 2002	Dec 2002	Jan 2003	Feb 2003
NO_2 ($\mu g/m^3$)	22.46	24.16	12.40	11.47	18.32	24.58	36.85	35.76	31.94	40.99	24.48	47.63

	Mar 2003	Apr 2003
NO_2 ($\mu g/m^3$)	30.74	34.26

Willand: Somerville Close (site code N10)



	Feb 2001	Mar 2001	Apr 2001	May 2001	Jun 2001	Jul 2001	Aug 2001	Sep 2001	Oct 2001	Nov 2001	Dec 2001	Jan 2002
NO_2 ($\mu g/m^3$)	47.23	22.54	miss	16.59	20.66	31.67	18.90	21.53	36.56	43.17	36.05	25.65

	Feb 2002	Mar 2002	Apr 2002	May 2002	Jun 2002	Jul 2002	Aug 2002	Sep 2002	Oct 2002	Nov 2002	Dec 2002	Jan 2003
NO_2 ($\mu g/m^3$)	41.71	22.01	37.43	22.91	30.24	33.45	31.14	31.17	37.12	41.79	44.60	45.90

	Feb 2003	Mar 2003	Apr 2003
NO_2 ($\mu g/m^3$)	40.43	34.27	40.25

A1.3 PM_{10} monitoring

(A) Description of monitoring technique

Monitoring for PM_{10} has been completed using the following specification of continuous automatic real-time analysers:

- BAM 1020 beta-attenuation monitor with Graseby Andersen 10µm sampling head.
- R&P TEOM analyser with Graseby Andersen 10µm sampling head.

These are sophisticated automatic monitoring systems housed in purpose built J-type air-conditioned enclosures. The analysers measure and record real-time PM_{10} measurements which are formatted into 15-minute and 1-hour averages. This enables both short-term and long-term average measurements to be made which are of a high accuracy and resolution. Full details of monitoring locations and analyser specific monitoring is given in section 2.8 above.

The un-heated BAM beta-attenuation has gravimetric equivalency enabling direct comparison of the data with the air quality objectives.

The TEOM does not have direct equivalency with gravimetric derived data. Therefore, the default adjustment factor of 1.3 has been applied to the monitoring data in order to ensure the data has gravimetric equivalency.

(B) Equipment maintenance and servicing

The aim of monitoring is to ensure that a high-level of accurate data capture is obtained. Therefore, all automatic monitoring equipment has routine (fortnightly) on-site checks and maintenance visits following documented procedures. These procedures have been drawn up in accordance with equipment manuals, manufacturer instructions and the UK Automatic Network Site Operators Manual. Routine visits include regular filter changes, sampling head cleaning and airflow/analyser test function checks at set intervals. These site visits are carried out by, or are supervised by, a trained, designated Mid Devon officer.

All analysers and related equipment (e.g. sample pumps, air conditioning units etc) are subject to independent routine maintenance and support via a service contract with a specialist service provider (Enviro Technology Services plc). This includes six-monthly maintenance/service and equipment check visits by manufacturer approved engineers following national protocols and traceable QA/QC procedures. The service provider is also ISO 9001 accredited and carries out similar or identical support work for the AUN network of PM_{10} analysers.

Non-routine site visits (e.g. as a result of equipment failure or spurious data) are also carried by the above service provider to the same standards. Contract arrangements ensure that visits are carried out within 48 hours of the notification of call-out to minimise data loss.

All routine and non-routine site visits are fully documented to detail all works carried out including any adjustments, modifications and repair completed.

(C) Data processing

Both analysers are connected to a data telemetry and handling package (Opsis Enviman using the ComVisioner and Reporter modules) enabling full data manipulation and frequent checks on data measurements. Data is stored on internal dataloggers and downloaded to a PC via a modem and telephone line (or mobile telephone).

User-defined options in the Enviman communication package means that incoming data has been set-up for automatic screening in order to ensure representative averages are derived from sufficient raw data. For the purposes of deriving 1-hour means, a minimum of 45 minutes data must be available in each hour (3 x 15 minute means). For the purposes of deriving 24-hour means then a minimum of 18 hours data (18 x 1 hour means) must be available in each day.

(D) Data validation and ratification

Following data processing, all collected data is screened or validated by visual examination to see if there are any spurious or unusual measurements. Where causes of such measurements are known (e.g. planned maintenance visits, sampling head cleaning and known equipment/power failures etc) then the affected data is deleted from the dataset. Any remaining suspicious data, such as large spikes, 'flat-lines' and excessive negative data is 'flagged' for more detailed investigation. At all times an original raw dataset is kept in the data processing software enabling any amendments to the data to be traced and to ensure it is possible to re-examine the original collected data at a later date.

Data validation is routinely carried out at approximate fortnightly intervals and non-routinely at any time.

Data validation is followed by a more thorough and detailed check known as data ratification. Ratification is carried at approximate 3-monthly intervals and involves a critical, in-depth review of all information relating to the individual analyser dataset and monitoring location in order to amend, verify or delete data as appropriate. A wide range of variables, inputs and information sources are used to complete the ratification process, as detailed below:

- Instrument history and local site visit reports (to determine effects from recorded previous or current analyser characteristics and problems)
- Data/baseline drift
- Negative or out-of-range data
- Pollutant spikes or other unusual short-term trends
- Data capture rates and distribution of missing or suspect data
- Local events and/or pollution sources (to determine any short-medium term effects on pollutant levels including unusual traffic or commercial/industrial related sources)
- Diurnal trends (to determine if daily and weekly pollutant trends are normal e.g. traffic rush-hour patterns)

- Meteorological phenomena (to determine any unusual data when examined against typical weather conditions and to determine the effect or cause relating to short-term phenomena such as electrical storms or temperature inversions)
- Comparisons with AUN monitoring sites (e.g. Southwest urban centre sites) and other locally available data (e.g. Taunton Deane Borough Council BAM 1020 data) to determine if similar or different pollutant trends are recorded – allowing for local 'spikes' and concentration differences
- Comparisons of collocated TEOM and BAM analyser results (to determine equivalency of corrected TEOM and BAM datasets in terms of concentrations and trend)
- Notes from short-term data inter-comparison work with locally collected data in Devon and Somerset (e.g. discussions with South Somerset District Council regarding local 'spikes' recorded using identical TEOM analysers in Somerton and Yeovil) and discussions via the Devon Air Quality Focus Group (a sub-group of the Chief Environmental Health Officers Pollution Sub-Group)
- Enviro Technology service visit data including QA audit and service reports

When data ratification has been completed then the data is then available for further statistical and critical examination for reporting purposes.

(E) Data presentation

PM_{10} monitoring data used in this report represents the analysis of the fully ratified dataset from each monitoring location. Where the monitoring periods are close to twelve months in duration then the period means have been assumed to be equivalent to annual means for the purposes of forward predicting concentrations levels.

Collocated PM_{10} data for Tiverton and Silverton showed a high-level equivalency, especially over daily and period means. As a result, an average of the period means for each analyser has been used for screening purposes in this report.

All the monitoring periods overlap two years, therefore, as with benzene monitoring data, for the purposes of forward correcting the monitoring data to give a prediction of likely concentrations in the relevant air quality objective year (2004 and 2010) them the primary and secondary correction factors (Box 3.3 of LAQM.TG(03)) that apply to the year that contains the majority of the monitoring data have been used.

The monitoring period at the Silverton site was split almost 50/50 between 2002 and 2003 collected data. Therefore, an average of the relevant factors for 2002 and 2003 has been used for the purposes of forward correcting the monitoring data for prediction purposes.

The above approach was confirmed as acceptable by the Updating & Screening Helpdesk by e-mail communication in April 2003.

The Silverton monitoring period was less than 9 months in duration, as a result the period has been corrected to give an equivalent annual or twelve-month mean. This correction was carried out in accordance with Box 8.5 of LAQM.TG(03) resulting in an

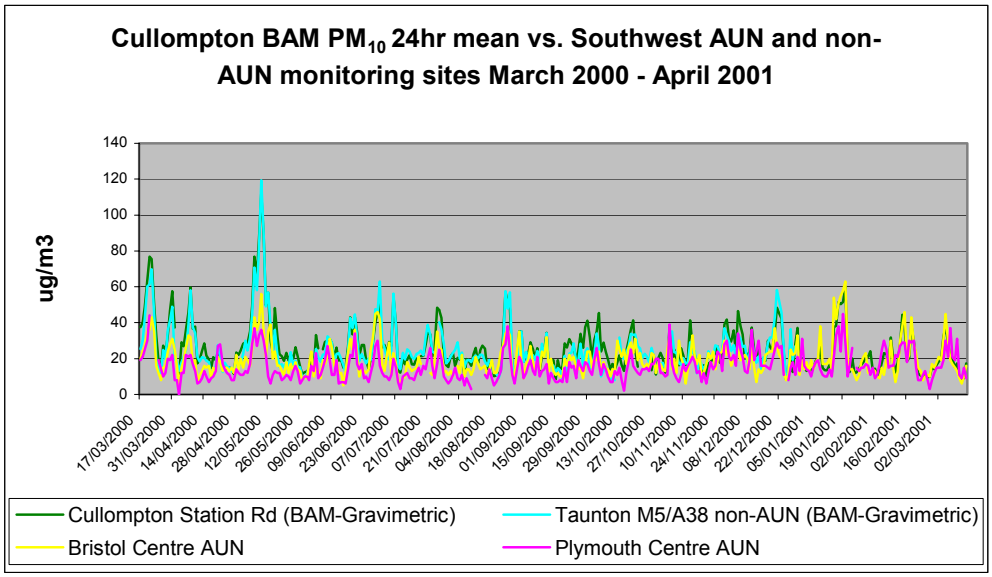
adjustment factor of 0.876 derived from AUN Urban Centre monitoring data for the same period from the Bristol, Cardiff and Plymouth sites (see calculation below).

For reporting purposes, all 15-minute, 1-hour, 24-hour means and percentiles are calculated in accordance with guidelines in LAQM.TG(03).

Full results are shown in the graphs in section *F* below. The graphs also show comparison data from Southwest AUN monitoring sites and other local data used for ratification purposes. The graphs illustrate the co-incident peaks and good correlation of trend between the various datasets. A statistical summary of the each PM_{10} analyser/monitoring site is also shown.

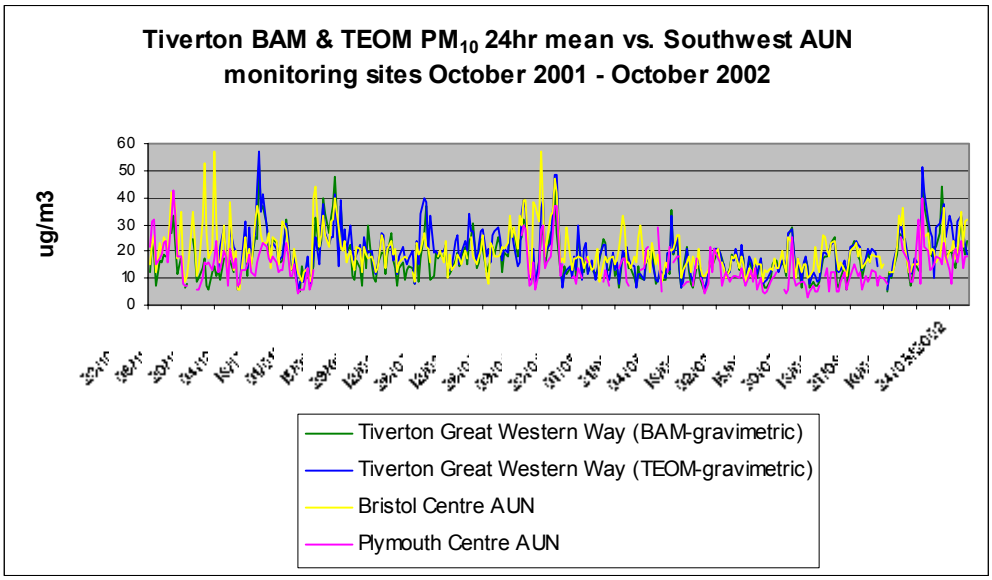
(F) PM_{10} continuous monitoring results

Cullompton: Station Road (site code MS2)



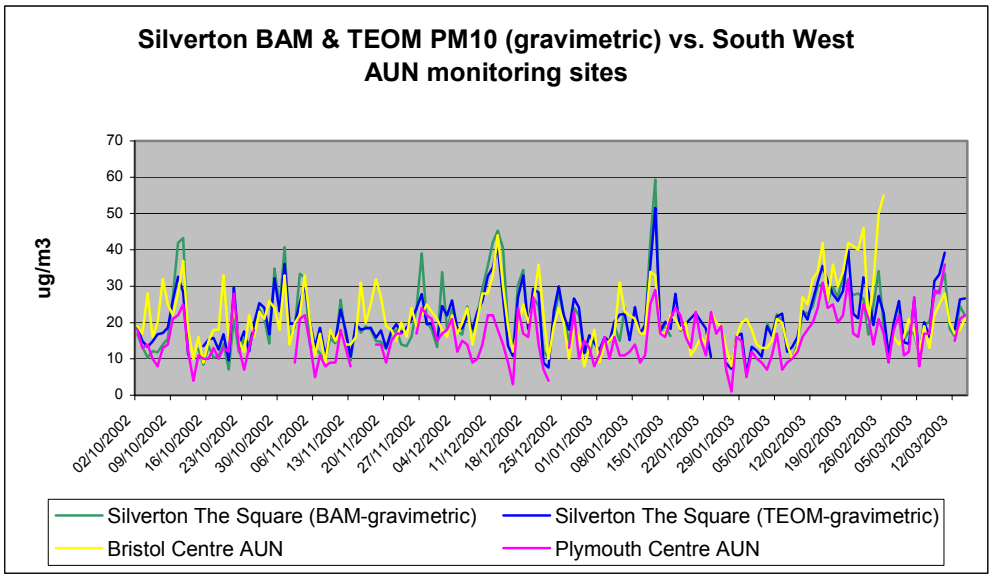
Cullompton PM_{10} monitoring data summary	
	BAM
Mean of monitoring period	25.71 µg/m^3
Data capture (%)	97.8
No. of 2004 objective exceedances (50 ug/m^3)	18
90% Percentile (35 exceedences)	45.32 µg/m^3
98% Percentile (7 exceedences)	76.92 µg/m^3
Maximum 24-hour mean	112.21 µg/m^3 (09/05/00)

Tiverton: Great Western Way (site code MS1)



Tiverton PM_{10} monitoring data summary		
	BAM	
Mean of monitoring period	17.42 µg/m^3	
Data capture (%)	95.9	
No. of 2004 objective exceedances (50 ug/m^3)	1	
90% Percentile (35 exceedences)	26.83 µg/m^3	
98% Percentile (7 exceedences)	43.92 µg/m^3	
Maximum 24-hour mean	52.66 µg/m^3 (08/12/01)	
	TEOM (uncorrected)	**TEOM (gravimetric)***
Mean of monitoring period	15.05 µg/m^3	19.56 µg/m^3
Data capture (%)	98.0	98.0
No. of 2004 objective exceedances (50 ug/m^3)	0	2
90% Percentile (35 exceedences)	23.50 µg/m^3	30.55 µg/m^3
98% Percentile (7 exceedences)	36.66 µg/m^3	47.66 µg/m^3
Maximum 24-hour mean	43.80 µg/m^3 (08/12/01)	56.94 µg/m^3 (08/12/01)
*Corrected by default factor of 1.3		

Silverton: The Green (site code MS3)



Silverton PM_{10} monitoring data summary		
	BAM	
Mean of monitoring period	20.59 µg/m^3	
Data capture (%)	86.5	
No. of 2004 objective exceedances (50 ug/m^3)	1	
90% Percentile (35 exceedences)	33.50 µg/m^3	
98% Percentile (7 exceedences)	44.53 µg/m^3	
Maximum 24-hour mean	59.40 µg/m^3 (12/01/03)	
	TEOM (uncorrected)	**TEOM (gravimetric)***
Mean of monitoring period	15.98 µg/m^3	20.77 µg/m^3
Data capture (%)	97.5	97.5
No. of 2004 objective exceedances (50 ug/m^3)	0	1
90% Percentile (35 exceedences)	23.94 µg/m^3	31.12 µg/m^3
98% Percentile (7 exceedences)	30.94 µg/m^3	40.22 µg/m^3
Maximum 24-hour mean	39.65 µg/m^3 (12/01/03)	51.55 µg/m^3 (08/12/01)
*Corrected by default factor of 1.3		

Calculation of estimated annual mean PM_{10} from monitoring period mean (<9 months data) based on Box 8.5 of LAQM.TG(03):

Silverton monitoring period: 02/10/02-14/03/01

(i) Plymouth Centre (long-term site A): Annual mean 2001= 15.0 µg/m^3
Period mean (02/10/02-14/03/01) = 15.15 µg/m^3

(ii) Cardiff Centre (long-term site B): Annual mean 2001= 20.0 µg/m^3
Period mean (02/10/02-14/03/01) = 25.07 µg/m^3

(iii) Bristol Centre (long-term site C): Annual mean 2001= 18.0 µg/m^3
Period mean (02/10/02-14/03/01) = 21.41 µg/m^3

Long-term AUN site	Annual mean 2001 (Am) PM_{10} µg/m^3	Period mean (Pm) PM_{10} µg/m^3	Ratio (Am/Pm)
A	15.0	15.15	0.990
B	20.0	25.07	0.798
C	18.0	21.41	0.841
		Average (Ra)	**0.876**

Mean of monitoring period (M)= 20.59 µg/m^3

M x Ra = 18.04 µg/m^3 (estimated annual mean for Silverton PM_{10})

APPENDIX 2: DETAILS OF MODELLING DATA

A2.1 DMRB modelling

As described in the updating and screening assessment sections above, the DMRB model has been used to carry out a screening assessment of NO_2 and PM_{10} concentrations at relevant locations where monitoring data is not available.

In all cases version 1.01 (February 2003) of the DMRB model spreadsheet has been used.

(A) Input and output data

Background concentrations used are estimated annual mean concentrations for 2001 (and onwards) based on 1km x 1km grid squares for the UK. All such data has been accessed from the internet at the following address www.airquality.co.uk/archive/laqm/tools.php. Background measurements have been taken at the 1km grid square corresponding to the modelled location, except for the A361(T) between M5 (J27) and Gornhay near Tiverton. At this location the modelled road is a major trunk road that runs through a rural area and therefore adjacent grid squares have been used to derive representative concentrations that avoid 'double counting' traffic emissions. This was carried out using the approach outlined in Box 1.5 of LAQM.TG(03).

Traffic flow data and statistics have been obtained from the Devon County Council Local Transport Plan and Statistics for 2001[5] or from location specific traffic census information obtained by Mid Devon District Council. All traffic flow volumes are annual average daily traffic flows (AADT).

For the purposes of forward predicting traffic flow volumes then road specific growth data has been obtained for 1991-2001 or 1996-2001. The percentage growth over these periods has been forward extrapolated, assuming a linear growth between 2001 and 2010 for both total LDV and HDV vehicle classes. Where specific roads have shown static or reduced traffic flows then the 2001 data has been used for each forward year modelled (i.e. assumed growth is 0%). The traffic growth percentages, as applied to each link road modelled, are shown below:

- A3072 at Crediton – 0% per annum
- A377/Exeter Road at Crediton – 0.6% per annum
- Station Road at Cullompton – 2% per annum
- B3181/Fore Street at Cullompton – 0% per annum
- A361(T) between M5 (J27) and Gornhay near Tiverton – 2% per annum
- A361 (T) near Cowley Moor, Tiverton – 2% per annum
- A361(T) near Worth Lodge/Lower Farleigh – 2% per annum

All distances used in the model are from the centre of the link road to the receptor and are based on site measurements or estimates from site visits and from accurately scaled GIS mapping data.

(B) DMRB spreadsheet results

See pages overleaf.

A2.2 Modelling of sulphur dioxide from boilers >0.5 MW

All modeling was carried out using the screening assessment set-out in paragraphs 7.17-7.25 of LAQM.TG(03). The nomogram spreadsheet (equivalent to Figure 7.1 of LAQM.TG(03)) was used for all calculations of maximum permitted emission rate and was obtained from the internet at the following address www.airquality.co.uk/archive/laqm/tools.php.

All boiler specific information was obtained from the plant operators and from existing records. The emission rate of specific fuels was calculated from the UK Emissions Factors Database 2000 (as in accordance with LAQM.TG(03)) obtained from the National Atmospheric Emissions Inventory (NAEI) from the internet at the following address www.naei.org.uk (Table A3 Emissions Factors for the Combustion of Liquid Fuels).

(A) Modelled SO_2 nomogram results

See pages overleaf.

APPENDIX 3: MONITORING AND MODELLED LOCATIONS

A3.1 Location figures

All labels on the following figures correspond to the 'Site Code' given in the relevant tables within this report.

See Figures overleaf.