UPDATING AND SCREENING ASSESSMENT FOR AIR QUALITY

2006

Executive Summary

In 1995 the Environment Act provided for a national air quality strategy requiring local authorities carry out ongoing rounds of reviews and assessment of the air quality in their area for seven specific pollutants. These are; carbon monoxide (CO), benzene, 1,3-butadiene, nitrogen dioxide (NO_2), lead, sulphur dioxide (SO_2) and PM_{10} (Particles under 10μm in diameter).

This document is an Updating and Screening Assessment of air quality across the Breckland Council district, which follows on from the Reviews and Assessments and Detailed Assessment of Air Quality carried out by Breckland Council in 1999 and 2000, 2003,2004 and 2005.

Each round of reviews and assessment is divided into a number of stages with progression to each stage dependent upon the air quality in each local authority area. Authorities are required to progress to the next stage only if there is a likelihood of exceeding the air quality standards and objectives.

In Breckland Council's area, the first round, stage one, of the review and assessment process was published in 1999 and identified four pollutants with potential to result in an exceedence of the air quality standards, and thus a stage two study was carried out to assess them in more detail. The second stage report was published in 2000 and concluded that no exceedences of any of the pollutants was likely by the dates set. In the second round of Review and Assessment PM10 was taken to a Detailed Assessment and Air Quality Management Area (AQMA) declared. Monitoring of this AQMA is ongoing.

To keep air quality on the agenda for all local authorities, and ensure that standards are maintained, guidance previously issued by DEFRA – Local Air Quality Management Technical Guidance (03) (LAQM TG(03)) - has been updated to help local authorities to carry out a third round of Review and Assessment, starting with an Updating and Screening Assessment (USA) by the end of April 2006. The USA is intended to identify significant changes that may have occurred since the last Progress Report (Breckland Council 2005), which might lead to a risk of the air quality objectives being exceeded. These might include new monitoring data, revised objectives or new or increased emission sources. All seven pollutants should be covered by the assessment and there are revised objectives for carbon monoxide, benzene, lead, nitrogen dioxide, sulphur dioxide, and particulate matter PM_{10}.

This report has considered all seven pollutants and concluded that all standards and objectives for carbon monoxide, benzene, 1,3 butadiene, lead, nitrogen dioxide, sulphur dioxide and PM_{10} are likely to be met and thus a more detailed assessment is not required for these pollutants.

Table 1. Checklist of considerations for each pollutant

Pollutant		Section Number
carbon monoxide	Monitoring data	**2.03**
	Very busy roads or junctions in built up areas	**2.04**
benzene	Monitoring data outside an AQMA	**3.03**
	Monitoring data within an AQMA	
	Very busy roads or junctions in built-up areas	**3.04**
	New Industrial sources	**3.05**
	Industrial sources with substantially increased emissions or new relevant exposure	
	Petrol stations	**3.06**
	Major fuel storage depots (petroleum only)	**3.07**
1,3,butadiene	Monitoring data	**4.03**
	New industrial sources	**4.04**
	Industrial sources with significantly increased emissions or new relevant exposure	**4.05**
lead	Monitoring data	**5.03**
	New industrial sources	**5.04**
	Industrial sources with substantially increased emissions or new relevant exposure	**5.05**
nitrogen dioxide	Monitoring data outside an AQMA	**6.03**
	Monitoring data within an AQMA	**6.04**
	Narrow congested streets with residential properties close to the kerb	**6.05**
	Junctions	**6.06**
	Busy streets where people may spend 1-hour or more close to traffic	**6.07**
	Roads with high flow of buses and/or HGVs	**6.08**
	New roads constructed or proposed since previous round of review and assessment	**6.09**
	Roads with significantly changed traffic flows or new relevant exposure	**6.11**
	Bus stations	**6.12**
	New industrial sources	**6.13**
	Industrial sources with substantially increased emissions or new relevant exposure	**6.14**
	Aircraft	**6.15**
sulphur dioxide	Monitoring data outside an AQMA	**7.03**
	Monitoring data within an AQMA	**7.04**
	New industrial sources	**7.05**
	Industrial sources with substantially increased emissions	**7.06**
	Areas of domestic coal burning	**7.07**
	Small boilers ($5MW_{(thermal)}$ burning coal or oil	**7.08**
	Shipping	**7.09**
	Railway Locomotives	**7.10**

Table 1. (continued) Checklist of considerations for each pollutant

PM_{10}	Monitoring data outside an AQMA	**8.02**
	Monitoring data within an AQMA	**8.03**
	Busy roads and junctions in Scotland	**8.04**
	Junctions	**8.05**
	Roads with high flow of buses and/or HGVs	**8.06**
	New roads constructed or proposed since last round of review and assessment	**8.07**
	Roads close to the objective during the last round of review and assessment	**8.06**
	Roads with significantly changed traffic flow or new relevant exposure	**8.09**
	New industrial sources	**8.10**
	Industrial sources with substantially increased emissions or new relevant exposure	**8.11**
	Areas with domestic solid fuel burning	**8.12**
	Quarries, landfill sites, opencast coal, handling of dusty cargoes at ports etc	**8.13**
	Aircraft	**8.14**

Chapter 1: Introduction

1.01 This document is an Updating and Screening Assessment (USA) of air quality across the Breckland Council district, which follows on from the USAs of 2000 and 2003, the Detailed Assessment for PM_{10} of 2004, and the Progress Report of 2005 carried out by Breckland Council.

1.02 Background

In 1995 the Environment Act provided for a national air quality strategy requiring local authorities carry out reviews and assessments of the air quality in their area for seven specific pollutants which are; carbon monoxide (CO), benzene, 1,3-butadiene, nitrogen dioxide (NO_2), lead, sulphur dioxide (SO_2) and PM_{10} (Particles under 10μm in diameter). Guidance on how to carry out the reviews and assessments is published by the Department for Environment Food and Rural Affairs (DEFRA). The second round of the review and assessment procedure is now completed and this report marks the beginning of the third round.

The third round is to be carried out in two stages, the first being this USA and the second, if relevant exceedences are identified, is a Detailed Assessment in 2007. If a Detailed Assessment is not required then a Progress Report is required instead.

In Breckland Council's area, all previous reports have shown that, with the exception of $PM_{10,}$ no exceedences of any of the pollutants were likely by the dates set. A Detailed Assessment for PM_{10} showed that, because of the number of exceedences of the objective, additional monitoring was required to validate existing monitoring results. Thus an Air Quality Management Area was declared in 2004 at East Wretham near Thetford. The information set out in these reports also included an outline of the sources of pollution and population statistics for Breckland, and the health effects of each of the pollutants. The sources of pollution and the population statistic have been reviewed to determine if there are likely to be any impact on air quality but the health information is not repeated here and reference should be made to the previous documents held by Breckland Council if this is required (Breckland Council 2003, 2004, 2005)

1.03 Updating and Screening Assessment

To keep air quality on the agenda for all local authorities, and ensure that standards are maintained, updates to the guidance – Local Air Quality Management Technical Guidance (03) (LAQM TG(03)) - have been issued by DEFRA which requires local authorities to carry out an Updating and Screening Assessment (USA) by the end of April 2006. The USA is intended to identify significant changes that may have occurred since the last USA of 2003, the Detailed Assessment for PM_{10} of 2004 and Progress report of 2005, which might lead to a risk of the air quality objectives being exceeded. These might include new monitoring data, revised objectives or new or increased emission sources. All seven pollutants should be covered by the assessment and there are revised objectives for benzene and 1,3-butadiene.

The assessment is to be based on the use of the checklists provided in LAQM TG(03) and on the Local Air Quality Management web site at the University of West

of England - http://www.uwe.ac.uk/aqm/review/blank_usa_checklist.doc - which gives support with a package of tools and Helpdesk services. These will be used to identify significant changes requiring further consideration. Where such changes are identified, screening or other tools should be applied to determine whether or not there is sufficient risk of exceedence of the objective. Finally, a conclusion should be reached as to whether a detailed assessment is required for each or any pollutant .

1.04 Summary of objectives of the UK Air Quality Strategy

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene (England and Wales)	5 µg/m^3 (1.5 ppb)	Annual Mean	31 December 2010
1,3-Butadiene	2.25 µg/m^3 (1 ppb)	Running Annual Mean	31 December 2003
Carbon monoxide	10 mg/m^3 (8.6 ppm)	Maximum daily running 8 Hour Mean	31 December 2003
Lead	0.5 µg/m^3	Annual Mean	31 December 2004
	0.25 µg/m^3	Annual Mean	31 December 2008
Nitrogen dioxide*	200 µg/m^3 (105 ppb) Not to be exceeded more than 18 times per year	1 Hour Mean	31 December 2005
	40 µg/m^3 (21 ppb)	Annual Mean	31 December 2005
Particles (PM_{10})	50 µg/m^3 Not to be exceeded more than 35 times per year	24 Hour Mean	31 December2004
	40 µg/m^3	Annual Mean	31 December 2004
Sulphur dioxide	350 µg/m^3 (132 ppb) Not to be exceeded more than 24 times per year	1 Hour Mean	31 December 2004
	125 µg/m^3 (47 ppb) Not to be exceeded more than 3 times per year	24 Hour Mean	31 December 2004
	266 µg/m^3 (100 ppb) Not to be exceeded more than 35 times per year	15 Minute Mean	31 December 2005
***Particles (PM_{10})** England, Wales and Northern Ireland (Not London)	50 µg/m^3 not to be exceeded more than 7 times per year	24-hour Mean	31 December 2010
	20 µg/m^3	Annual Mean	31 December 2010

Table 1.1. Objectives included in the Air Quality Regulations 2000 and (Amendment) Regulations 2002 for the purposes of Local Air Quality Management

Notes: µg/m^3 - micrograms per cubic metre mg/m^3 - milligrams per cubic metre
ppb - parts per billion ppm - parts per million
* The objectives for nitrogen dioxide (and particles for 2010) are provisional

Table 1.1 sets out the objectives to be included in the current USA and the assessments for each in the Breckland Council district are detailed in the following chapters.

Chapter 2: Review and assessment of carbon monoxide

2.01 Introduction

The Government and the Devolved Administrations have adopted a maximum daily running 8-hour mean concentration of 10 mg/m^3 as the air quality standard for carbon monoxide (CO) to be achieved by 31 December 2010.

Box 2.1: Checklist for carbon monoxide		
Reference no.	**Source, location or data to be assessed**	**Section/Page Number**
A	Monitoring data	2.03
B	Very busy roads	2.04

2.02 Result of first round of review and assessment of air quality

The first round of review and assessment of air quality, which was taken to stage two for CO, was completed in May 2000 and followed the Government's guidance for CO through the use of the recommended screening model and methodology. The guidance indicated that existing national policies were expected to deliver the national air quality objective by the end of the year 2003 with the possible exception of the near vicinity of heavily trafficked roads or in the vicinity of certain stationary sources.

All industrial sources thought to have the potential to lead to an exceedence of the air quality standard were investigated and modelling showed that the risk of the CO air quality objective being exceeded by the end of 2003 in localities where there might be exposure was negligible. Therefore, Breckland Council was not required to proceed any further and undertake a third stage review and assessment of CO.

2.03 Monitoring Data

Breckland Council has not carried out any monitoring for CO since the last review and assessment. However, there are no additional prescribed industrial sources of CO within the district since the last review and assessment was completed, and no previously existing sources have undergone changes that might lead to an increase in CO emissions. Industrial sources included in this assessment are those prescribed by the Pollution Prevention and Control (England and Wales) Regulations 2000 and regulated by the Environment Agency and/or local authorities, and two large coal fired boilers at HM Prison Wayland.

2.04 Very busy roads

Technical Guidance LAQM TG(03) states that for the assessment of CO, "*very busy roads and junctions in areas where the 2003 background is expected to be above 1 mg/m^3*" should be identified. The criteria for very busy roads are given as single carriageway roads where the daily average flows exceed 80,000 vehicles per day or dual carriageway roads where the daily average flows exceed 120,000 vehicles per day. Using the average background concentrations for CO estimated from the maps and year adjustment figures at http://www.airquality.co.uk/archive/laqm/tools.php it is

shown that Breckland Council has no areas where the 2010 background is expected to be above 0.13 mg/m^3 . There are also no roads that meet the daily vehicle flows.

2.05 Conclusion for carbon monoxide

Breckland Council has considered all relevant background, industrial and traffic criteria and found that there is very little likelihood of exceedence of the air quality standard for carbon monoxide in 2006 (objective date to be achieved by 31 December 2003).

Chapter 3: Review and assessment of benzene

3.01 Introduction

The Government and the Devolved Administrations have adopted an annual mean of 5 μg/m^3 to be achieved by the end of 2010 in England and Wales. In Scotland and Northern Ireland, a running annual mean of 3.25 μg/m^3 has been adopted as an additional objective, to be achieved by the end of 2010.

Box 3.1: Checklist for benzene		
Reference no.	**Source, location or data that need to be assessed**	
A	Monitoring data outside an AQMA	3.03
B	Monitoring data within an AQMA	3.03
C	Very busy roads or junctions in built-up areas	3.04
D	New Industrial sources	3.05
E	Industrial sources with substantially increased emissions or new relevant exposure	3.06
F	Petrol stations	3.07
G	Major fuel storage depots (petroleum only)	3.08

3.02 Result of last round of review and assessment of air quality

The first round of review and assessment of air quality for Breckland Council was completed in May 1999 and was taken only as far as stage one for benzene. At this time the government stated that existing national policies, particularly with regard to improvements in vehicle technology such as greater use of catalytic converters, were expected to deliver the national air quality objective by the end of 2005. The stage one report stated that there were no sources of benzene emissions or any major roads likely to lead to an exceedence of the air quality standards in Breckland. In conclusion it was stated that "By 2005 all petrol service stations will have vapour balancing equipment installed and in use which will contribute to overall reductions in quantities of benzene in ambient air. In conclusion, it is likely that the air quality objective for benzene will be met and it is not intended to move to a second stage review for this pollutant".

3.03 Monitoring data (outside and within an AQMA)

Breckland Council has carried out no monitoring of benzene across the district since the first review and assessment and as the petrol stations mentioned in 3.02 above have all been fitted with vapour balancing equipment, and with the improved vehicle technology used in new vehicles since this time, it is thought unlikely that concentrations would exceed those found at the first stage. An AQMA was declared in 2004 for PM_{10} and is in an isolated rural area with no petrol stations or other source of benzene, thus no monitoring has been carried out within the AQMA for benzene.

3.04 Very busy roads or junctions in built-up areas

The guidance LAQM TG(03) states that EU legislation and national policy measures have led to a reduction in the benzene content of petrol from 5% to 1%. Again there are no heavily trafficked roads across the district which are likely to lead to an exceedence of the air quality standard for benzene.

3.05 New Industrial sources

There have been no new industrial sources of benzene emissions in Breckland Council's district which are likely to lead to an exceedence of the air quality standard.

3.06 New Industrial sources with substantially increased emissions or new relevant exposure

There has been no increased emission from existing industrial sources of benzene in Breckland Council's district or no new receptors which are likely to lead to an exceedence of the air quality standard.

3.07 Petrol stations

The main sources of benzene emissions in the UK are from petrol-engined vehicles, petrol refining and refuelling of vehicles at petrol stations forecourts. Petrol vapour recovery systems on underground storage tanks have now been installed at all service stations with a throughput of more than 500m^3 per year in Breckland Council's district. Petrol vapour recovery systems for refuelling at pumps at service stations are not yet required. LAQM TG(03) states that petrol stations with a throughput of less than 1000m^3 are unlikely to have a significant effect on benzene emissions. The majority of petrol stations in the Breckland Council area have a throughput of more than 1000m^3 per year. LAQM TG(03) states that only petrol stations with a throughput of petrol of more than 2000m^3 per year which are close to a busy road with daily flows of more than 30,000 vehicles and with relevant receptors within 10m of the pumps should be considered. Breckland has no petrol stations that meet all of these criteria.

3.08 Major fuel storage depots (petroleum only)

There are no petroleum storage depots in the Breckland Council district.

3.09 Conclusion for benzene

Using the average background and roadside concentrations for Benzene estimated from the maps and year adjustment figures at http://www.airquality.co.uk/archive/laqm/tools.php it is shown that Breckland Council has no areas where the 2010 background is expected to be above 0.20 mg/$m^{3.}$ After consideration of all relevant background, industrial and traffic criteria it was found that there is very little likelihood of exceedence of the air quality standard for benzene in 2003, 2006 or 2010.

Chapter 4: Review and assessment of 1,3-butadiene

4.01 Introduction

The Government and the Devolved Administrations have adopted a maximum running annual mean concentration of 2.25 μg/m^3 as an air quality standard for 1,3-butadiene. The objective is for the standard to be achieved by the end of 2003.

Box 4.1: Checklist for 1,3-butadiene		
Reference no.	**Source, location or data that need to be assessed**	
A	Monitoring data	4.03
B	New industrial sources	4.04
C	Existing industrial sources with significantly increased emissions or new relevant exposure	4.05

4.02 Result of last round of review and assessment of air quality for 1,3-butadiene

The last round of Review and Assessment of air quality concluded that there were no industrial sources of 1,3-butadiene emissions or any major roads likely to lead to an exceedence of the air quality standard for 1,3-butadiene in Breckland, and concluded that it was likely that the air quality objective for 1,3-butadiene would be met.

4.03 Monitoring data

Breckland Council has carried out no monitoring of 1,3-butadiene since the last review and assessment as it was thought unlikely that concentrations would exceed the objective.

4.04 New industrial sources

There have been no new industrial sources of 1,3-butadiene in Breckland, or in adjacent local authorities, since the first review and assessment.

4.05 Existing industrial sources with significantly increased emissions

There are no existing industrial sources of 1,3-butadiene in Breckland, or in adjacent local authorities.

4.06 Conclusion for 1,3,butadiene

Using the average background concentrations for 1,3-butadiene estimated from the maps and year adjustment figures at http://www.airquality.co.uk/archive/laqm/tools.php it is shown that Breckland Council has no areas where the 2010 background is expected to be above 0.06 mg/m^3. After consideration of all relevant background, industrial and traffic criteria it was found that there is very little likelihood of exceedence of the air quality standard for 1,3-butadiene in 2006 or 2010. .

Chapter 5: Review and assessment of lead

5.01 Introduction

The Government and the Devolved Administrations have adopted an annual mean concentration of 0.5 μg/m^3 as the air quality standard for lead, with an objective for the standard to be achieved by the end of 2004. In addition, a lower air quality objective of 0.25 μg/m^3 to be achieved by the end of 2008 has also been set.

Box 5.1: Checklist for lead		
Reference no.	**Source, location or data that needs to be assessed**	
A	Monitoring data outside an AQMA	5.03
B	New industrial sources	5.04
C	Industrial sources with substantially increased emissions	5.05

5.02 Result of second round of review and assessment of air quality for lead

The second round of review and assessment of air quality for lead concluded that in view of the lack of industrial sources for lead, supporting monitoring data and the continuing decrease in the use of leaded petrol by motor vehicles it was expected that the objective for lead would be met by 2004.

5.03 Monitoring data

No monitoring for lead has been carried out in, or adjacent to, Breckland Council's district since the second round of Review and Assessment.

5.04 New industrial sources

There are no new industrial sources of lead since the last review and assessment.

5.05 Industrial sources with substantially increased emissions

There is one foundry within the Breckland Council district that is a source of lead. However on-site emissions monitoring shows that there has been no increase in the amount of lead used at the foundry in the casting process and thus the emissions are not likely to have increased since the first and second rounds of Review and Assessment of air quality.

5.06 Conclusion for lead

Breckland Council has considered all relevant background, industrial and traffic criteria and found that there is very little likelihood of exceedence of the air quality standard for lead in 2004 and 2008.

Chapter 6: Review and assessment of nitrogen dioxide

6.01 Introduction

The Government and the Devolved Administrations have adopted two Air Quality Objectives for nitrogen dioxide, as an annual mean concentration of 40 μg/m^3 and a 1-hour mean concentration of 200 μg/m^3 not to be exceeded more than 18 times per year. The objectives were to be achieved by the end of 2005. .

Box 6.1: Checklist for nitrogen dioxide		
Reference no.	**Source, location or data that need to be assessed**	
A	Monitoring data outside an AQMA	6.03
B	Monitoring data within an AQMA	6.04
C	Narrow congested streets with residential properties close to the kerb	6.05
D	Junctions	6.06
E	Busy streets where people may spend 1-hour or more close to traffic	6.07
F	Roads with high flow of buses and/or HGVs	6.08
G	New roads constructed or proposed since previous round of review and assessment	6.09
H	Roads with significantly changed traffic flows or new exposure.	6.10
I	Bus stations	6.11
J	New industrial sources	6.12
K	Industrial sources with substantially increased emissions	6.13
L	Aircraft	6.14

6.02 Result of second round of review and assessment of air quality for nitrogen dioxide

Since completion of the last review and assessment of air quality, Breckland Council has continued monitoring of nitrogen dioxide using diffusion tubes and one continuous analyser. In the second stage of the review and assessment the Government's guidance for NO_2 was followed through the use of the recommended screening models and methodology, and included information which supported the final conclusion. The guidance indicated that the existing national policies will ensure that the national air quality objectives will be achieved by the end of the year 2005 for all areas. Thus the second stage review and assessment concluded that the risk of the nitrogen dioxide air quality objectives being exceeded by the end of 2005 is negligible in the Council's area. Breckland Council did not therefore undertake a third stage of review and assessment of nitrogen dioxide.

6.03 Monitoring data outside an AQMA

Breckland Council monitors NO_2 concentrations using a chemiluminescent analyser and diffusion tubes. The chemiluminescent analyser is serviced every 6 months and

calibrated using gases every two weeks. The analyser is not part of the national network and all quality controls are in accordance with Breckland Council protocols only.

The Breckland Council diffusion tube network is also not part of the national network. Because laboratories can differ in their results of diffusion tube analysis LAQM TG(3) recommends that a "bias correction" is carried out. This correction is required in order to make adjustment to the result by taking into account the differences between laboratories. Using the spread sheet provided at http://www.airquality.co.uk/archive/laqm/tools.php for this calculation, the bias factor is 0.99 and in Figure 6.1 the annual mean is shown for all sites in Breckland with the raw and the adjusted results.

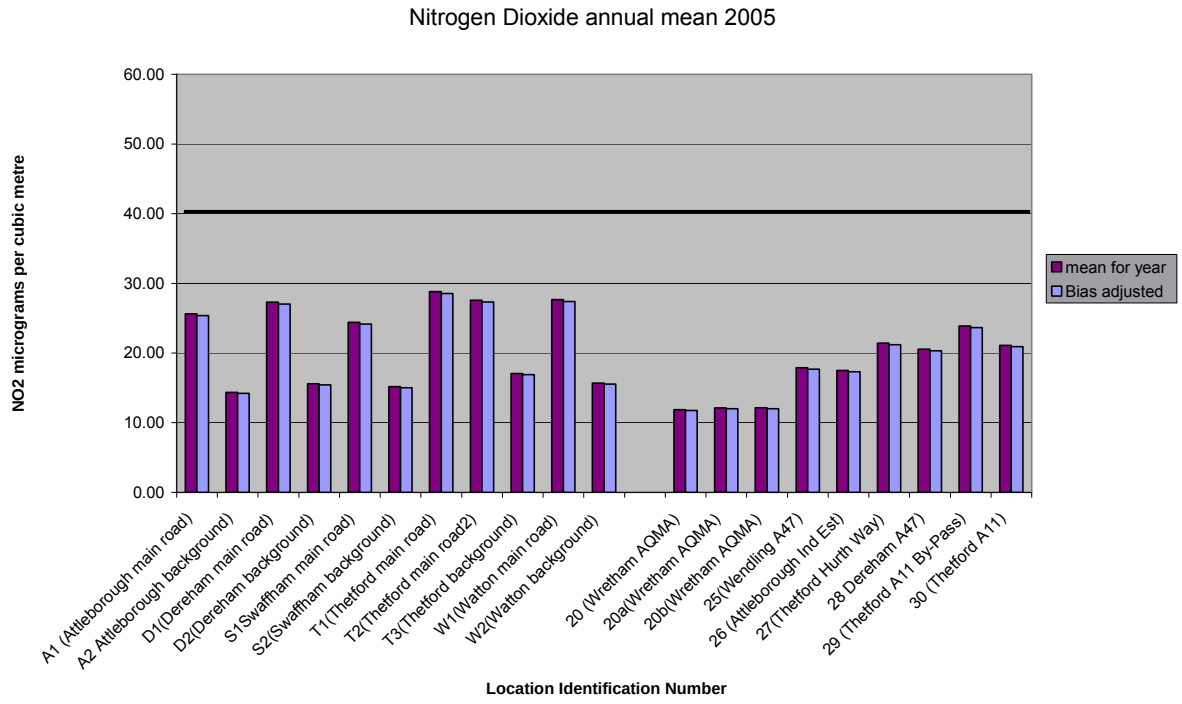

Figure 6.1 Results for annual means NO2 diffusion tubes Jan – Dec 2005

6.04 Monitoring data within an AQMA

Site numbers 20, 20a and 20b shown in Figure 6.1 are located in the AQMA declared for PM_{10}. It can be seen that annual mean concentrations are well below the annual objective for 2005 of 40µg/m^3

6.05 Narrow congested streets with residential properties close to the kerb

There are no such streets in Breckland Council's district that meet this criterion.

6.06 Junctions

LAQM TG(03) suggests that junctions were possibly not modelled adequately in the first round of reviews and assessments and that all "busy" junctions with traffic movements greater than 10,000 vehicles per day should be considered in the USA. The modelling tool provided to local authorities for assessing NO_2 concentrations from traffic is from the Design manual for Roads and Bridges (DMRB). Diffusion

tubes have been located at the busiest junctions in Breckland Councils district. Where possible the results (from the year 2005) from these tubes have been used for the DMRB model and where there are no results available the projected background concentrations for 2005 at http://www.airquality.co.uk/archive/laqm/tools have been used. Results for this modelling are presented in Table 6.1 below.

All receptors			Estimated NO_2 concentrations at receptor (2005)				
Receptor number	Name	Year	Distance from link centre to receptor (m)	AADT (combined vehicle per day)	Average speed Km/hr	%HDV	NO2 ug/m3
1	Besthorpe By-Pass TM 956046	2005	43	28290	100	9	16.7
2	North Tuddenham TG 142039	2005	32	21574	100	8	21.7
3	Swaffham By pass TF 819001	2005	23	18583	100	11	20.6
4	London St Swaffham TF 819017	2005	10	11612	20	6	19.1*
5	Yaxham Road Dereham TF 995124	2005	12	12659	20	3	19.3
6	Dereham By pass/ A1075 junction TF 997123	2005	32	17429	100	11	23.7*
7	Dereham High Street TF 989127	2005		Not available			Diffusion tube measured as 27.30
8	Dereham Southend TF	2005	5	3608	40	2	16.0
9	A47 Wendling TF 931132	2005	17	15155	100	11	24.1*
10	Mundford Rd Thetford TF 836877	2005	32	9628	100	9	20.2*
11	A1075 Thetford TF 841884	2005	7	7284	100	4	20.2*
12	Boston Road Thetford TF 834854	2005	25	16444	60	5	20.8*

Table 6.1. DMRB Projections of NO_2 for 2005. * = local diffusion tube data used

Table 6.1 above shows the results of the DMRB model for NO_2 at 11 locations projected for 2005. Norfolk County Transport Planners provided all traffic flow information. There was no current information on Dereham High Street since the recent town centre redevelopment and this could not be modelled, however the annual mean measured with diffusion tubes is shown. One business questioned air quality as it was perceived that traffic had increased since the redevelopment. Analysis of diffusion tube results for the past four years show a decrease in annual mean NO_2 concentrations. It can be seen that all locations are projected to be well below the annual average for NO_2

Table 6.2 below shows the results of the DMRB model for NO_2 at 11 locations projected for 2010. It can be seen that all locations are projected to be well below the annual average for NO_2

All receptors			Estimated NO_2 concentrations at receptor (2010)				
Receptor number	Name	Year	Distance from link centre to receptor (m)	AADT (combined vehicle per day)	Average speed Km/hr	%HDV	NO2 ug/m3
1	Besthorpe By-Pass TM 956046	2010	43	30978	100	9	13.7
2	North Tuddenham TG 142039	2010	32	23264	100	8	17.9
3	Swaffham By pass TF 819001	2010	23	20348	100	11	19.0
4	London St Swaffham TF 819017	2010	10	12715	20	6	18.3*
5	Yaxham Road Dereham TF 995124	2010	12	13748	20	3	18.8
6	Dereham By pass TF 997123	2010	32	18998	100	11	17.3*
7	Dereham High Street TF 989127	2010		Not available			
8	Dereham Southend TF	2010	5	3933	40	2	13.8
9	A47 Wendling TF 931132	2010	17	16595	100	11	23.3*
10	Mundford Rd Thetford TF 836877	2010	32	10456	100	9	19.8
11	A1075 Thetford TF 841884	2010	7	7910	100	4	17.1*
12	Boston Road Thetford TF 834854	2010	25	17858	60	5	19.4*

Table 6.2. DMRB Projections of NO_2 for 2010. * = local diffusion tube data used

6.07 Busy streets where people may spend 1- hour or more close to traffic

There are short stretches of such streets in the town centres of Dereham, Attleborough and Swaffham where people may be exposed to NO_2 arising from traffic at certain times of day. It is possible, but unlikely, that they would be in these areas for 1 hour or more. However, results for these locations were included in the DMRB modelling in tables 6.1 and 6.2 and the diffusion tube results for these locations are highlighted and set out in Table 6.3 below. Furthermore, results from diffusion tubes, which have been located at all of the sites in Table 6.3, for almost 10 years (albeit not bias corrected), show that at no time in this period has there been an exceedence of the annual average NO_2 concentration of 40 $\mu g/m^{3.}$ Thus it is unlikely that an hourly concentration of 200 $\mu g/m^3$ would be exceeded more than 18 times.

Site	30.12.04-31.01.05	31.03.05-01.03.05	01.01.05-31.03.05	31.03.05-28.04.05	28.04.05-03.06.05	03.06.05-30.06.05	30.06.05-01.08.05	01.08.05-01.09.05	01/09/05 - 04.10.05	04.11.05-03.11.05	03.11.05 - 12.05	1.12.05-12.01.06
	January	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
A1 (Attleborough main road)	26.36	28.67	32.06	31.6	26.67	26.9	22.6	20.98	29.98	14.67	16.69	30.28
A2 Attleborough background)		15.81	16.69	14.41	9.99	8.17	8.38	9.68	10.58		30.14	19.62
D1(Dereham main road)	31.35	36.16		28.99	26.67	27.32	23.4	17.84	27.04	26.17	29.76	25.56
D2(Dereham background)	22.55	15.47	17.79	14.64	12.23	10.31	8.7	10.14	14.66	18.26	22.16	20.13
S1Swaffham main road)	20.61	27.12	27.27	27.43	22.44	26.23	18.58	16.73	26.63	26.01	27.24	26.75
S2(Swaffham background)	15.89	15.03	16.09	10.99	9.6	6.95	6.22	5.83	11.43	12.8	51.97	19.17
T1(Thetford main road)	33.44	30.61	31.18	32.17	24.04	24.58	23.4	25.49	29.93	29.92	30.42	30.91
T2(Thetford main road2)	26.2	29.23	32.67	26.91	27.88	26.71	23.54	23.82	28.18	29.85	26.91	29.25
T3(Thetford background)	22.28	20.46	21.76	16.32	11.98	11.28	10.25	9.78	17.36	17.38	23.63	22.26
W1(Watton main road)	28.88	20.74					22.55		29.7	27.42	33.42	30.98
W2(Watton background)	17.88	25.45	17.3	14.58	11.2	8.78	9.31	10.69	14.37	15.09	22.21	21.45
20 (Wretham AQMA)	12.19	12.7	15.04	11.8	9.12	8.66	7.53	9.07	12.1	13.53	13.95	16.89
20a(Wretham AQMA)	11.7	12.76	15.54	12.5	9.68	8.23	6.78	9.28	12.33	14.2	15.86	16.74
20b(Wretham AQMA)	11.97	11.59	15.59	11.92	9.47	8.42	7.19	10.69	12.29	15.35	15.21	16.04
25(Wendling A47)	11.97	20.91	19.39	18.86	17.03	18.97	17.45	16.32	18.41	15.87	19.53	19.83
26 (Attleborough Ind Est)	19.06	20.02	22.59			13.42	11.98	12.21	16.08	15.87	22.05	21.71
27(Thetford Hurth Way)	18.68	20.02	22.59	22.16	24.73	17.75	15.44	16.73	22.87	21.64	27.24	27.08
28 Dereham A47)	25.88	24.96	24.57	22.16	21.1	16.04	12.17	14.8	17.69	23	21.23	22.85
29 (Thetford A11 By-Pass)	19.11	20.85	22.31	22.28	28.62	24.52	20.63	16.47	28.84	24.97	28.06	29.99
30 (Thetford A11)	29.2	27.17	27.6	26.56	9.12	19.76	19.04	9.11	22.39	19.09	21.77	22.59

Table 6.3. Results of diffusion tubes for all locations in 2005

6.08 Roads with high flow of buses and/or HGVs

LAQM TG(03) states that an unusually high proportion of HGVs can be taken to be greater than 25%. There are no such roads in Breckland Council with particularly high flows of buses or HGVs. The DMRB model requires the percentage of HGVs for all roads to be input and the information made available for this by County Transport Planners showed that no roads had a percentage of HGVs greater than 11%.

6.09 New roads constructed or proposed since previous round of review and assessment

There have been no new roads constructed since the last round of review and assessment. Currently underway is the dualling of the section of the A11 between Attleborough and Besthorpe which is due to be opened early next year. It is thought likely that this will have a neutral impact on NO_2 concentrations in the town centre.

6.10 Roads with significantly changed traffic flows or new relevant exposure.

LAQM TG(03) defines "significantly changed" traffic flows as increasing by 25% since the first round of reviews and assessments. There are no roads that meet this criterion in Breckland. There have been no new residential developments in areas close to trunk roads since the previous round of review and assessment.

6.11 Bus stations

LAQM TG(03) states that only bus stations with more than 1000 movements per day should be considered. There are no such bus stations in Breckland.

6.12 New industrial sources

The Norfolk Local Air Quality Management Group made up of the seven Norfolk local authorities, has discussed the contribution of industrial sources since the previous round of reviews and assessments. The group concluded that there have been no new industrial sources of NO_2 in Breckland Council's district or any adjacent local authority areas since the previous round of reviews and assessments. .

6.13 Industrial sources with substantially increased emissions or new relevant exposure

The Norfolk Local Air Quality Management Group concluded that there have been no substantially increased industrial sources of NO_2 in Breckland Council's district or any adjacent local authority areas since the previous round of reviews and assessments. There have been no new residential developments in areas close to industrial sources roads since the previous round of review and assessment.

6.14 Aircraft

There are no airports in the Breckland Council district.

6.15 Conclusion for nitrogen dioxide

Breckland Council has considered all relevant background, industrial and traffic criteria and found that there is very little likelihood of exceedence of the air quality standards for NO_2 in 2005 or 2010.

Chapter 7:Review and assessment of sulphur dioxide

7.01 Introduction

The Government and the Devolved Administrations have adopted a 15-minute mean of 266 μg/m^3 as an air quality standard for sulphur dioxide, with an objective for the standard not to be exceeded more than 35 times in a year by the end of 2005. Additional objectives have also been set which are equivalent to the EU limit values specified in the First Air Quality Daughter Directive. These are for a 1-hour mean objective of 350 μg/m^3, to be exceeded no more than 24 times per year, and a 24-hour objective of 125 μg/m^3, to be exceeded no more than 3 times per year, to be achieved by the end of 2004.

Box 7.1: Checklist for sulphur dioxide		
Reference no.	**Source, location or data that need to be assessed**	
A	Monitoring data outside an AQMA	7.03
B	Monitoring data within an AQMA	7.04
C	New industrial sources	7.05
D	Industrial sources with substantially increased emissions or new relevant exposure	7.06
E	Areas of domestic coal burning	7.07
F	Small boilers (5MW$_{(thermal)}$ burning coal or oil	7.08
G	Shipping	7.09
H	Railway Locomotives	7.10

7.02 Result of second round of review and assessment of air quality for sulphur dioxide

In the second stage of the review and assessment the Government's guidance for SO_2 was followed through the use of the recommended screening models and methodology, and included information which supported the final conclusion. The guidance indicated that the existing national policies would ensure that the national air quality objectives will be achieved by the end of the year 2005 for all areas. Thus the second stage review and assessment concluded that the risk of the sulphur dioxide air quality objectives being exceeded by the end of 2005 is very unlikely.

7.03 Monitoring data outside an AQMA

Breckland Council has not carried out any monitoring of SO_2 since the second round of review and assessment which concluded that the major sources within and adjacent to the district were unlikely to cause an exceedence of the objectives.

7.04 Monitoring data within an AQMA

Breckland Council has not carried out any monitoring of SO_2 within the AQMA declared for PM_{10} since the second round of review and assessment. There have been no changes to the mix of industry in the area and thus it is unlikely that there is an exceedence of the objectives.

7.05 New industrial sources

The Norfolk Local Air Quality Management Group has discussed the contribution of industrial sources since the second round of reviews and assessments. The group concluded that there have been no new industrial sources of SO_2 in Breckland Council's district or any adjacent local authority areas since the second round of reviews and assessments.

7.06 Industrial sources with substantially increased emissions

The Norfolk Local Air Quality Management Group concluded that there have been no substantially increased industrial sources of SO_2 in Breckland Council's district or any adjacent local authority areas since the second round of reviews and assessments.

7.07 Areas of domestic coal burning

Domestic coal burning was not considered likely to lead to an exceedence of the air quality objective for SO_2 in the second round of reviews and assessments. Levels of coal burning are not thought to have increased and thus it is still unlikely that such activity would lead to an exceedence of the air quality standard for SO_2 in 2004 or 2005

7.08 Small boilers ($5MW_{(thermal)}$ burning coal or oil)

There have been no changes to the existing coal and oil burning appliances in the Breckland district since the second round of reviews and assessments and thus the air quality standard for SO_2 is unlikely to be exceeded.

7.09 Shipping

There is no shipping in the Breckland Council's district.

7.10 Railway Locomotives

There are several railway stations and stops on the main Norwich to London line in the Breckland district, but none are likely to have diesel locomotives stationary for 15 minutes. There is one station in Dereham on the Dereham to Wymondham line, run at weekends and holidays only, where diesel powered locomotives may be stationary for 15 minutes. The Mid Norfolk Railway company have stated that the only time that engines run while stationary is at Christmas in order to change batteries and keep the heating running. It is thus unlikely that any short-term objectives for SO_2 would be exceeded.

7.11 Conclusion for sulphur dioxide

Breckland Council has considered all relevant background, industrial and traffic criteria and found that there is unlikely to be an exceedence of the 15 minute or 1 hour objective for sulphur dioxide in 2004.

Chapter 8: Review and assessment for PM_{10}

8.01 Information

The Government and the Devolved Administrations have adopted two Air Quality Objectives for fine particles (PM_{10}), which are equivalent to the EU Stage 1 limit values in the first Air Quality Daughter Directive. The objectives are 40 µg/m^3 as the annual mean, and 50 µg/m^3 as the fixed 24-hour mean to be exceeded on no more than 35 days per year, to be achieved by the end of 2004. The objectives are based upon measurements carried out using the European gravimetric transfer reference sampler or equivalent.

The EU has also set indicative limit values for PM_{10} which are to be achieved by 1 January 2010. These stage 2 limit values are considerably more stringent and are:

20 µg/m^3 as the annual mean and 50 µg/m^3 as the 24 hour mean to be exceeded on no more than 7 days per year.

The objectives are:

For all parts of England (except London) Wales and Northern Ireland, a 24 hour mean of 50 µg/m^3 not be exceeded more than 7 times per year and an annual mean of 20 µg/m^3 to be achieved by the end of 2010.

Box 8.1: Checklist for PM_{10}		
Reference no.	**Source, location or data that need to be assessed**	
A	Monitoring data outside an AQMA	
B	Monitoring data within an AQMA	
C	Busy roads and junctions in Scotland	
D	Junctions	
E	Roads with high flow of buses and/or HGVs	
F	New roads constructed or proposed since first round of review and assessment	
G	Roads close to the objective during the first round of review and assessment	
H	Roads with significantly changed traffic flow	
I	New industrial sources	
J	Industrial sources with substantially increased emissions	
K	Areas with domestic solid fuel burning	
L	Quarries, landfill sites, opencast coal, handling of dusty cargoes at ports etc	
M	Aircraft	

8.02 Result of detailed assessment of air quality for PM_{10}

Continuous monitoring results at one site in Breckland using a beta attenuation gauge showed that in 2002 there had been 43 exceedences of the daily mean, and in 2003 there had been 45. Based on these results, Breckland Council proposed that

a detailed assessment of PM_{10} should be made. Based on the pattern of exceedences and local records, the Detailed Assessment concluded that the exceedences of the 24 hour mean were most likely attributable to the wind erosion of the light sandy soils of the Breckland area and an Air Quality Management Area was declared in 2004 based on data for 2002 and 2003.

8.03 Monitoring data outside an AQMA

There is no monitoring of PM_{10} outside the AQMA. Background PM_{10} data for annual means in 2004 across the Breckland area, supplied at http://www.airquality.co.uk/archive/laqm/tools, range from 18.4 -24.3ug/m^3 and the projection for 2010 background levels range from 16.7 – 22.7ug/m^3.

8.04 Monitoring data within an AQMA

Until the purchase of a TEOM instrument in August 2005, Breckland Council has monitored PM_{10} continuously at one site using a beta attenuation instrument. The site is surrounded by heath land and arable farming on very light sandy soil and was thus thought to represent a worst possible case for rural PM_{10}, although many Breckland residents live in similar locations. LAQM TG(03) does not include such local sources for projections of PM_{10} to future years.

Results from this site for 2002 and 2003 were adjusted to reflect the heated manifold on the beta attenuation instrument, i.e. the results were multiplied by 1.3 to account for loss of volatile PM_{10} due to heating. The standard for PM_{10}, to be achieved by the end of 2004, is 50 µg/m^3 as the fixed 24-hour mean to be exceeded on no more than 35 days per year. At this site in 2002 there were 43 days, and in 2003 45 days, when this was exceeded, although the measured annual means were 22.4 µg/m^3 and 22.0 µg/m^3 respectively.

Using the method set out in LAQM TG(03) boxes 8.6 and 8.7, the annual mean PM_{10} concentrations were projected for 2004 to be 27.2 µg/m^3 and for 2007 at 24.27 µg/m^3. In 2004 there were 14 exceedences of the 24 hour standard and in 2005 there were 15, therefore the objective was met in 2004.

Projections for 2010 suggest that the annual mean objective is likely to be exceeded. In fact many of the background concentrations projected for 2010 at http://www.airquality.co.uk/archive/laqm/tools are above the annual objective, before any additional burden from traffic or industry.

Projections of exceedences of the daily mean have not been made as the information set out in the method for this procedure in box 8.1 of LAQM TG(03) includes only transport and industry as the main contributory source of PM_{10} at the local level. This is not felt to be appropriate in this situation. It should be borne in mind that these projections relate only to sites which are similar to the location of the monitoring station.

Early results of the comparison of the TEOM and the beta attenuation instruments' data suggest that the beta attenuation instrument may be over reading PM_{10}. Unfortunately the suppliers of the TEOM instrument have not yet been able to resolve software problems and until these are resolved, the had agreed to download the information required for validating the data. Even more unfortunately, they forgot to do this for a period of two months and this means that the data quality is not able

to be assured in this period. A further period of monitoring is required to make a meaningful comparison of the two data sets, but if results to date are correct then it may be appropriate to revoke the AQMA in future.

8.05 Busy roads and junctions in Scotland

Not applicable.

8.06 Junctions

Table 8.1 below shows the predicted PM_{10} concentrations for 2010 for all junctions where there are potential receptors.

All Receptors		Estimated PM_{10} concentrations at receptor (2010)		
Receptor number	Name Grid Reference	Year	PM_{10}	
			Annual mean µg/m^3	Days >50µg/m^3
1	Besthorpe By-Pass TM 956046	2010	23.55	9.19
2	North Tuddenham TG 142039	2010	23.15	8.39
3	Swaffham By pass TF 819001	2010	23.28	8.65
4	London St Swaffham TF 819017	2010	23.04	8.18
5	Yaxham Road Dereham TF 995124	2010	22.93	7.97
6	Dereham By pass TF 997123	2010	24.21	11
7	A47 Wendling TF 931132	2010	23.55	9.19
8	Mundford Rd Thetford TF 836877	2010	24.78	11.88
9	A1075 Thetford TF 841884	2010	24.65	11.57
10	Boston Road Thetford TF 834854	2010	23.94	10.00

Table 8.1. Predicted PM_{10} concentrations for 2010

Background concentrations for PM_{10} for 2010 were calculated, using the method set out in LAQM TG(03) Box 8.6, and entered into the DMRB spreadsheet. Predictions indicate that it is likely that the provisional annual mean objective for 2010 of 20ug/m^3 and the permitted maximum of 7 exceedences of the 24 hour mean will be exceeded at all of the above locations.

8.07 Roads with high flow of buses and/or HGVs

LAQM TG(03) states that an unusually high proportion of HGVs can be taken to be greater than 25%. There are no such roads in Breckland Council with particularly high flows of buses or HGVs. The DMRB model requires the percentage of HGVs for all roads to be input and the information made available for this by County Transport Planners showed that no roads had a percentage of HGVs greater than 11%.

8.08 New roads constructed or proposed since second round of review and assessment

There have been no new roads constructed or proposed since the second round of review and assessment.

8.09 Roads close to the objective during the second round of review and assessment

All roads modelled in the first round of reviews and assessments were included in this USA, and as seen in Table 8.1, although likely to exceed the air quality standards for 2010 – it is not likely that the 2004 standards will be exceeded, which is the relevant date of the PM_{10} objective.

8.10 Roads with significantly changed traffic flow

LAQM TG(03) defines "significantly changed" traffic flows as increasing by 25% since the first round of reviews and assessments. There are no roads that meet this criterion in Breckland.

8.11 New industrial sources

The Norfolk Local Air Quality Management Group concluded that there have been no new industrial sources of PM_{10} in Breckland Council's district or any adjacent local authority areas since the first round of reviews and assessments.

8.12 Industrial sources with substantially increased emissions

The Norfolk Local Air Quality Management Group concluded that there have been no substantially increased industrial sources of PM_{10} in Breckland Council's district or any adjacent local authority areas since the second round of reviews and assessments.

Since the second round of reviews and assessment, poultry farms have been found to be significant sources of PM_{10} by some local authorities, but to date there is no evidence to suggest that this is the case in Breckland. Within the AQMA there are several poultry houses that since 2003 have been housing ducks. Ducks are kept in wetter less dusty conditions than other poultry (chickens and turkeys) and are thus thought unlikely to give rise to significant amounts of dust. Previous monitoring at the same location in the AQMA, before declaration, and when "dry" poultry were housed, did not show any patterns of PM_{10} exceedences as would be expected at changes in the rearing cycles. Therefore, until further studies are published there is no intention to carry out monitoring at the many poultry farms in the Breckland area.

8.13 Areas with domestic solid fuel burning

Domestic coal and wood burning was not considered likely to lead to an exceedence of the air quality objective for PM_{10} in the first round of reviews and assessments. Levels of coal burning have not increased and thus it is still unlikely that such activity would lead to an exceedence of the air quality standard for PM_{10} in 2004.

8.14 Quarries, landfill sites, opencast coal, handling of dusty cargoes at ports etc

There are a number of quarries in the Breckland Council area but these were not thought to be significant sources of PM_{10} at relevant receptors.

8.15 Aircraft

There are no airports in Breckland.

8.16 Conclusion for PM_{10}

Breckland Council has considered all relevant background, industrial and traffic criteria and found that there is very little likelihood of exceedence of the daily or annual air quality objectives for PM_{10} in 2004 for traffic or industrial sources. However there is a likelihood of an exceedence of the daily and annual means for 2010.

Breckland Council proposes that monitoring be continued within the AQMA for comparison of the TEOM data with the beta gauge data. Based on results it is likely that an application will made to revoke the AQMA in due course.

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