

Mid Suffolk District Council

Environmental Control Section

Upgrading and Screening Assessment of Air Quality in Mid Suffolk

May 2007

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Executive Summary

1. This document represents the 2007 Upgrading and Screening Assessment of air quality in the Mid Suffolk district. This is to fulfil a requirement of Part IV of the Environment Act, and Regulations made thereunder.
2. The report follows on from previous assessments/progress reports, (most recently in May 2005), and is the latest document in terms of evaluation of air quality in comparison to objectives introduced by the Air Quality Regulations (2000) and amendment regulations (2002).
3. This report, as described, is a “Screening Assessment”. The purpose is to evaluate whether any of the seven pollutants specified in the regulations are likely to be present at levels, which exceed the air quality objectives, and, therefore, whether more extensive investigation is required into the stipulated pollutants i.e. a detailed assessment rather than a screening assessment.
4. The findings of the assessment are that for the majority of the pollutants there is no likelihood of further investigation being required. This is the case for benzene, 1,3-butadiene, lead, carbon monoxide and sulphur dioxide.
5. It is recommended that data continues to be collated in respect of nitrogen dioxide to assist in future assessments, although it is not considered necessary to undertake a detailed assessment for nitrogen dioxide.
6. Following monitoring, undertaken from December 2004 – March 2005, it is considered that there is no likely breach of the air quality objective for particulate matter (PM₁₀) and that no further detailed assessment is required for this pollutant.

1.Introduction

- 1.1 Part IV of the Environment Act (1995) (1) places a duty on Local Authorities to review and assess the air quality in their area.
- 1.2 Regulations (2,3) made under the Act detail the pollutants of concern, and the objectives, which must be met.
- 1.3 Seven key pollutants have been identified - nitrogen dioxide, sulphur dioxide, particulate matter, lead, carbon monoxide, benzene and 1,3-butadiene. Air quality objectives have been set for these compounds.
- 1.4 Previous assessments, most recently the updating and screening assessment in 2003, and progress reports in 2004 and 2005 have concluded that the air quality objectives will be met within Mid Suffolk.
- 1.5 However, assessment of air quality is an ongoing requirement, taking into consideration any changes in those factors that could impact upon air quality. These are principally transport, industrial and commercial sources.
- 1.6 The latest phase in the approach to assessing air quality standards is detailed in guidance issued by The Department for Environment, Food and Rural Affairs (4,5). The purpose of the Upgrading and Screening Assessment is to determine the likelihood of any air quality objectives being exceeded and to determine whether detailed assessment is required for any of the pollutants.
- 1.7 Where a Local Authority undertakes a detailed assessment and identifies an exceedence of an air quality objective, then the extent of the area must be identified, and declared as an Air Quality Management Area (AQMA). The Authority must then introduce an air quality action plan, detailing those measures it intends to take in pursuance of the air quality objective.
- 1.8 This report is solely the Upgrading and Screening Assessment, and is concerned with identifying any areas of concern which may require detailed assessment, and monitoring, in order to determine whether the air quality objectives are being met.
- 1.9 The pollutants of most concern in Mid Suffolk are likely to be nitrogen dioxide and particulate matter. These have been the subject of previous monitoring exercises, and to date, there has been no indication that the air quality objectives have been, or are likely to be, exceeded.

2. Air Quality Objectives

<u>Pollutant</u>	<u>Air Quality Objective</u>	<u>Measured As</u>	<u>Compliance Date</u>
Benzene	16.25 µg/m ³	Running Annual Mean	31.12.2003
	5.0 µg/m ³	Annual Mean	31.12.2010
1,3-butadiene	2.25 µg/m ³	Running Annual Mean	31.12.2003
Carbon Monoxide	10.0 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 per year	1-hour mean	31.12.2005
	40 µg/m ³	Annual Mean	31.12.2005
Particulates (PM₁₀)	50µg/m ³ not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40µg/m ³	Annual mean	31.12.2004
Sulphur Dioxide	350µg/m ³ not to be exceeded more than 24 times per year	1-hour mean	31.12.2004
	125µg/m ³ not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266µg/m ³ not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

3. Methodology

- 3.1** Detailed guidance on the undertaking of the Upgrading and Screening Assessment is provided by DEFRA (5). Local Authorities are expected to make reference to this guidance when undertaking reviews. The guidance issued for the 2003 assessment remains in force with some minor additions to the matters that must be considered. New “Updating and Screening Checklists” have been produced, and these form the basis of the assessment.
- 3.2** The guidance recommends a logical approach to assessment, identifying potential sources of the individual pollutants, and making reference to data available on background concentrations, measured emissions from industrial sources, and emissions from traffic (based on traffic flow data) to determine locations where air quality objectives may be exceeded.
- 3.3** Where reference is made to industrial processes, the potential impact of premises close to the border of (but not within) Mid Suffolk has also been considered. This was as part of a countywide working group comprising representatives from all Suffolk Local Authorities. It appears unlikely that any industrial processes outside of the Mid Suffolk boundary are likely to impinge upon air quality within the district.
- 3.4** Where traffic data is required, average annual daily traffic flows (AADT’s) have been provided by Suffolk County Council. Obviously, data will not be available for all roads, but those with the greatest flow of traffic have been included in the counts.
- 3.5** The need to proceed to a detailed assessment can then be based on these findings, and also (where the main source of the pollutant is from road vehicle emissions) by using the “Design Manual for Roads and Bridges” software (6) (developed by the Highways Agency) to predict likely pollutant levels.
- 3.6** The approach has been to take each pollutant in turn, and to assess whether circumstances have changed such that there is a need to proceed to a more detailed assessment, or whether the screening assessment is sufficient to determine that no further action is necessary.

4. Assessment of Benzene

Previous Assessments

4.1 Stage 1 Review and Assessment, March 1999 – Guidance issued at the time of the review recommended that “..*only those Authorities with major industrial processes which either handle, store, or emit benzene, which have the potential, in conjunction with other sources to result in elevated levels of benzene in relevant locations, are expected to need to undertake a second or third stage review*”.

ICI Paints Division was considered as a potential source, but was considered to be a trivial emitter. The risk of the AQ objective being exceeded was considered negligible.

4.2 Stage 2 Review and Assessment, March 2000 – no review was undertaken, as benzene had not been identified in the Stage 1 review as likely to exceed the Air Quality Objective.

4.3 Stage 3 Review and Assessment, December 2001 – repeated the comments of the first stage review.

4.4 The previous updating and screening assessment (April 2003) concluded that there was no likely exceedence of the air quality objective for benzene. There have been no developments within the district to suggest that this situation has altered.

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4.5 The current objective for benzene is a running annual mean concentration of 16.25 $\mu\text{g}/\text{m}^3$. There is a further objective, introduced by the amendment to the Regulations, that an annual mean concentration of 5 $\mu\text{g}/\text{m}^3$ should be achieved by the end of 2010.

4.6 The main sources of benzene are petrol-engined vehicles, petrol refining, and the distribution and uncontrolled emissions from petrol station forecourts without vapour recovery systems.

4.7 The advice of the updated checklist is that the following matters should be considered when determining if it is appropriate to consider a detailed assessment for benzene -

- (a) Monitoring data
- (b) Very busy roads or junctions in built up areas
- (c) New industrial sources
- (d) Industrial sources with substantially increased emissions
- (e) Petrol stations

- 4.8** In respect of **monitoring data**, no monitoring for benzene has been undertaken in Mid Suffolk, it has not previously been identified as a pollutant, which warrants a detailed assessment.

Details of average annual background concentrations of pollutants can be obtained from a DEFRA website (7). Reference to this web site revealed that the highest projected annual background value for benzene in Mid Suffolk in 2003 was $0.393 \mu\text{g}/\text{m}^3$ compared to an air quality objective of $16.25 \mu\text{g}/\text{m}^3$. In terms of projected average annual background concentrations for 2010, the highest projected value for Mid Suffolk is $0.311 \mu\text{g}/\text{m}^3$ compared to an air quality objective of $5 \mu\text{g}/\text{m}^3$.

Given the extremely low background values there is no need to undertake more detailed monitoring.

- 4.9** In respect of **very busy roads or junctions**, the guidance recommends that this only need be considered where there are average daily traffic flows in excess of 80,000 vehicles per day for single carriageway roads, and 120,000 vehicles per day for dual carriageway roads. There are no roads within Mid Suffolk, which are remotely close to this criteria (the A14 is the major traffic route through Mid Suffolk and even here flows rarely exceed a daily average of 44,000). Thus this potential source of benzene need not be considered.

- 4.10** In respect of **industrial sources**, the only site likely to emit benzene within Mid Suffolk is PPG Industries (previously ICI Paints). Previous assessments, and advice obtained from the air quality “helpdesk” has indicated that this potential source need not be explored further. However, a meeting was held with a company representative to evaluate current data obtained from emission modelling. A requirement of permits issued by the Environment Agency, in relation to the PPG resins manufacturing facility is that emissions must be modelled using the Agency’s H1 emission spreadsheet. Benzene is one of a suite of pollutants that has to be evaluated, because one of their raw materials (t-butyl benzoate) may break down during the reaction process, emitting benzene. The modelling results conclude that, under worst-case conditions, the maximum concentration of benzene at the site boundary would be $0.035 \mu\text{g}/\text{m}^3$. This is an insignificant amount in terms of the air quality objective of $5 \mu\text{g}/\text{m}^3$ and need not be explored further.

In respect of other industrial processes, there are none within the district that are likely to emit benzene in significant quantities, and no known processes that have developed since the previous review.

- 4.11** In respect of **petrol stations**, consideration should be given to emissions from those stations with an annual throughput greater than 2 million litres, with a busy road (i.e. more than 30,000 vehicles per day) nearby, and a relevant exposure site within 10m of the pumps.

Exact throughput of the larger stations in the district is not known, but there are 8 “authorised” stations, which are known to have a throughput greater than one million litres per annum, so these were all considered.

They are -

- (a) Tesco Filling Station, Stowmarket
- (b) Beacon Hill Service Station, Coddenham
- (c) Haughley Park Service Station, A14 Westbound, Stowmarket
- (d) Norton Service Station
- (e) Stowmarket Service Station, Combs Ford
- (f) Tothill Services Ltd, A14 Eastbound, Stowmarket
- (g) Stowupland Service Station, Thorney Green
- (h) Brockford Garage, Wetheringsett-cum-Brockford

Traffic flow data obtained from Suffolk County Council indicates that the only road through Mid Suffolk where number of vehicles exceeds 30,000 is the A14 carriageway.

The only sources of concern therefore are Tothill Services and Haughley Park Service Station, as they are adjacent to the A14, but there is no relevant exposure site within 10m of the pumps at either of these stations.

Therefore, this potential source of benzene is of no significance.

Conclusion

4.12 There is no need to proceed to a detailed assessment of the air quality objective for benzene within Mid Suffolk.

5. Assessment of 1,3- butadiene

Previous Assessments

5.1 Stage 1 Review and Assessment, March 1999 – Guidance recommended that “..only those Authorities with major industrial processes which either handle, store or emit 1,3-butadiene and which have the potential in conjunction with other sources to result in elevated levels in relevant locations are expected to need to undertake a second or third stage review”.

ICI Paints Division was identified as a possible source, but was considered to be a trivial emitter, and the conclusion of the review was that the air quality objective would be met without intervention.

5.2 Stage 2 Review and Assessment, March 2000 – no review was undertaken, as the Stage 1 review had not identified any likely exceedence of the Air Quality Objective.

5.3 Stage 3 Review and Assessment, December 2001 – any further review was considered unnecessary.

5.4 Updating and Screening Assessment 2003 – not necessary to proceed to a detailed review.

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5.5 The current objective for 1,3-butadiene remains unchanged, a maximum running annual mean concentration of 2.25 $\mu\text{g}/\text{m}^3$.

5.6 The guidance recommends that the screening and updating assessment should include an assessment of -

- (a) Monitoring Data
- (b) New Industrial Sources
- (c) Industrial Sources with Substantially Increased Emissions

5.7 With regard to **monitoring data**, no data has been collated for Mid Suffolk. Reference to the website (7) indicated that the highest estimated annual mean background concentration of 1,3-butadiene at any location within Mid Suffolk for 2003 was 0.151 $\mu\text{g}/\text{m}^3$. Using the year adjustment factors on this database, the highest projected annual mean background concentration of 1,3-butadiene at any location in Mid Suffolk for 2006 is 0.10 $\mu\text{g}/\text{m}^3$. Therefore, background concentrations are well below the objective limit of 2.25 $\mu\text{g}/\text{m}^3$.

5.8 With regard to **new industrial sources**, reference must be made to Annex 2, Appendix E of the guidance. This indicates that the only, likely significant source of 1,3-butadiene is likely to be the petrochemical industry. No such processes have developed within Mid Suffolk since the previous air quality review.

5.9 There are also no processes operating within the district which have previously been identified as likely emitters of 1,3-butadiene. Therefore, in terms of **industrial sources with substantially increased emissions**, there is nothing to consider.

Conclusion

5.10 Given the low background levels and the fact that there are no known sources of concern within the district in respect of 1,3-butadiene emissions, it is not considered necessary to proceed to a detailed assessment of 1,3-butadiene.

6. Assessment of Lead

Previous Assessments

- 6.1** Stage 1 Review and Assessment, 1 March 1999 – The review concluded that, “*Given the existing low levels of lead, it is the conclusion of Mid Suffolk District Council that there is no need to consider the possibility of an air quality management area for lead*”.
- 6.2** Stage 2 Review and Assessment, March 2000 – no further review was undertaken, as lead had not been identified in the Stage 1 review as likely to exceed the air quality objective.
- 6.3** Stage 3 Review and Assessment, December 2001 – No further assessment was considered necessary.
- 6.4** Updating and Screening Assessment, May 2003 – not considered necessary to proceed to a detailed assessment.

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- 6.5** There are two relevant standards to consider for lead, an annual mean concentration of $0.5 \mu\text{g}/\text{m}^3$ which had to be achieved by the end of 2004, and an annual mean concentration of $0.25\mu\text{g}/\text{m}^3$ to be achieved by the end of 2008.
- 6.6** The screening and updating checklist recommends that consideration be given to -
- (a) Monitoring data
 - (b) New industrial sources
 - (c) Industrial Sources with substantially increased emissions
- 6.7** No monitoring data is available other than from the national network of monitoring sites. These sites cannot be correlated to Mid Suffolk, as they are indicative of industrial and urban areas. Therefore no meaningful data is available in respect of background levels.
- 6.8** No new industrial sources have been developed which have the potential to emit significant quantities of lead.
- 6.9** The only process previously identified, as a potential source of lead emissions within Mid Suffolk was the aluminium reclamation furnace operated by F. A. Edwards & Sons at Denham, Eye.
This was a small smelting operation, and not “*..a major industrial process emitting significant quantities of lead*” as identified in the guidance.

However, since the 2003 assessment, the permit for this operation has been revoked and the furnace is no longer in operation, thus there are now no identified sources of lead emissions in the district.

6.10 The Environment Agency were consulted by the Suffolk Air Quality Group in January 2006, and advised that none of the processes which they oversee have increased lead emissions over the previous three years.

Conclusion

6.11 In the light of the above information, it is not considered necessary to proceed to a detailed assessment for lead.

7. Assessment of Carbon Monoxide

Previous Assessments

7.1 The Stage 1 Review and Assessment, March 1999 – indicated that there were several potential sources of carbon monoxide emissions adjacent to the Mid Suffolk district, but only two within the area. Based on data collected it was concluded that these industrial processes did not emit sufficient quantities of carbon monoxide to cause the air quality objectives to be exceeded.

7.2 The Stage 2 Review and Assessment, March 2000- undertaken because of the predicted increases in traffic levels on the A14. The impact of the major industrial sources of carbon monoxide was considered. These were:

- British Gas PLC, Diss Compressor Station, Eye Airfield
- Climax Molybdenum UK Ltd, Needham Road, Stowmarket

These were re-examined using the Environment Agency guidance method as referred to in Chapter 2 of LAQM TG4(00) (8). It was concluded that the emissions from these sources did not significantly affect air quality within the region – either on their own or with background included (predicted to be less than 0.1 ppm in 2003).

The A14 effect was examined using the DMRB screening model. Kerbside location results were well below the air quality standards.

As the objectives for carbon monoxide were being met it was concluded that no further assessment of this pollutant was necessary.

7.3 Stage 3 Review, December 2001 – no further review was undertaken.

7.4 Upgrading and Screening Assessment 2003 concluded that there was no significant risk of exceedence of the air quality objective.

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7.5 The air quality objective for carbon monoxide is unchanged, at 10 mg/m³ (expressed as a maximum daily running 8-hour mean concentration).

7.6 The main source of carbon monoxide is road transport, accounting for 67% of total release in 2000.

7.7 As part of the screening assessment, the updated checklist recommends that consideration should be given to -

- (a) Monitoring Data
- (b) Road Traffic

7.8 In respect of **monitoring data**, no monitoring for carbon monoxide has been

undertaken in Mid Suffolk. It has not previously been identified as a pollutant that warrants a detailed assessment.

Reference to the web site of projected background values (7) indicates that the highest projected annual background value for carbon monoxide in Mid-Suffolk in 2001 was 0.299 mg/m³. Using the year adjustment factors to project this forward as far as 2005 gives a value of 0.21 mg/m³. Thus, background levels are extremely low in comparison to the air quality objective of 10mg/m³.

7.9 In respect of **road traffic**, the guidance recommends that this only need be considered where there are average daily traffic flows in excess of 80,000 vehicles per day, and background concentrations exceed 1mg/m³.

Figures provided by Suffolk County Council show that on the busiest trunk road in the district (the A14), the highest annual average daily traffic (AADT) in 2005 in Mid Suffolk was 40,146 comprising 19% heavy goods vehicles. Furthermore, at no location in the district does the background concentration of carbon monoxide exceed 1mg/m³. Thus there are no locations within Mid Suffolk at which the potential for exceedence of the carbon monoxide objective need be considered.

Conclusion

7.10 The low background concentrations of carbon monoxide, and the current traffic flows are such that there is no need to conduct a more detailed assessment of carbon monoxide levels in Mid Suffolk

8. Assessment of Sulphur Dioxide

Previous Assessments

- 8.1** Stage 1 Review and Assessment March 1999 – Due to the presence of a number of processes, which had the potential to emit significant quantities of SO₂ (Climax Molybdenum, Fibropower, Blue Circle Cement, and two sugar manufacturing plants outside the district). It was considered necessary to “..conduct a second stage review and assessment for SO₂ for potential exposure to individuals in relevant locations arising from major point sources”.
- 8.2** Stage 2 Review and Assessment March 2000 – It was concluded that “*The national strategy targets for sulphur dioxide will be achieved by 2004/2005...A third stage review is not required for sulphur dioxide*”.
- 8.3** Stage 3 Review December 2001 – As identified in the stage 2 review, no further action was necessary.
- 8.4** Updating and Screening Assessment May 2003 - It was concluded that there was no risk of exceedence of the Air Quality objective for sulphur dioxide.

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- 8.4** There are three different objectives to be met in respect of sulphur dioxide, all of which relate to exposure over short periods of time. These objectives are unchanged from previous assessments.
- 8.5** In carrying out the updating and screening assessment, the guidance advises as to those sources, which should be considered in terms of possible exceedences of the objectives.

These are as follows:

- (a) Monitoring Data
 - (b) New Industrial Sources
 - (c) Industrial sources with Substantially Increased Emissions
 - (d) Areas of Domestic Coal Burning
 - (e) Small Boilers (>5MW) Burning Fuel Oil or Coal
 - (f) Shipping
 - (g) Railway Locomotives
- 8.7** In respect of **monitoring data**, no monitoring has been undertaken by Mid Suffolk District Council since the last review. Reference to the website (7) shows that data is available for background sulphur dioxide concentrations in 2001, expressed as an annual mean in µg/m³. The highest recorded value is 6.77 µg/m³. This data is of limited value as the relevant air quality objectives are expressed over one hour, 24 hours and 15 minutes. However, as the 15 minute, 1 hour and 24 hour objectives are 266, 350 and 125

$\mu\text{g}/\text{m}^3$ respectively, it does confirm that there is no location within Mid-Suffolk where background concentrations of sulphur dioxide are significant.

8.8 In respect of **new industrial sources**, no processes which could emit significant quantities of sulphur dioxide have commenced operations within Mid-Suffolk since the previous air quality review.

8.9 In respect of **existing industrial processes**, there is only one process where sulphur dioxide emissions may be of concern. This is the power station at Fibropower, Eye Airfield.

As advised (in 6.10), the Environment Agency were consulted on the subject of processes for which they are the regulatory authority, one of which is Fibropower. Their advice was that, as a result of improvements at the works, which were required to comply with the Waste Incineration Directive, their emissions of sulphur dioxide, nitrogen dioxide and particulate matter have reduced. It can therefore be concluded that there is no increase in sulphur dioxide emissions from this source.

8.10 In respect of **domestic coal burning**, the situation is unchanged to that reported on in the last USA. Mid Suffolk is not an area where significant quantities of coal are burnt. There are only two settlements of over 4000 persons, and the district is largely rural and sparsely populated.

Guidance recommends that consideration only need be given to those areas where there are more than 100 houses burning solid fuel in an area of 500m x 500m. In 2003, we surveyed all coal merchants in the district to try to build up a picture of coal usage, but a poor response was received.

Therefore, the Suffolk Air Quality Group (a working group comprising Officers from all Local Authorities within the County) approached the South Wales and Southern England Regional Co-ordinator of the Coal Merchants Federation to discuss coal usage. His response was that from the returns of regional coal merchants, he was able to conclude that the overall burn of domestic solid fuel in Suffolk had reduced since 2003.

The current condition of Mid-Suffolk's housing stock confirms the move towards less solid fuel usage. In a stock of approximately 3,500 properties, only 12 properties still use solid fuel as a means of central heating. The burning of solid fuel has reduced considerably. Approximately 1200 of the converted properties still have an open fire as an alternative to electric central heating, but coal usage is low.

It is considered extremely unlikely that there are any areas in Mid Suffolk where the domestic burning of coal will give rise to an exceedance of the air quality objective for sulphur dioxide.

8.11 There are no known small **oil or coal fired boilers** (>5 MW), which have developed since the 2003 assessment.

8.12 Emissions from **coal-fired and diesel-fired locomotives** are not considered significant. The guidance suggests that this should be considered where diesel or steam locomotives are **regularly** stationary for 15 minutes or more, and where members of the public are **regularly** exposed to emissions.

Diesel trains operate through Mid-Suffolk on the Ipswich-Cambridge line, and will stop at stations in Needham Market, Stowmarket, Elmswell and Thurston. However, at none of these stations do the trains idle for 15 minutes or more, and for the most part they will only be stationary for the time it takes passengers to board. Therefore there is no likelihood of regular exposure.

The only known location where steam trains operate within Mid Suffolk is the Mid Suffolk Light Railway at Wetheringsett-cum-Brockford. Reference to the planning conditions relating to this premises shows that they only operate diesel trains on a maximum of 20 “special event” days per year. Thus there will be no “regular exposure to persons within 15metres of the locomotive”. The closest residential properties are considerably further than 15 metres from the locomotives. Over the course of a year, the emissions from this source are considered to be insignificant.

8.13 Emissions from **shipping** need not be considered, as this is not an issue in a land-locked district.

Conclusion

8.14 Consideration of all the appropriate sources indicates that there is no location in Mid Suffolk at which the air quality objective for sulphur dioxide is likely to be exceeded. Thus there is no need to proceed to a detailed assessment for sulphur dioxide.

9. Assessment of Nitrogen Dioxide

Previous Assessments

- 9.1** Stage 1 Review and Assessment March 1999 – it was considered necessary to proceed to a second stage assessment due to “...*potential exposure to individuals in relevant locations arising from both point sources and the A14 trunk road...*” .
- 9.2** Stage 2 Review and Assessment March 2000 – it was concluded that “..*there is a significant risk that the air quality objective will be exceeded at locations along sections of the A14 from road traffic emissions..*” Therefore it was considered necessary to conduct a third stage review.
- 9.3** Stage 3 Review and Assessment December 2001 – following continuous monitoring for a period of 3 months, in a location where it was considered most likely that the air quality objective may be exceeded, it was concluded that “..*air quality objectives for nitrogen dioxide will be met at all of the key locations identified in the Stage 2 assessment*”.
- 9.4** Updating and Screening Assessment 2003 – no indication that air quality objectives would be breached in Mid Suffolk.

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- 9.5** The air quality objectives for nitrogen dioxide remain unchanged, the annual mean concentration shall not exceed $40\mu\text{g}/\text{m}^3$ and a one-hour mean concentration of $200\mu\text{g}/\text{m}^3$ shall not be exceeded more than 18 times per year. These objectives should be achieved by the end of 2005.
- 9.6** The principal source of nitrogen oxides (which are readily converted to nitrogen dioxide) is road transport, which in 2000 accounted for 49% of total UK emissions. Other main sources are the electricity supply industry and other industrial sectors.
- 9.7** Therefore, emissions from transport are of prime importance in assessing the objective for nitrogen dioxide. Guidance recommends that the following sources should be considered:
- (a) Monitoring data
 - (b) Narrow congested streets with residential properties close to the kerb
 - (c) Junctions
 - (d) Busy streets where people may spend one hour or more close to traffic
 - (e) Roads with high flow of buses and/or HGV's
 - (f) New roads constructed or proposed since first round of review and assessment
 - (g) Roads with significantly changed traffic flows
 - (h) Bus Stations
 - (i) New Industrial Sources
 - (j) Industrial Sources with Substantially Increased Emissions
 - (k) Aircraft

9.8 Monitoring Data – the monitoring data that is available consists of the background concentration figures, the results of continuous sampling undertaken during the 3rd Stage review, and an ongoing programme of “passive” sampling by diffusion tubes at 5 locations across the district.

The background figures show that the highest estimated concentration of nitrogen dioxide for 2005 was 21.3 (expressed as an annual mean value). The air quality objective is 40µg/m³, so there is a significant background component to consider, as well as the impact of traffic.

In respect of monitoring data, Mid Suffolk Council has, for several years monitored nitrogen dioxide by use of passive diffusion tubes at five locations across the district. Initially, this was at a combination of roadside, intermediate, and background locations. The focus of monitoring shifted in 2004 when it was apparent that there was little point in monitoring the intermediate and background locations, thus during 2004, 2005 and 2006, monitoring was undertaken (mainly) at those residential locations closest to the A14 carriageway, where the greatest flows of traffic are experienced.

The results were as follows –

Annual Mean Concentrations of Nitrogen Dioxide

<u>YEAR</u>	Lower Crescent, Barham	High Street, Needham Market	Station Road, Claydon	Foresters Walk, Claydon	Old Stowupland Road, Stowmarket
2004	28.5	22.2	33.1	33	27.3
2005	33.3	33.7	32.5	34.9	33.3
2006	36	30.3	33	31	29.6

The results show that at none of the measured locations are the nitrogen dioxide levels likely to exceed the objective limit – **an annual mean of 40µg/m³**.

Whilst the provision and analysis of these diffusion tubes is undertaken by a NAMAS accredited supplier (Bureau Veritas Laboratories), the data is somewhat limited as passive diffusion tube sampling can be inaccurate. Therefore, the guidance recommends that an adjustment factor should be used based on a co-location study using a continuous chemiluminescence sampler.

The advice of Bureau Veritas was that field trials indicated a bias adjustment factor of 0.96 should be used. Thus the diffusion tube values are slightly high, and the highest value, after bias adjustment, is 34.6 µg/m³, well below the air quality objective limit of 40.

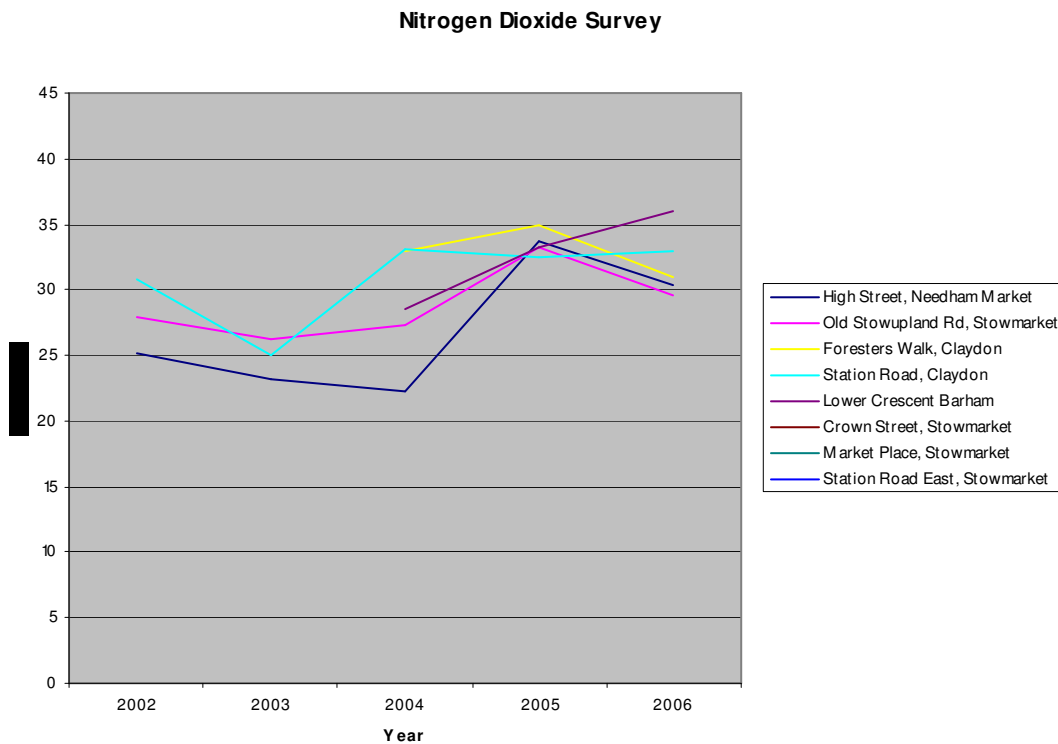
The focus of attention has subsequently shifted to undertaking more monitoring in Stowmarket, at locations where traffic may be stationary or slower-moving (despite the fact that vehicle movements are much lower). Thus, there are now 6

monitoring stations at –

- (a) Old Stowmarket Road, Stowmarket
- (b) Crown Street, Stowmarket
- (c) Market Place, Stowmarket
- (d) Combs Ford, Stowmarket
- (e) Gipping Road, Stowmarket
- (f) High Street, Needham Market

The monitoring programme is ongoing and will be reported on in next year's progress report.

The attached graph shows details of annual nitrogen dioxide results, and demonstrates that none are above the air quality objective of $40 \mu\text{g}/\text{m}^3$.



9.9 Narrow Congested Streets – it is recommended that local authorities specifically look at locations where congestion may create specific problems, and where the following criteria are met:

- (a) Streets are narrow (carriageway less than 10m)
- (b) Residential property is within 5m of the kerb
- (c) Average speed is less than 50kph (31 mph)
- (d) Traffic flow is greater than 10,000 vehicles per day

There is little chance of these conditions being met in Mid Suffolk, and no

locations, which could be considered as “street canyons”.

Station Road West, Stowmarket, is the location, which, most likely, meets these criteria. Using traffic flow for 2005, and assuming exposure at 5m, a 1% heavy duty vehicle content and average traffic speeds down as low as 10 kph, the DMRB model was run for this location. The output value was a predicted annual nitrogen dioxide level of $17.4 \mu\text{g}/\text{m}^3$, this is well below the air quality objective ($40 \mu\text{g}/\text{m}^3$) and indicates that there is no need to consider this issue further.

Data relating to Pains Hill in Stonham Parva, where houses front on to the A140 was also modelled, and this showed a predicted level of $25.7 \mu\text{g}/\text{m}^3$.

9.10 Junctions – the combined effect of traffic flows at junctions may cause “hotspots” of nitrogen dioxide pollution, this is generally a matter to consider where there are more than 10,000 vehicles at a junction and a relevant exposure within 10metres.

As a means of evaluating this issue it was decided to look at those junctions, which are considered to be the busiest in the district, where there may be a relevant exposure, and run the DMRB module to determine whether this was likely to be an issue.

The most likely location in Mid Suffolk is the junction of the A1308 with the B1115 (Station Road West) in Stowmarket, and there is exposure (14, Stowupland Road) within 20m. The traffic flows are known for both roads. The DMRB model was used to predict exposure and the result for nitrogen dioxide was an annual mean value of $23.8 \mu\text{g}/\text{m}^3$, well below the objective value. However, as this is considered to be the busiest junction, in a residential area, within the district, a diffusion tube will be located in the vicinity to monitor levels of NO_2 .

Another junction that was examined was the A140/B1077 junction, one of the busiest junctions on the A140, where there is exposure - The Bull Auberge, Yaxley, - within 10m. The DMRB result was a predicted annual mean value of $21.7 \mu\text{g}/\text{m}^3$.

A third busy junction is the “Stonham Tap” junction at the A140/A1120, where there is exposure, at Maltings House, within 10m. Again, the DMRB result showed that there was no need to pursue this matter further, the estimated annual mean value being $26.1 \mu\text{g}/\text{m}^3$ nitrogen dioxide.

Given that it is predicted that there will be no exceedences at the busiest junctions in the district it is not considered necessary to pursue this matter further.

9.11 Busy Streets – the intention here is to consider exposure of persons over a short period of time where they may be exposed to nitrogen dioxide emissions from vehicle exhausts.

The guidance recommends that consideration should be given to those locations, in “busy streets” where members of the public may regularly spend one hour or

more in an outdoor location other than their normal domestic environment. e.g. streets with many shops, streets with outdoor bars and cafes.

Within Mid Suffolk there are very few locations where such exposure may occur. There is no street café culture and no significant “shopping streets” outside of Stowmarket. The only location that requires consideration is Ipswich Street (The High Street) in Stowmarket.

This location was considered in the 2003 assessment and it was found that average daily traffic values were less than 5,000, and hence not close to the 10,000 at which guidance recommends this matter should be investigated further, thus no further action is required.

9.12 Roads With High Flow of Buses/Heavy Duty Vehicles – this is a factor to consider where the proportion of buses/heavy goods vehicles on a road is greater than 25%. This could include roads such as “bus only streets” and roads leading to industrial estates.

If there is a relevant exposure within 10m, and if the number of heavy-duty vehicles exceeds 2500 then this source may require investigation.

Consideration was given to the following sources -

- (a) Buses in Bury Street, Stowmarket
- (b) Heavy Goods Vehicles delivering to:
 - (i) Needham Road Industrial Estate, Stowmarket
 - (ii) Eye Airfield Industrial Estate
 - (iii) TOMO Industrial Estate, Creting Road Stowmarket
 - (iv) Lion Barn Industrial Estate, Needham Market

With respect to buses in Bury Street, Stowmarket, concern has been expressed that the buses are stationary at the lights adjacent to the Tavern Street/Station Road junction, and that this causes pollution. However, to put this into perspective, observations undertaken in Bury Street indicated that the number of buses/other heavy goods vehicles was not remotely close to 25% and nowhere near the limit of 2,500 buses/HGV’s per day – estimates from our counts suggest no more than 200. Therefore this was not considered to require further investigation.

With regard to the Needham Road Industrial Estate, access will be off the A1120 Cedars Link road, or off the A1308, and there is no relevant exposure within 10m of the roads.

Access to the Eye Airfield estate is generally direct from the A140, and there is no relevant exposure. A DMRB assessment was carried out for the junction of the A140/B1117 Eye Road, (section 9.9) and it was concluded that pollutant levels were well below the air quality objectives.

No figures were available to indicate the percentage of heavy-duty vehicles accessing the Lion Barn Industrial Estate, or the TOMO estate off Creting

Road. Therefore, observations were made during the daytime, which suggested that the number of heavy duty vehicles was less than 1,000 per day, and certainly much lower than the 2,500 at which consideration needs to be given.

Therefore, there is no need to consider this source further. This is as expected, because there are no sites within Mid Suffolk which would be principally used by heavy duty vehicles. All will have a balanced traffic flow.

9.13 New Roads– no new roads of any significance have opened since the 2003 updating and screening assessment. However, there is a proposal to construct the B1115 relief road in Stowmarket. This will run from the A1308 (Gipping Way), crossing over the London-Norwich railway line and Old Stowupland Road, and connecting to the B1115 Stowupland Road. A full environmental appraisal has been undertaken, including an air quality assessment undertaken by Faber Maunsell (9), which concluded that air quality objectives would not be exceeded at any receptor location. The conclusion drawn in the assessment was that 1226 properties in the study area would see an improvement in air quality, 244 properties would see a deterioration in air quality (but no breach of the objectives), and 110 properties would experience no change.

9.14 Roads With Significantly Changed Traffic Flows – Guidance recommends that this issue should be considered where:

- (a) There are more than 10,000 vehicles per day
- (b) There is an increase of 25% or more in traffic flow
- (c) The road had previously been identified “at risk” of exceeding the objective

Figures obtained from Suffolk County Council indicate that there are few roads within the district where average daily traffic flows are in excess of 10,000 vehicles. These are:

- (a) The A14 carriageway at all measured locations
- (b) The A1120 Cedar’s link road between Stowmarket and Stowupland
- (c) The A1308 Stowmarket Inner Relief Road
- (d) The A140 at all measured locations

Annual Average Daily Traffic Flows (7 day) and Year on Year Percentage Change In Flow

<u>Road</u>	<u>2002 AADT</u>	<u>2003 AADT</u>	<u>2004 AADT</u>	<u>2005 AADT</u>	<u>% Increase</u>
A1120 (Cedar’s Link Road)	13053	-	-	13246	1.48

A1308 (Stowmarket Relief Road)	15071	14984	15156	15368	1.97
A140 Mendlesham Airfield	14155	13459	14313	13374	-5.5
A140 Creeting St Mary	15090	14882	14765	14514	-3.8
A140 Thornham Parva	14282	14105	14144	13858	-3.0
A14 Baylham	46566	48963	49228	47899	2.86
A14 Tothill	38845	39838	40428	40146	3.2

Therefore, given that none of the “high volume” roads show a significant increase in traffic numbers, there is no need to consider this issue further.

9.15 Bus Stations – there are no major bus stations within the district. Stowmarket is the largest town, but does not have the benefit of a bus station. There is a small bus depot at Mendlesham – Galloways, but the number of bus movements is not remotely close to the 1000 per day at which guidance recommends this source should be considered. Thus bus stations are not an issue requiring investigation,

9.16 New Industrial Sources – with reference to Annex 2 of Appendix E to the guidance, there are no known new industrial sites with the potential to emit significant quantities of nitrogen dioxide

9.17 Industrial Sources With Increased Emissions – with reference to Appendix E of the guidance, the most significant sources of nitrogen dioxide emissions are combustion processes, the two largest processes in Mid Suffolk are the Transco Gas Compressor Station and the Fibropower power station.

Reference to the public registers indicated that at Transco Compressor Station, Eye Airfield the annual emission of nitrogen dioxide for 2005 (20.13 tonnes) was less than those considered in the previous updating and screening assessment - 2002 (29.7 tonnes) and 2001 (47.8 tonnes). Thus there is a decrease rather than an increase in emissions.

With regard to Fibropower there was a general, year-on-year reduction in nitrogen dioxide emissions at the time of the previous updating and screening assessment. It has subsequently been confirmed by staff at The Environment Agency, that following the introduction of new abatement plant (as required by the Waste Incineration Directive) emissions of nitrogen dioxide have been further reduced.

Thus there is no need to consider these matters further.

9.18 Aircraft –guidance advises that nitrogen dioxide emissions from aircraft will have a negligible impact once they are above about 200m or beyond 1000m from the airport boundary, and that only large airports with a predicted total passenger or equivalent freight throughput of more than 5 million per annum have the potential to cause an exceedence of the Air Quality Objectives. Guidance recommends that aircraft emissions at airports only need be considered if they were not assessed during the 2003 Updating & Screening Assessment, or if there is new relevant exposure.

The Wattisham military airbase was discounted as a significant source in the 2003 Updating & Screening Assessment because the number of flights (approximately 40,000 flights per annum) falls well below the thresholds in the screening criteria for commercial airports (specified above). There is no new relevant exposure significantly nearer the airbase and thus no further assessment is necessary at this time.

Conclusion

9.19 The screening of all potential sources, and reference to monitoring data shows that there are no locations within Mid Suffolk at which a detailed assessment of nitrogen dioxide is required. The authority will continue to monitor nitrogen dioxide by way of passive diffusion tubes at locations where it is felt levels are likely to be at their highest, and for the remainder of this year this will concentrate on locations in Stowmarket.

10. Assessment of Particulate Matter (PM₁₀)

Previous Assessments

- 10.1** Stage 1 Review and Assessment March 1999 – it was concluded that due to the traffic flow on the A14, and the potential for particulate emissions from industrial and commercial processes, it was necessary to proceed to a second stage review.
- 10.2** Stage 2 Review and Assessment March 2000 – it was concluded that the air quality objective for particulate matter may be exceeded at locations along (adjacent to) the A14 carriageway, and that it was necessary to proceed to a third stage review.
- 10.3** Stage 3 Review and Assessment December 2001 – following continuous monitoring it was concluded that both the annual average and the 24hr objective would be met at all points along the A14.
- 10.4** Updating and Screening Assessment 2003 – considered that the air quality objective would be met, but recommended some continuous monitoring in vicinity of A14 by way of confirmation.

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- 10.5** The definition of PM₁₀ is “...*particulate matter which passes through a size-selective inlet with a 50% efficiency cut off at 10µm aerodynamic diameter*” Thus, in effect, it includes solid particles across a range of sizes, but generally less than 10µm in diameter.
- 10.6** Particles may be generated from combustion sources, such as road vehicles, power generation, industrial combustion etc. These particles are generally less than 2.5µm.
- 10.7** Particles generated from other sources, such as quarrying, construction and wind blown dusts and soils, are generally of larger particle size, but below 10µm.
- 10.8** The air quality objectives for PM₁₀ are that the annual mean concentration should not exceed 40µg/m³ and that a 24-hour mean of 50µg/m³ should be exceeded on more than 35 days per year.
- 10.9** Guidance on the upgrading and screening assessment recommends that consideration should be given to the following potential sources of particulate matter -
- (a) Monitoring data
 - (b) Junctions
 - (c) Roads with a high flow of buses and/or HGV's
 - (d) New roads constructed or proposed since the first round of review and assessment
 - (e) Roads close to the objective during the first round of review and assessment

- (f) Roads with significantly changed traffic flows
- (g) New industrial sources
- (h) Industrial sources with substantially increased emissions
- (i) Areas of domestic solid fuel burning
- (j) Quarries, landfill sites, open cast coal, handling of dusty cargo at ports
- (k) Aircraft

10.10 Monitoring data – the 2003 updating and screening assessment suggested that some monitoring of PM₁₀ should be undertaken where residential property is close to the high levels of traffic on the A14 carriageway.

Monitoring was subsequently undertaken between December 2004 and March 2005, at a location in Cooper's Way, Barham. Following this, the annual mean value was extrapolated from the data obtained, and indicated a value for PM₁₀ of **21.4µg/m³**, well below the air quality objective of 40.

Thus the PM₁₀ value is not exceeded at a location where traffic levels are high and residential property is close to the A14.

10.11 Junctions – as discussed in the nitrogen dioxide assessment (9.10) the approach taken was to identify those junctions where an exceedence of the air quality objective was most likely to occur and to run the DMRB model to determine whether a detailed assessment was required.

The junctions identified, and the modelling results were as follows –

- (a) A1308/B1113 Central Stowmarket – annual mean of 28.5 µg/m³,
- (b) A140/A1120 Stonham Tap – annual mean of 26.7 µg/m³,
- (c) A140/B1077 Eye/Yaxley – annual mean of 25.0 µg/m³,

Thus, all values were well below the objective target of 40 µg/m³.

There is a second objective, that a 24-h mean value of 50 µg/m³ must not be exceeded on more than 35 occasions per year.

The modelling results predicted that the number of exceedences would be 22, 16 and 12 respectively, thus all are well within objective limits.

Given that there are no predicted exceedences at the busier junctions in the district it is not considered necessary to explore this matter further.

10.12 Roads With a High Flow of Heavy Duty Vehicles – this is a factor to consider where the proportion of buses/heavy goods vehicles on a road is greater than 20%, this could include roads such as “bus only streets” and roads leading to quarries/freight terminals.

This matter was explored in 9.12, and there are no relevant sites within Mid Suffolk.

10.13 New Roads – no new roads of any significance have opened since the previous updating and screening assessment. However, there is a proposal to construct the B1115 relief road in Stowmarket. This will run from the A1308 (Gipping

Way), crossing over the London-Norwich railway line and Old Stowupland Road, and connecting to the B1115 Stowupland Road. The conclusion of the report was that there would be a net improvement in air quality. (See Nitrogen Dioxide Assessment, section 9.13)

10.14 Roads Close to The Objective - The 2003 screening assessment identified the A14 carriageway through the centre of Mid-Suffolk as a potential cause of high particulate matter emissions. Therefore, the Council instructed Enstec Services Ltd. to undertake monitoring of particulate matter between December 2004 and March 2005. The monitoring location was Cooper's Way, Barham – a location where vehicle emissions from the A14 carriageway are likely to result in the highest PM₁₀ levels across the district.

Extracts from the Enstec report can be seen in Appendix 1.

The equipment used was a Rupprecht and Patashnick TEOM (Tapered Element Oscillating Microbalance) with a PM₁₀ size selective head. A meteorological mast was fitted above the instrument enclosure to record wind speed and direction.

Comparison was made between the measured data and the ADMS-Roads modelling programme. To this end, traffic data was obtained from Suffolk County Council and meteorological data was supplied by RAF Wattisham. From this analysis, it was determined that the annual mean value for PM₁₀ was **21.4µg/m³**, well below the air quality objective of 40.

The other objective for PM₁₀ is that the number of days on which the 24hour average exceeds 50 µg/m³ should be no more than 35. The modelled data suggests that there will be no more than **5** exceedences of this value.

Therefore, it can be concluded that the air quality objective for PM₁₀ will be met at a location which is considered to be indicative of the highest levels likely to be experienced.

10.15 Roads With Significantly Changed Traffic Flows – Guidance recommends that this issue should be considered where –

- (a) There are more than 10,000 vehicles per day
- (b) There is an increase of 25% or more in traffic flow, and
- (c) The road had previously been identified “at risk” of exceeding the objective.

These issues were considered under the nitrogen dioxide assessment – see 9.14, it was concluded that there are no roads where daily traffic flow exceeds 10,000 vehicles per day where there is an appreciable increase in volume since the last assessment, the highest increase was 3.2%. Thus there is no need to consider this matter further.

10.16 New Industrial Sources – no new industrial processes with the potential to emit significant quantities of particulate matter have commenced operation

since the 2003 Updating and Screening Assessment

10.17 Industrial Sources With Increased Emissions – previous assessments (Stage 2 and Stage 3) have considered the Fibropower Power Station, Eye, as a potential source of significant PM₁₀ emissions, but concluded that the air quality objective would not be exceeded.

As previously stated, consultation with the Environment Agency has suggested that particulate matter emissions from this source will have reduced as a result of the installation of improved abatement plant.

Thus there is no need to consider this source further, and there are no known increases in emissions from other sources.

10.18 Areas of Domestic Solid Fuel Burning – the burning of solid fuel in the Mid Suffolk district is not considered to be significant source of particulate matter. (sulphur dioxide assessment, section 8.10).

10.19 Quarries, Landfill Sites – fugitive emissions from quarries can cause high emissions of particulate matter. But whilst there are several quarries within Mid Suffolk, the Environmental Health Department has received few complaints regarding dust nuisance. The absence of complaints cannot, in itself, be used as a definitive means of stating that the objective will not be exceeded, but it is a useful measure for evaluating a potential problem. Some of the more significant quarries such as Broomfield Pit at Barham, and Shrublands Quarry, Coddendam have never been the source of complaint. Due to the distance to residential property, there are no relevant receptors.

The two most significant sites are the Needham Chalks Quarry, Needham Market, and the Viridor Landfill site, Great Blakenham. Both of these premises are regulated under the Pollution Prevention and Control Act, and thus have conditions contained within legal permits which require operations to be undertaken in a manner which contains emissions to atmosphere.

Since the 2003 assessment there have been no complaints regarding dust emissions from the Viridor landfill site, and only one complaint regarding Needham Chalks.

With regard to Needham Chalks, emissions from “point” sources are satisfactory. The closest properties are shielded by the quarry wall and should not be subjected to wind blown fugitive emissions.

It is not considered necessary to undertake further evaluation of this source.

10.20 Aircraft –guidance advises that particulate matter emissions from aircraft will have a negligible impact once they are above about 200m or beyond 1000m from the airport boundary, and that only large airports with a predicted total passenger or equivalent freight throughput of more than 5 million per annum have the potential to cause an exceedence of the Air Quality Objective. Guidance recommends that aircraft emissions at airports only need be considered if they were not assessed during the 2003 Updating &Screening Assessment, or if there is new relevant exposure.

The Wattisham military airbase was discounted as a significant source in the

2003 Updating & Screening Assessment because the number of flights (approximately 40,000 flights per annum) falls well below the thresholds in the screening criteria for commercial airports (specified above). There is no new relevant exposure significantly nearer the airbase and thus no further assessment is necessary at this time.

Conclusion

10.21 The 2003 assessment recommended that PM₁₀ monitoring be undertaken along the A14 carriageway. This has subsequently been undertaken, and it was concluded that the air quality objective would be met.

There is no need to proceed to a detailed assessment of particulate matter concentrations.

11. Conclusions and Recommendations

- 11.1** The latest review confirms that there is no likelihood of the air quality objectives being exceeded, in Mid Suffolk, for benzene, 1,3-butadiene, carbon monoxide, lead and sulphur dioxide.
- 11.2** The air quality objective for nitrogen dioxide is also unlikely to be breached at any location in the district. This has been the case with previous assessments, and monitoring results/predictive modelling results confirm that this remains so.
- 11.3** Monitoring in the vicinity of the A14, for particulate matter (PM₁₀) has shown that there is no exceedence of air quality objectives.
- 11.4** With regard to nitrogen dioxide, monitoring for the remainder of this year will focus on Stowmarket and areas where there are high vehicle numbers in close proximity to residential property.
- 11.5** It is not considered necessary to undertake any additional monitoring.
- 11.5** If concerns are expressed regarding air quality then the council will continue to use the screening mechanism in Technical Guidance TG(03) as a means of determining any likely exceedence. If traffic data is available then the DMRB module can be used to predict likely pollutant levels.

References

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9. Faber Maunsell (2006) : *Stowmarket Relief Road, Stowmarket, Air Quality Assessment, January 2006.*

Appendix 1

Extract from “Monitoring and Assessment of Particulate Matter (PM₁₀) in Mid Suffolk – Enstec Services, Report No. 70-02-03 May 2005

Executive Summary

1. This document presents the results of a programme of monitoring and modelling of PM10 in Mid Suffolk. It follows from the Updating and Screening Assessment of air Quality within Mid Suffolk which was conducted as required under of Part IV of the Environment Act. That assessment concluded that the National air quality objectives were likely to be met for all of the major pollutants, but recommended that a programme of monitoring and further assessment was required of PM10.
2. PM10 was therefore monitored for a period of three months at a location close to the A14 as this was identified as the main source of PM10 emissions within the district. In addition, it was required that additional detailed modelling be conducted to assess PM10 within the district, with the emphasis being on assessing the impact of traffic and in particular the A14 on PM10.
3. Monitoring was conducted during 10 December 2004 and 10 March 2005. The results were found to compare favourable with data from the nearest automatic monitoring station at Norwich centre with both sites showing similar trends. The level of concentration – both of the mean and of the 24 hour averages were also largely comparable and the data indicated that the objectives were met in 2004. Further, the monitoring data also suggested that the annual objectives for 2010 will be just be met and that the 24 hour objective will be met with relative ease.
4. The modelling results agreed closely with the monitoring data and results from the modelling confirmed that both the annual and 24 hour objectives in 2004 were met.
5. The modelling results also indicated that the annual objectives will just be met in 2010, but that the 24 hour objectives will easily be met. This finding was again in agreement with the results obtained from the monitoring. This general agreement between the modelling and monitoring results gives a high degree of confidence in these finding.