

Acknowledgements

The author would like to thank Elizabeth Bates and Chris Parkinson for assisting with this report.

Summary

This document presents the findings of the April 2006 Update and Screening Assessment for York. The report has been prepared in accordance with the Local Air Quality Management Technical Guidance Note LAQM.TG(03) Update, January 2006. Update and screening assessments have been undertaken for the following pollutants:

- carbon monoxide
- benzene
- 1,3 butadiene
- lead
- nitrogen dioxide
- sulphur dioxide
- particulate matter (PM₁₀)

For carbon monoxide, benzene, 1,3 butadiene and lead the report concludes that there is no risk of the objectives for these pollutants being breached. It is recommended that a further update and screening assessment for these pollutants is undertaken no later than April 2009. A progress report will however be produced by the end of April 2007.

For nitrogen dioxide (NO₂), the update and screening assessment has shown that there are some locations outside the current AQMA where elevated concentrations of nitrogen dioxide have been monitored during specific periods. A number of diffusion tubes outside the AQMA showed elevated concentrations of NO₂ in 2003. It was concluded that the majority of these diffusion tubes showed abnormally high readings during 2003 due to the weather conditions experienced across much of the UK during that period. There were very few of these tubes which exhibited high pollutant levels the following year or in previous years. Monitoring will continue at these sites and a progress report on nitrogen dioxide will be prepared by the end of April 2007.

For Sulphur Dioxide (SO₂) and Particulate matter (PM₁₀) the report concludes that at the current monitoring locations the air quality objectives are being met. No further assessment for these pollutants is required at this time.

Any comments or queries regarding this document should be addressed to:

Andrew Gillah
Senior Environmental Protection Officer (Air Quality)
City of York Council
Environmental Protection Unit
Directorate of Neighbourhood Services
De Grey House, Exhibition Square
York
Y01 7HE

e-mail: andrew.gillah@york.gov.uk
tel: (01904) 551529 fax: (01904) 551590

Contents

<u>Section</u>	<u>Page</u>
	<u>N°</u>
List of Figures	9
List of Tables	12
Glossary of Terms	13
List of Abbreviations	14
1.0 Introduction	15
1.1 Reviews and assessments of air quality in York	15
1.2 Purpose of the update and screening assessment	18
2.0 Update and Screening Assessment for Carbon Monoxide	19
2.1 The national perspective	19
2.2 The local perspective	19
2.3 Scope of the update and screening assessment for carbon monoxide	19
2.4 Assessment of carbon monoxide monitoring data for York	20
2.5 Assessment of carbon monoxide from traffic	20
2.5.1 Assessment procedure	20
2.5.2 Assessment of traffic in York	21
2.6 Conclusions from the update and screening of carbon monoxide	21
3.0 Update and Screening Assessment for Benzene	22
3.1 The national perspective	22
3.2 The local perspective	22
3.3 Scope of the update and screening assessment for benzene	23
3.4 Assessment of benzene monitoring data for York	23
3.5 Assessment of benzene from traffic	24
3.5.1 Assessment procedure	24
3.5.2 Assessment of traffic in York	25
3.6 Assessment of benzene from industrial sources	25
3.6.1 Assessment procedure	25
3.6.2 Assessment of industry in York	25
3.7 Assessment of benzene from petrol stations	26
3.7.1 Assessment procedure	26

3.7.2	Assessment of petrol stations in York	26
3.8	Assessment of benzene from major fuel storage depots	28
3.8.1	Assessment procedure	28
3.8.2	Assessment of fuel storage depots in York	28
3.9	Conclusions from the update and screening of benzene	28
4.0	Update and Screening Assessment for 1,3-Butadiene	29
4.1	The national perspective	29
4.2	The local perspective	29
4.3	Scope of the update and screening assessment for 1,3-butadiene	29
4.4	Assessment of 1,3 butadiene monitoring data for York	30
4.5	Assessment of 1,3-butadiene from industrial sources	30
4.5.1	Assessment procedure	30
4.5.2	Assessment of industry in York	31
4.6	Conclusions from the update and screening of 1,3 butadiene	31
5.0	Update and Screening Assessment for Lead	32
5.1	The national perspective	32
5.2	The local perspective	32
5.3	Scope of the update and screening assessment for lead	32
5.4	Assessment of lead monitoring data for York	33
5.5	Assessment of lead from industrial sources	33
5.5.1	Assessment procedure	33
5.5.2	Assessment of industry in York	34
5.6	Conclusions from the update and screening of lead	35
6.0	Update and Screening Assessment for Nitrogen Dioxide	36
6.1	The national perspective	36
6.2	The local perspective	36
6.3	Scope of the update and screening assessment for nitrogen dioxide	37
6.4	Assessment of nitrogen dioxide monitoring data for the area outside the AQMA	39
6.4.1	Nitrogen dioxide monitoring results from real time monitoring stations outside the AQMA	39
6.4.2	Nitrogen dioxide monitoring results from diffusion tube monitoring sites outside the AQMA	40

6.4.3	Predicted 2005 concentrations based on data from nitrogen dioxide diffusion tubes located outside the AQMA	56
6.4.4	Predicted 2005 upper 95% confidence limits for bias corrected annual average nitrogen dioxide concentrations at diffusion tube monitoring sites outside the AQMA	62
6.5	Assessment of nitrogen dioxide monitoring data for the area inside the AQMA	66
6.5.1	Nitrogen dioxide monitoring results from real time monitoring stations inside the AQMA	66
6.5.2	Nitrogen dioxide monitoring results from diffusion tube monitoring sites inside the AQMA	68
6.5.3	Predicted 2005 upper 95% confidence limits for bias corrected annual average nitrogen dioxide concentrations at diffusion tube monitoring sites inside the AQMA	68
6.6	Assessment of nitrogen dioxide in narrow congested streets with residential properties close to the kerb	73
6.6.1	Assessment procedure	73
6.6.2	Assessment of narrow congested streets	73
6.7	Assessment of nitrogen dioxide at junctions	74
6.7.1	Assessment procedure	74
6.7.2	Assessment of junctions	74
6.8	Assessment of nitrogen dioxide in busy streets where people may spend 1-hour or more close to traffic	74
6.8.1	Assessment procedure	74
6.8.2	Assessment of busy roads	75
6.9	Assessment of nitrogen dioxide from roads with a high proportion of buses or HGVs	75
6.9.1	Assessment procedure	75
6.9.2	Assessment of roads with a high proportion of buses or HGVs	75
6.10	Assessment of nitrogen dioxide from new or proposed roads	76
6.10.1	Assessment procedure	76
6.10.2	Assessment of new and proposed roads in York	77

6.11	Assessment of nitrogen dioxide on roads with significant increases in traffic flows, or new relevant exposure	78
6.11.1	Assessment procedure	78
6.11.2	Assessment of roads in York which have experienced increases in traffic flows of greater than 25%	78
6.12	Assessment of nitrogen dioxide in bus stations	79
6.12.1	Assessment procedure	79
6.12.2	Assessment of bus stations in York	80
6.13	Assessment of nitrogen dioxide from industrial sources	80
6.13.1	Assessment procedure	80
6.13.2	Assessment of industry in York	80
6.14	Assessment of nitrogen dioxide from aircraft	82
6.14.1	Assessment procedure	82
6.14.2	Assessment of aircraft emissions in York	82
6.15	Conclusions from the update and screening of nitrogen dioxide	83
7.0	Update and Screening Assessment for Sulphur Dioxide	84
7.1	The national perspective	84
7.2	The local perspective	84
7.3	Scope of the update and screening assessment for sulphur dioxide	85
7.4	Assessment of sulphur dioxide monitoring data for York	85
7.5	Assessment of sulphur dioxide from industrial sources	88
7.5.1	Assessment procedure	88
7.5.2	Assessment of industry in York	88
7.6	Assessment of sulphur dioxide from domestic sources	90
7.6.1	Assessment procedure	90
7.6.2	Assessment of domestic solid fuel burning	90
7.7	Assessment of sulphur dioxide from small boilers (>5 MW _(thermal))	91
7.7.1	Assessment procedure	91
7.7.2	Assessment of large boiler plant	91
7.8	Assessment of sulphur dioxide from transport sources	92
7.8.1	Assessment procedure	92
7.8.2	Assessment of sulphur dioxide emissions from shipping	92
7.8.3	Assessment of sulphur dioxide emissions from railway	92

locomotives	
7.9 Conclusions from the update and screening of sulphur dioxide	92
8.0 Update and Screening Assessment for PM₁₀	93
8.1 The national perspective	93
8.2 The local perspective	93
8.3 Scope of the update and screening assessment for PM ₁₀	94
8.4 Assessment of PM ₁₀ data for the area outside the AQMA	95
8.4.1 PM ₁₀ monitoring results from real time monitoring stations outside the AQMA	95
8.5 Assessment of PM ₁₀ data for the area inside the AQMA	97
8.5.1 PM ₁₀ monitoring results from real time monitoring stations inside the AQMA	97
8.6 Assessment of PM ₁₀ concentrations close to junctions	99
8.6.1 Assessment procedure	99
8.6.2 Assessment of PM ₁₀ concentrations at junctions	99
8.7 Assessment of PM ₁₀ concentrations close to roads with high flows of buses or HGVs	101
8.7.1 Assessment procedure	101
8.7.2 Assessment of roads with a high proportion of buses or HGVs	101
8.8 Assessment of PM ₁₀ from new or proposed roads	102
8.8.1 Assessment procedure	102
8.8.2 Assessment of new and proposed roads in York	102
8.9 Assessment of PM ₁₀ concentrations on roads with significant increases in traffic flows since the last round of reviews and assessments	103
8.9.1 Assessment procedure	103
8.9.2 Assessment of roads in York which have experienced increases in traffic flows of greater than 25%	103
8.10 Assessment of PM ₁₀ concentrations on roads which were close to the objective during the second round of review and assessment.	104
8.10.1 Assessment procedure	104
8.10.2 Assessment of roads which were close to the objective	104

during the second round of review and assessment.

8.11	Assessment of PM ₁₀ from industrial sources	104
	8.11.1 Assessment procedure	104
	8.11.2 Assessment of industry in York	105
8.12	Assessment of PM ₁₀ from domestic sources	107
	8.12.1 Assessment procedure	107
	8.12.2 Assessment of domestic solid fuel burning	107
8.13	Assessment of fugitive PM ₁₀ emissions	107
	8.13.1 Assessment procedure	107
	8.13.2 Assessment of fugitive emission sources in York	108
8.14	Assessment of PM ₁₀ from aircraft	108
	8.14.1 Assessment procedure	108
	8.14.2 Assessment of aircraft emissions in York	109
8.15	Conclusions from the update and screening of PM ₁₀	109
Appendix 1 : Authorised Processes in and around York		110
Appendix 2 : Diffusion tube precision factors		114

List of Figures

<u>Figure N°</u>	<u>Title</u>	<u>Page N°</u>
1	Summary diagram of City of York Council's Air Quality Review and Assessment Process	17
2	Area covered by the Council of the City of York Air Quality Management Area Order N° 1.	37
3	Locations outside the AQMA where real time monitoring of nitrogen dioxide has been undertaken	39
4	Location of city wide survey tubes outside the AQMA (2003)	43
5	Location of city wide survey tubes outside the AQMA (2004)	44
6	Location of survey A tubes outside the AQMA (2003)	45
7	Location of survey A tubes outside the AQMA (2004)	46
8	Location of survey B tubes outside the AQMA (2003)	47
9	Location of survey B tubes outside the AQMA (2004)	48
10	Location of survey C tubes outside the AQMA (2003)	49
11	Location of survey C tubes outside the AQMA (2004)	49
12	Location of survey D tubes outside the AQMA (2003)	50
13	Location of survey D tubes outside the AQMA (2004)	50
14	Bias corrected annual average nitrogen dioxide concentrations for city wide survey tubes outside the AQMA (2003)	51
15	Bias corrected annual average nitrogen dioxide concentrations for city wide survey tubes outside the AQMA (2004)	51
16	Bias corrected annual average nitrogen dioxide concentrations for survey tubes A outside the AQMA (2003)	52
17	Bias corrected annual average nitrogen dioxide concentrations for survey A tubes outside the AQMA (2004)	52

18	Bias corrected annual average nitrogen dioxide concentrations for survey B tubes outside the AQMA (2003)	53
19	Bias corrected annual average nitrogen dioxide concentrations for survey B tubes outside the AQMA (2004)	53
20	Bias corrected annual average nitrogen dioxide concentrations for survey C tubes outside the AQMA (2003)	54
21	Bias corrected annual average nitrogen dioxide concentrations for survey C tubes outside the AQMA (2004)	54
22	Bias corrected annual average nitrogen dioxide concentrations for survey D tubes outside the AQMA (2003)	55
23	Bias corrected annual average nitrogen dioxide concentrations for survey D tubes outside the AQMA (2004)	55
24	Predicted 2005 bias corrected annual average nitrogen dioxide concentrations for city wide survey tubes outside the AQMA (based on 2003 results)	57
25	Predicted 2005 bias corrected annual average nitrogen dioxide concentrations for city wide survey tubes outside the AQMA (based on 2004 results)	57
26	Predicted 2005 bias corrected annual average nitrogen dioxide concentrations for survey A tubes outside the AQMA (based on 2003 results)	58
27	Predicted 2005 bias corrected annual average nitrogen dioxide concentrations for survey A tubes outside the AQMA (based on 2004 results)	58
28	Predicted 2005 bias corrected annual average nitrogen dioxide concentrations for survey B tubes outside the AQMA (based on 2003 results)	59
29	Predicted 2005 bias corrected annual average nitrogen dioxide concentrations for survey B tubes outside the AQMA (based on 2004 results)	59
30	Predicted 2005 bias corrected annual average	60

	nitrogen dioxide concentrations for survey C tubes outside the AQMA (based on 2003 results)	
31	Predicted 2005 bias corrected annual average nitrogen dioxide concentrations for survey C tubes outside the AQMA (based on 2004 results)	60
32	Predicted 2005 bias corrected annual average nitrogen dioxide concentrations for survey D tubes outside the AQMA (based on 2003 results)	61
33	Predicted 2005 bias corrected annual average nitrogen dioxide concentrations for survey D tubes outside the AQMA (based on 2004 results)	61
34	Location of real time monitoring sites within the AQMA	66
35	Roads in York where HGVs and buses make up more than 25% of the total flow	76
36	The new James Street Link road	77
37	Roads which have experienced 25% or more growth in AADT traffic flows (where AADT is greater than 10,000)	79
38	Locations where real time monitoring of sulphur dioxide has been undertaken in York	86
39	Locations outside the AQMA where real time monitoring of PM ₁₀ has been undertaken	96
40	Location of real time PM ₁₀ monitoring equipment within the AQMA	98
41	Predicted 90 th percentile of daily 24 hour average PM ₁₀ concentrations in York by 2005.	100
42	Predicted annual average PM ₁₀ concentrations in York in 2005.	100

List of Tables

<u>Table N°</u>	<u>Title</u>	<u>Page N°</u>
1	8 hour running mean carbon monoxide monitoring results from Rawcliffe air quality monitoring station in 2003, 2004 and 2005.	20
2	Authorised petrol stations in York	27
3	Summary of real time nitrogen dioxide monitoring results for locations outside the AQMA	40
4	Nitrogen dioxide diffusion tube monitoring surveys undertaken since the completion of City of York Council's last Update and Screening Assessment.	41
5	Diffusion tube monitoring sites outside the AQMA which have a predicted upper 95% confidence limit of $40\mu\text{g}/\text{m}^3$, or greater, in 2005	63
6	Summary of real time nitrogen dioxide monitoring results from monitoring sites within the AQMA.	67
7	Diffusion tube monitoring within the AQMA which have a predicted upper 95% confidence limit of $40\mu\text{g}/\text{m}^3$, or greater, in 2005.	69
8	Industrial processes in York (or within 5km of York boundary) which have the potential to emit significant quantities of nitrogen dioxide	81
9	Summary of real time sulphur dioxide monitoring results	87
10	Industrial processes within 5km of York which have the potential to emit significant quantities of sulphur dioxide	89
11	Summary of real time PM_{10} monitoring results for locations outside the AQMA	96
12	Summary of real time PM_{10} monitoring results for locations within the AQMA	98
13	Industrial processes in York (or within 5km of York boundary) which have the potential to emit significant quantities of PM_{10}	106

Glossary of Terms

Air Quality Objectives

Targets set by the Government for air quality which are considered to be achievable in terms of cost, benefit and technical feasibility.

Air Quality Standards

Optimistic targets for air quality which represent the minimum or no significant risk to health levels. They take no account of cost, benefit and technical feasibility.

Review

The consideration of current and future concentrations of air pollutants for which objectives have been set.

Assessment

The consideration of whether or not the air quality objectives will be met by the relevant compliance dates.

Relevant Location

Outdoor, non-occupational, locations where members of the public are likely to be regularly exposed to pollutants over the averaging time of the air quality objectives.

Air Quality Management Area (AQMA)

An area formally designated by a local authority where one or more of the air quality objectives are unlikely to be met.

Air Quality Action Plan (AQAP)

A plan of action drawn up by a local authority for improving air quality in an Air Quality Management Area.

List of Abbreviations

ppb - parts per billion

ppm - parts per million

µg/m³ - microgrammes per cubic metre

mg/m³ - milligrammes per cubic metre

LAQM - Local Air Quality Management

AQMA - Air Quality Management Area

AQAP - Air Quality Action Plan

DEFRA - Department for the Environment, Food and Rural Affairs

NRM – National Railway Museum

QA - Quality Assurance

QC - Quality Control

TEOM - Tapered Element Oscillating Microbalance

1.0 Introduction

1.1 Reviews and assessments of air quality in York

Under the requirements of the Environment Act 1995, Part IV, all local authorities are required to periodically review and assess air quality in their areas against health based objectives prescribed by the Government. Where it is found that the objective levels are unlikely to be met, local authorities must declare Air Quality Management Areas (AQMAs) and draw up Air Quality Action Plans (AQAPs) for improving air quality in those areas.

In December 1998 City of York Council completed the First Stage Review and Assessment of Air Quality in York. This report concluded that no further action would be needed to meet the air quality objectives for the following pollutants:

- benzene
- 1,3 butadiene
- lead
- carbon monoxide

For three other pollutants; nitrogen dioxide, sulphur dioxide and PM₁₀, the report concluded that more detailed reviews and assessments should be undertaken.

In February 2000 City of York Council completed the Second and Third Stage Review and Assessment of Air Quality in York. This report concluded that the air quality objectives for sulphur dioxide and PM₁₀ would be met, but recommended that an AQMA should be declared due to potential breaches of the annual average nitrogen dioxide objective. Following a period of extensive public participatory consultation an AQMA was declared in January 2002.

The declaration of the AQMA in York placed a duty on City of York Council to undertake a fourth stage review and assessment of nitrogen dioxide concentrations in the city and to submit an AQAP to the Department for the Environment, Food and Rural Affairs (DEFRA). A final Fourth Stage Review and Assessment of Air Quality in York, and an AQAP were submitted to DEFRA in July 2004.

In 2003 local authorities were issued with new guidance requiring them to undertake a risk based approach to future reviews and assessments of all pollutants for which air quality objectives have been set. The aim of this approach is to ensure that the amount of work undertaken for each pollutant is proportional to the risk of the objectives for that pollutant being breached.

In accordance with the revised guidance an Update and Screening Report for York was submitted to DEFRA in May 2003. The report concluded that no further action was needed to meet the air quality objectives for benzene, 1,3

butadiene, carbon monoxide and lead. The report also concluded that no further action was needed to meet the objectives for nitrogen dioxide outside the current AQMA. The report did however identify a need to undertake further detailed assessments of :

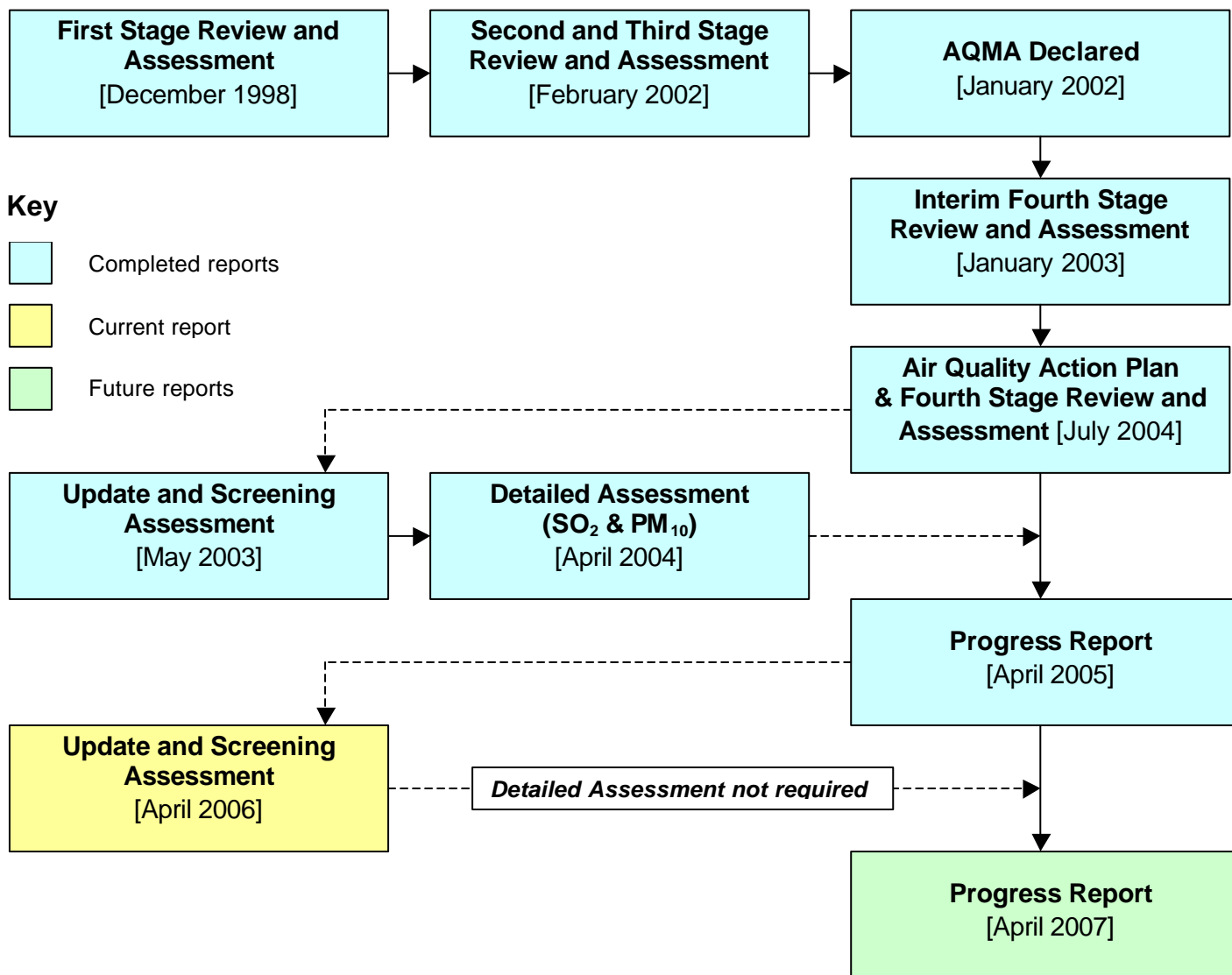
- PM₁₀ emissions in villages where there is still a high proportion of domestic solid fuel burning, and;
- SO₂ emissions from diesel locomotives waiting in railway sidings

In April 2004 a Detailed Assessment was undertaken to provide an accurate assessment of the likelihood of the air quality objectives being exceeded at 'relevant locations' in the vicinity of these two emission sources. The report concluded that the declaration of further AQMAs for sulphur dioxide and PM₁₀ was not necessary.

In April 2005 an Air Quality Progress Report was submitted to DEFRA. This report showed that the declaration of the current Air Quality Management Area (AQMA) was justified and was still valid with respect to likely exceedences of the annual average nitrogen dioxide objective by December 2005.

City of York Council's Air Quality Review and Assessment process is shown in Figure 1 below :

Figure 1 : Summary diagram of City of York Council's Air Quality Review and Assessment Process



1.2 Purpose of the update and screening assessment

Local authorities are required to take a risk based approach to undertaking reviews and assessments of air quality. The aim of this approach is to ensure that the amount of work undertaken for each pollutant is proportional to the risk of the objectives for that pollutant being breached.

Firstly, the aim of the update and screening assessment is to identify those matters which have changed since the last review and assessment, which might lead to a *risk* of an air quality objective being exceeded. If a potential risk is identified, a further detailed assessment is required to provide an accurate assessment of the *likelihood* of an air quality objective being exceeded at locations with relevant exposure. This should be sufficiently detailed to allow the designation or amendment of any necessary AQMA.

This document details the findings of the May 2006 Update and Screening Assessment for York. This document has been prepared in accordance with the Local Air Quality Management Technical Guidance Note LAQM.TG (03), Update January 2006.