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2012 Air Quality Updating and Screening Assessment for Malvern Hills District Council

In fulfillment of Part IV of the
Environment Act 1995
Local Air Quality Management

June 2012

Local Authority Officer	Christopher Poole
Department	Pollution Team, Central Operations
Address	Worcestershire Regulatory Services PO Box 866 Worcester WR1 9DP
Telephone	01527 881395
e-mail	Pollution.team@worcsregservices.gov.uk
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Executive Summary

This report presents the findings of Malvern Hills District Council's Updating and Screening Assessment (USA) of air quality within the district. The USA evaluates new and changed sources to identify those that may give rise to a risk of an exceedence of an air quality objective. Results from monitoring within the district are also presented and evaluated in relation to the objectives; the likelihood of an exceedence at relevant locations is discussed, as is the requirement to proceed to a Detailed Assessment.

Previous Review and Assessments have concluded that concentrations of carbon monoxide, benzene, 1,3-butadiene, lead, sulphur dioxide, nitrogen dioxide and PM₁₀ are compliant with the relevant objectives. To date, no Air Quality Management Areas (AQMAs) have been declared.

Monitoring data for 2011 confirm that concentrations of nitrogen dioxide remain well below the annual mean objective, and that there are no locations requiring Detailed Assessment.

The USA has not identified any significant changes in emissions sources within the Malvern Hills District Council area.

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1 Introduction

1.1 Description of Local Authority Area

Lying on the western edge of Worcestershire and south of the West Midlands region, Malvern Hills district covers 577km². The area is dominated by the Malvern Hills, designated as an Area of Outstanding Natural Beauty, which, coupled with the rivers Severn and Teme which flow through the district, provide a quality natural environment attracting over a million visitors every year.

The district is mainly rural with three main centres of population: Malvern, in the centre of the district, is the main town and contains the majority of the district's industry; Tenbury Wells in the northwest grows hops, apples and soft fruits; Upton upon Severn in the southeast of the district is a tourist and marina town. In terms of employment, approximately 72% of employed residents are employed within the services sector.

Road traffic is the major source of pollutants within the Malvern Hills area, with nitrogen dioxide being the most significant and, to a lesser extent, particulates (PM₁₀). Whilst there are two motorways which pass through the district, the M5 and the M50, there is no relevant exposure nearby. The principal exposure to road traffic emissions lie within Malvern itself.

1.2 Purpose of Report

This report fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where exceedences are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

The objective of this Updating and Screening Assessment is to identify any matters that have changed which may lead to risk of an air quality objective being exceeded. A checklist approach and screening tools are used to identify significant new sources or changes and whether there is a need for a Detailed Assessment.

1.3 Air Quality Objectives

The air quality objectives applicable to LAQM in England are set out in the Air Quality (England) Regulations 2000 (SI 928), The Air Quality (England) (Amendment) Regulations 2002 (SI 3043), and are shown in Table 1.1. This table shows the objectives in units of microgrammes per cubic metre $\mu\text{g}/\text{m}^3$ (milligrammes per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

Table 1.1 Air Quality Objectives included in Regulations for the purpose of LAQM in England

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	$16.25\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
	$5.0\mu\text{g}/\text{m}^3$	Annual mean	31.12.2010
1,3-Butadiene	$2.25\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
Carbon monoxide	$10.0\text{mg}/\text{m}^3$	Running 8-hour mean	31.12.2003
Lead	$0.5\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
	$0.25\mu\text{g}/\text{m}^3$	Annual mean	31.12.2008
Nitrogen dioxide	$200\mu\text{g}/\text{m}^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	$40\mu\text{g}/\text{m}^3$	Annual mean	31.12.2005
Particles (PM_{10}) (gravimetric)	$50\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	$40\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
Sulphur dioxide	$350\mu\text{g}/\text{m}^3$, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	$125\mu\text{g}/\text{m}^3$, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	$266\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

The Council has been reviewing air quality annually since 1998, producing Progress Reports or Updating and Screening Assessments as required by Defra.

The principal source of air pollution within the Malvern Hills district is related to road traffic emissions, and the principal pollutant of concern is nitrogen dioxide. This has been measured using diffusion tubes since 2001 at locations where, primarily, there is queuing or slow-moving traffic combined with relevant exposure in close proximity.

To date, there have been no exceedences of the air quality objectives identified at any of these worst-case locations. Air quality across the district is considered good. Since 2001 there have been no significant alterations to road layouts or traffic flows which has necessitated a change to the existing monitoring locations.

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

There are no automatic monitoring sites in the Malvern Hills District Council area.

2.1.2 Non-Automatic Monitoring Sites

During 2011, Malvern Hills District Council monitored annual mean nitrogen dioxide concentrations using passive diffusion tubes at seven locations across its area (Figures 2.1 and 2.2). Table 2.1 provides details of each of the monitoring sites.

The diffusion tubes are prepared and analysed by Gradko using the 20% TEA in water method. Tubes are changed on a monthly basis. Further details of the diffusion tube QA/QC is presented in Appendix A.

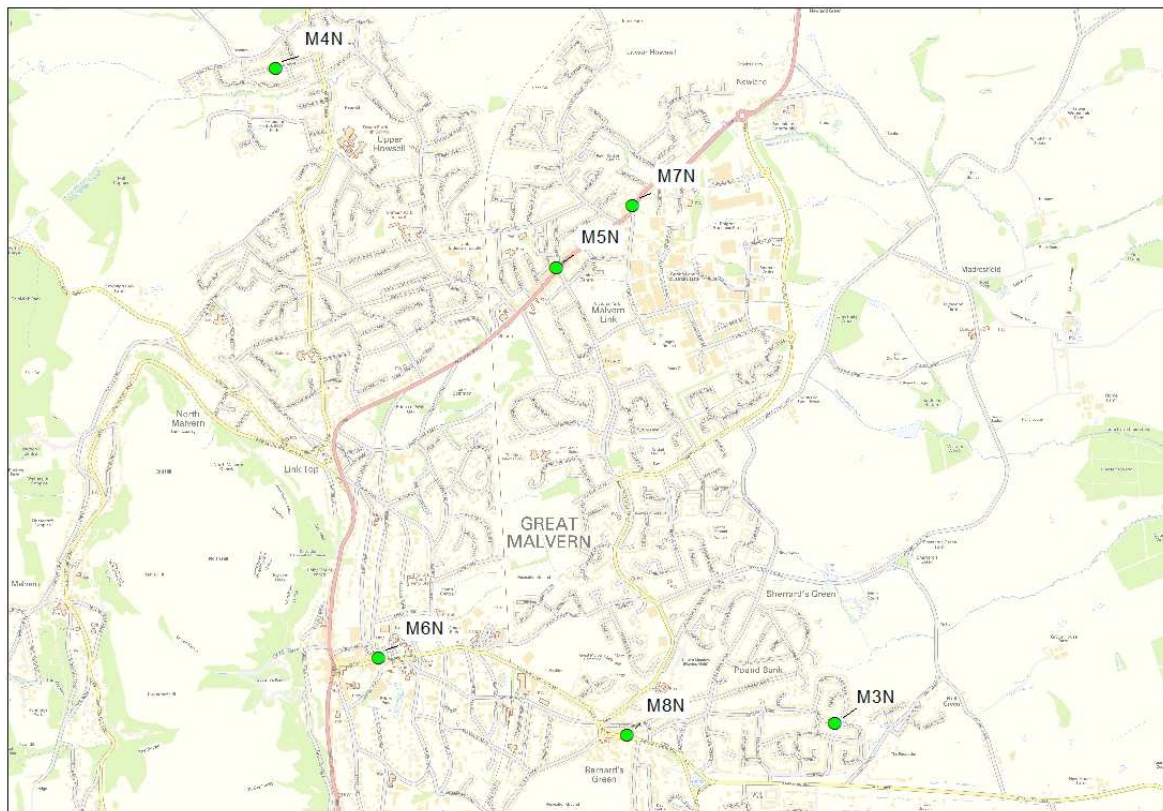


Figure 2.1 Non-Automatic Monitoring Sites in Malvern

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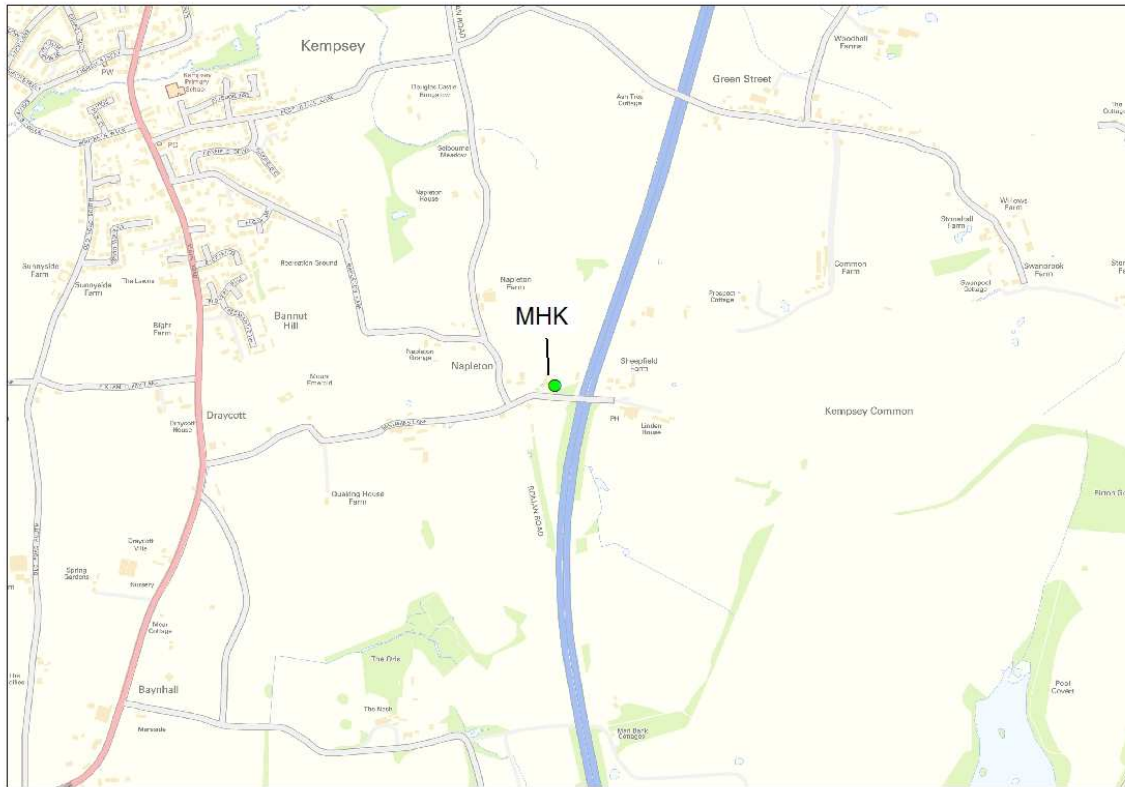


Figure 2.2 Non-Automatic Monitoring Sites in Kempsey
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Table 2.1 Details of Nitrogen Dioxide Diffusion Tube Monitoring Sites

Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	In AQMA?	Co-located with a Continuous Analyser?	Relevant Exposure?	Distance to kerb of nearest road	Does this location represent worst-case exposure?
Teme Avenue M3N	Urban Background	379790	245677	No	No	7m	1.0m	N
Westward Road M4N	Urban Background	377240	248667	No	No	8m	1.5m	N
Richmond Road M5N	Roadside (Junction)	378520	247754	No	No	0.5m	4.5m	Y
Graham Road M6N	Roadside (Junction)	377711	245979	No	No	0.5m	1.9m	Y
Barnards Green M8N	Roadside	378842	245627	No	No	0.3m	3.2m	Y
M5 Kempsey MHK	Rural (Motorway)	386319	248321	No	No	0m	68m	Y
Worcester Road M7N	Roadside	378870	248042	No	No	1m	5.4m	Y

2.2 Comparison of Monitoring Results with AQ Objectives

2.2.1 Nitrogen Dioxide

Automatic Monitoring Data

There are no automatic monitoring locations within the Malvern Hills DC area.

Diffusion Tube Monitoring Data

Measured concentrations at the seven diffusion tube monitoring sites in 2011 are presented in Table 2.2. Concentrations since 2002, at all sites where monitoring data are available, are presented in Table 2.3.

The national bias adjustment factor has been applied to the diffusion tube data. Further details are provided in Appendix A.

Measured concentrations in 2011 were well below the annual mean objective at all monitoring locations, including worst-case locations adjacent to junctions of busy roads.

Concentrations have reduced in 2011 relative to 2010 concentrations at all monitoring locations. Figure 2.3 presents data for those sites where at least five years of data are available. Overall, between 2002 and 2011, concentrations have remained fairly stable at all long-term sites.

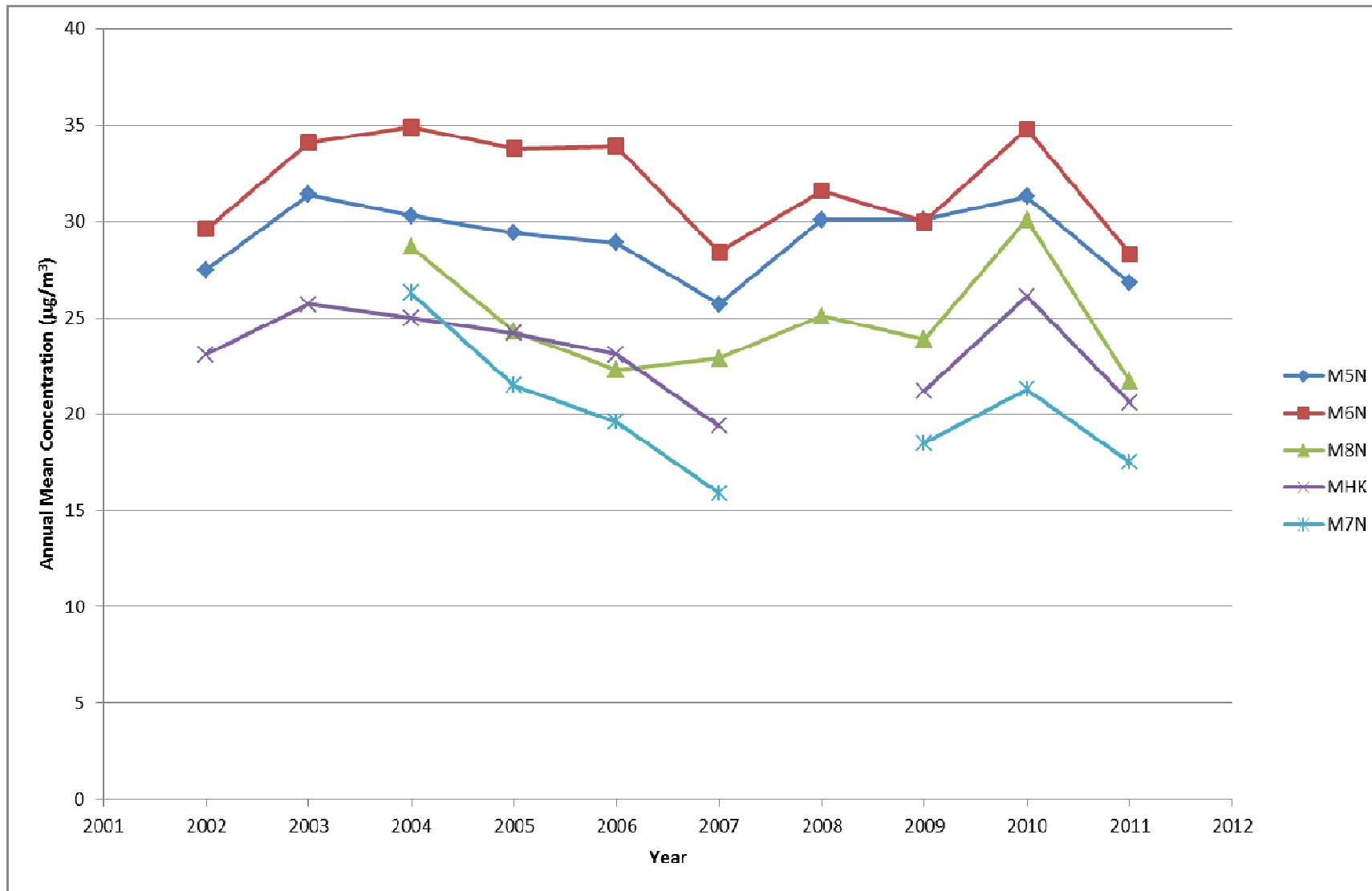
Table 2.2 Results of Nitrogen Dioxide Diffusion Tubes in 2011 (Bias Adjusted)

Site Name	Site Type	In AQMA?	Triplicate or Co-located?	Data Capture (Months)	2011 Annual Mean Concentration ($\mu\text{g}/\text{m}^3$)
Teme Avenue M3N	Urban Background	N	N	12	10.6
Westward Road M4N	Urban Background	N	N	12	13.2
Richmond Road M5N	Roadside (Junction)	N	Triplicate	12	26.8
Graham Road M6N	Roadside (Junction)	N	Triplicate	12	28.3
Barnards Green M8N	Roadside	N	Triplicate	12	21.7
M5 Kempsey MHK	Rural (Motorway)	N	Triplicate	12	20.6
Worcester Road M7N	Roadside	N	Triplicate	12	17.5
Objective					40

Table 2.3 Results of Nitrogen Dioxide Diffusion Tubes (2002 to 2011)

Site Name	Site Type	In AQMA?	Annual Mean Concentration ($\mu\text{g}/\text{m}^3$)										
			2002 [1.00]	2003 [0.96]	2004 [0.91]	2005 [0.97]	2006 [0.98]	2007 [0.89]	2008 [0.92]	2009 [0.90]	2010 [0.95]	2011 [0.89]	
Teme Avenue M3N	Urban Background	N	-	-	-	-	-	-	-	-	-	15.7	10.6
Westward Road M4N	Urban Background	N	-	-	-	-	-	-	-	-	-	15.3	13.2
Richmond Road M5N	Roadside (Junction)	N	27.5	31.4	30.3	29.4	28.9	25.7	30.1	30.1	31.3	26.8	
Graham Road M6N	Roadside (Junction)	N	29.6	34.1	34.9	33.8	33.9	28.4	31.6	30.0	34.8	28.3	
Barnards Green M8N	Roadside	N	-	-	28.7	24.3	22.3	22.9	25.1	23.9	30.1	21.7	
M5 Kempsey MHK	Rural (Motorway)	N	23.1	25.7	25.0	24.2	23.1	19.4	-	21.2	26.1	20.6	
Worcester Road M7N	Roadside	N	-	-	26.3	21.5	19.6	15.9	-	18.5	21.3	17.5	
Objective			-	-	-	40	40	40	40	40	40	40	

Figure 2.3 Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Sites



2.2.2 PM₁₀

PM₁₀ is not monitored within the Malvern Hills District Council area.

2.2.3 Sulphur Dioxide

Sulphur Dioxide is not monitored within the Malvern Hills District Council area.

2.2.4 Benzene

Benzene is not monitored within the Malvern Hills District Council area.

2.2.5 Other pollutants monitored

No other pollutants are measured within the Malvern Hills District Council area.

Summary of Compliance with AQS Objectives

Malvern Hills District Council has examined the results from monitoring in the district. Concentrations are all below the objectives, therefore there is no need to proceed to a Detailed Assessment.

3 Road Traffic Sources

3.1 Narrow Congested Streets with Residential Properties Close to the Kerb

The criteria for assessing narrow congested streets are set out in Section A.1 of Box 5.3, LAQM.TG(09). The 2009 USA did not identify any locations requiring assessment, and this remains the case.

Malvern Hills District Council confirms that there are no new/newly identified congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb, that have not been adequately considered in previous rounds of Review and Assessment.

3.2 Busy Streets Where People May Spend 1-hour or More Close to Traffic

The criteria for assessing busy streets relevant for the hourly nitrogen dioxide objective are set out in Section A.2 of Box 5.3, LAQM.TG(09) and are unchanged from previous rounds of Review and Assessment. The 2009 Updating and Screening Assessment did not identify any locations requiring assessment, and no new locations have subsequently been identified.

Malvern Hills District Council confirms that there are no new/newly identified busy streets where people may spend 1 hour or more close to traffic.

3.3 Roads with a High Flow of Buses and/or HGVs.

The criteria for assessing roads with high flows of buses and/ or HGVs are set out in Section A.3 of Box 5.3, LAQM.TG(09) and are unchanged from previous rounds of Review and Assessment. The 2009 Updating and Screening Assessment did not identify any roads meeting the criteria for assessment, and no new locations have subsequently been identified.

Malvern Hills District Council confirms that there are no new/newly identified roads with high flows of buses/HGVs.

3.4 Junctions

The criteria for assessing junctions are set out in Section A.4 of Box 5.3, LAQM.TG(09) and are unchanged from previous rounds of Review and Assessment. The 2009 Updating and Screening Assessment did not identify any junctions requiring assessment. No new busy junctions have subsequently been identified.

Malvern Hills District Council confirms that there are no new/newly identified busy junctions/busy roads.

3.5 New Roads Constructed or Proposed Since the Last Round of Review and Assessment

The criteria for assessing new roads are set out in Section A.5 of Box 5.3, LAQM.TG(09) and are unchanged from previous rounds of Review and Assessment. A consultation with Worcestershire County Council Highways has confirmed that there have been no major new roads constructed or proposed since the 2009 Updating and Screening Assessment.

Malvern Hills District Council confirms that there are no new/proposed roads.

3.6 Roads with Significantly Changed Traffic Flows

The criteria for assessing roads with significant increases in traffic flows are set out in Section A.6 of Box 5.3, LAQM.TG(09) and are unchanged from previous rounds of Review and Assessment. A consultation with Worcestershire County Council Highways has confirmed that there have been no significant changes to traffic flows on existing roads in the district.

Malvern Hills District Council confirms that there are no new/newly identified roads with significantly changed traffic flows.

3.7 Bus and Coach Stations

The criteria for assessing bus and coach stations are set out in Section A.7 of Box 5.3, LAQM.TG(09). Previous Updating and Screening Assessments have concluded that there are no bus stations within the District with more than 2,500 daily

movements or with relevant exposure within 10m. Malvern Hills District Council has confirmed that there have been no significant changes.

Malvern Hills District Council confirms that there are no relevant bus stations in the Local Authority area.

4 Other Transport Sources

4.1 Airports

The criteria for assessing airports are set out in Section B.1 of Box 5.4, LAQM.TG(09). There are no airports within the Malvern Hills District.

Malvern Hills District Council confirms that there are no airports in the Local Authority area.

4.2 Railways (Diesel and Steam Trains)

The criteria for assessing railways (diesel and steam trains) are set out in Section B.2 of Box 5.4, LAQM.TG(09).

4.2.1 Stationary Trains

The 2009 Updating and Screening Assessment did not identify any locations where diesel locomotives were stationary for more than 15 minutes on a regular basis. There has been no change to this position.

Malvern Hills District Council confirms that there are no locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.

4.2.2 Moving Trains

None of the rail lines identified in Table 5.1 of LAQM.TG(09) as carrying large numbers of movements of diesel locomotives travel through the Malvern Hills area.

Malvern Hills District Council confirms that there are no locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.

4.3 Ports (Shipping)

The criteria for assessing ports (shipping) are set out in Section B.3 of Box 5.4, LAQM.TG(09). Malvern Hills is located inland and there is therefore no significant shipping to consider.

Malvern Hills District Council confirms that there are no ports or shipping that meet the specified criteria within the Local Authority area.

5 Industrial Sources

5.1 Industrial Installations

5.1.1 New or Proposed Installations for which an Air Quality Assessment has been Carried Out

The criteria for assessing industrial installations are set out in Section C.1 of Box 5.5, LAQM.TG(09) and are unchanged from previous rounds of Review and Assessment. There have been no new industrial installations within the Malvern Hills District Council area since the 2009 USA was completed, and there are currently no proposals for any significant installations.

Malvern Hills District Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area.

5.1.2 Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been Introduced

Data provided by the Environment Agency show that the poultry farm in Birtsmorton, operated by I and J Howat, was permitted to increase PM₁₀ emissions by a third in 2010 relative to previous years. The farm is now permitted to release up to 5,000kg PM₁₀ per year. There are no residential properties within 100m of this farm, and therefore the increase does not require further consideration. The data for the period 2008 to 2010 confirms that there were no other significant changes to emissions from Part A installations which they regulate within the Worcestershire area. Malvern Hills District Council is not aware of any other industrial installations which have significantly increased their emissions, and no new exposure has been introduced nearby to any existing installations.

Malvern Hills District Council confirms that there are no industrial installations with substantially increased emissions or new relevant exposure in their vicinity within its area or nearby in a neighbouring authority which require further consideration.

5.1.3 New or Significantly Changed Installations with No Previous Air Quality Assessment

There have been no new industrial installations within the Malvern Hills District Council area since the 2009 USA was completed, and there are currently no proposals for any significant installations.

Malvern Hills District Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

5.2 Major Fuel (Petrol) Storage Depots

The criteria for assessing major fuel (petrol) storage depots are set out in Section C.2 of Box 5.5, LAQM.TG(09) and are unchanged from previous rounds of Review and Assessment. Previous Review and Assessment reports have not identified any major fuel storage depots; Malvern Hills District Council has confirmed that this continues to be the case.

Malvern Hills District Council confirms that there are no major fuel (petrol) storage depots within the Local Authority area.

5.3 Petrol Stations

The criteria for assessing petrol stations are set out in Section C.3 of Box 5.5, LAQM.TG(09) and are unchanged from previous rounds of Review and Assessment. Malvern Hills District Council confirmed in the 2009 USA that there are no petrol stations meeting the criteria requiring assessment. Since then, no new petrol stations have been installed.

Malvern Hills District Council confirms that there are no petrol stations meeting the specified criteria.

5.4 Poultry Farms

The criteria for assessing poultry farms are set out in Section C.4 of Box 5.5, LAQM.TG(09); this was a new consideration for the 2009 Updating and Screening

Assessment. The 2009 USA stated that there were no poultry farms meeting the criteria requiring an assessment; this position remains unchanged.

Malvern Hills District Council confirms that there are no poultry farms within the Malvern Hills District area which meet the criteria requiring further consideration.

6 Commercial and Domestic Sources

6.1 Biomass Combustion – Individual Installations

The criteria for assessing biomass combustion (individual installations) are set out in Section D.1a of Box 5.8, LAQM.TG(09). Since the 2009 USA, one biomass boiler has been installed at Hanley Castle High School.

The biomass calculator¹ was used to calculate the target emission rates for the boiler. The boiler data used are presented in Table 6.1, whilst the calculated Target Emission Rates are presented in Table 6.2. Background concentrations have been taken from the national maps provided on the UK-Air website². The boiler emission rates do not exceed the Target Emission Rates for nitrogen dioxide or PM₁₀, and therefore it is not necessary to proceed to a Detailed Assessment for the boiler.

Table 6.1 Boiler Data used in the Screening Assessment

Boiler Location	Building Height (m)	Stack Diameter (m)	Stack Height (m)	Background Concentration (µg/m ³)		Emission Rates (g/s)	
				PM ₁₀	NO ₂	PM ₁₀	NO ₂
Hanley Castle	7.3	0.3	9.5	14.4	7.2	0.001	0.006

Table 6.2 Target Emission Rates from Biomass Calculator

Boiler Location	PM ₁₀ Annual Mean		Nitrogen Dioxide Annual Mean		Nitrogen Dioxide Hourly Mean	
	Target Emission Rate (g/s)	Detailed Assessment Required?	Target Emission Rate (g/s)	Detailed Assessment Required?	Target Emission Rate (g/s)	Detailed Assessment Required?
Hanley Castle	0.0259	No	0.1444	No	0.0726	No

Malvern Hills District Council has assessed the biomass combustion plant, and concluded that it will not be necessary to proceed to a Detailed Assessment.

¹ Available at: http://laqm.defra.gov.uk/documents/biomass_calculator_tool6.xls

² <http://uk-air.defra.gov.uk/>

6.2 Biomass Combustion – Combined Impacts

The criteria for assessing biomass combustion (combined impacts) are set out in Section D.1b of Box 5.8, LAQM.TG(09). The estimated average PM₁₀ background concentration in Malvern Hills in 2012 is 13.7µg/m³ (range 11.9 – 18.2µg/m³).

Using the nomograms provided in TG(09) and data provided in Table 5.3, and assuming a worst-case background of 18µg/m³ in a small town, emissions of at least 6500 kg PM₁₀ per year would be required in a square 500m by 500m in order for this type of emission source to be likely to lead to exceedence of the UK daily mean objective for PM₁₀. This is equivalent to over 225 households within a 500m by 500m grid square all burning wood in fireplaces as their primary fuel. Alternatively, there would need to be a minimum of 28,500m² of commercial floorspace (approximately equivalent to 11 large supermarkets) heated by biomass boilers within a 500m by 500m grid square all using wood as their primary fuel. Using this fact, and the findings of previous Review and Assessment reports, it is considered highly unlikely that there are any areas of biomass combustion exceeding these criteria.

Malvern Hills District Council confirms that there are unlikely to be combined impacts from biomass combustion in the Local Authority area.

6.3 Domestic Solid-Fuel Burning

The criteria for assessing domestic solid-fuel burning are set out in Section D.2 of Box 5.8, LAQM.TG(09) and are unchanged from previous Review and Assessments. The 2009 USA concluded that there were no areas of significant domestic coal or smokeless fuel burning. There has not been a significant increase in domestic solid-fuel burning.

Malvern Hills District Council confirms that there are no areas of significant domestic fuel use in the Local Authority area.

7 Fugitive or Uncontrolled Sources

The criteria for assessing fugitive or uncontrolled sources are set out in Section E.1 of Box 5.10, LAQM.TG(09) and are unchanged from previous Review and Assessments. The 2009 USA concluded that there were no potential sources of fugitive dust within the Malvern Hills District area.

No new potential fugitive or uncontrolled sources have been identified.

Malvern Hills District Council confirms that there are no permanent potential sources of fugitive particulate matter emissions in the Local Authority area.

8 Conclusions and Proposed Actions

8.1 Conclusions from New Monitoring Data

Concentrations of nitrogen dioxide measured at seven monitoring sites across the Malvern Hills District Council area were well below the annual mean objective in 2011. Concentrations have remained similar at all sites over a ten year period (2002 - 2011), although there was a reduction in concentrations at all sites in 2011 relative to 2010 data. A Detailed Assessment is not required based on monitoring data.

A rationalisation of monitoring sites within the area was carried out in early 2012, and a number of locations were decommissioned or relocated. Three monitoring locations, where low results have been measured in recent years, have been discontinued, and two sites have been relocated. In addition, new monitoring sites have been established within Upton upon Severn. Further details will be provided in the 2013 Progress Report.

8.2 Conclusions from Assessment of Sources

The Updating and Screening Assessment has not identified any significant changes to emissions sources within the Malvern Hills District Council area that will lead to a deterioration in air quality. There have been no new or significantly altered industrial processes, road, transport, commercial, domestic or fugitive sources of emissions for which more Detailed Assessment is required.

8.3 Proposed Actions

A Progress Report will be submitted to Defra in April 2013, setting out new monitoring data and identifying any changes to emissions sources.

9 References

Defra (2009) Review & Assessment: Technical Guidance LAQM.TG(09), available at: <http://archive.defra.gov.uk/environment/quality/air/airquality/local/guidance/documents/tech-guidance-laqm-tg-09.pdf>

Defra (2012) Data Archive, available at: <http://uk-air.defra.gov.uk/data/>

Appendices

Appendix A: QA/QC of Diffusion Tube Data

Appendix A: QA/QC of Diffusion Tube Data

Bias Adjustment Factor

The national bias adjustment factor for diffusion tubes supplied and analysed by Gradko, 20% TEA in water for 2011 is 0.89. This factor is taken from spreadsheet version 03/12, and is based on 26 studies. This factor has been applied to all 2011 diffusion tube data presented in this report.

WASP

Gradko take part in the Workplace Analysis Scheme for Proficiency (WASP), operated by the Health and Safety Laboratory (HSL). During 2011, on average, 84.4% of samples were determined to have been satisfactory (1st quarter: 100%; 2nd quarter: 100%; 3rd quarter: 100%, 4th quarter: 37.5%).