

10 Updating and Screening Assessment for PM₁₀

10.1 THE NATIONAL PERSPECTIVE

National UK emissions of primary PM₁₀ have been estimated as totalling 141,000 tonnes in 2003. Of this total, around 27 % was derived from road transport sources. It should be noted that, in general, the emissions estimates for PM₁₀ are less accurate than those for the other pollutants with prescribed objectives, especially for sources other than road transport.

The Government established the Airborne Particles Expert Group (APEG) to advise on sources of PM₁₀ in the UK and current and future ambient concentrations. Their conclusions were published in January 1999 (APEG, 1999). APEG concluded that a significant proportion of the current annual average PM₁₀ is due to the secondary formation of particulate sulphates and nitrates, resulting from the oxidation of sulphur and nitrogen oxides. These are regional scale pollutants and the annual concentrations do not vary greatly over a scale of tens of kilometres. There are also natural or semi-natural sources such as wind-blown dust and sea salt particles. The impact of local urban sources is superimposed on this regional background. Such local sources are generally responsible for winter episodes of hourly mean concentrations of PM₁₀ above 100 µg m⁻³ associated with poor dispersion. However, it is clear that many of the sources of PM₁₀ are outside the control of individual local authorities and the estimation of future concentrations of PM₁₀ are in part dependent on predictions of the secondary particle component.

10.2 STANDARD AND OBJECTIVE FOR PM₁₀

The Government and the Devolved Administrations have adopted two Air Quality Objectives for fine particles (PM₁₀), which are equivalent to the EU Stage 1 limit values in the first Air Quality Daughter Directive. The objectives are 40 µg m⁻³ as the annual mean, and 50 µg m⁻³ as the fixed 24-hour mean to be exceeded on no more than 35 days per year, to have been achieved by the end of 2004. In addition, there is an objective of 20 µg m⁻³ as the annual mean, and 50 µg m⁻³ as the fixed 24-hour mean to be exceeded on no more than 7 days per year, to be achieved by the end of 2010. The objectives are based upon measurements carried out using the European gravimetric transfer reference sampler or equivalent.

It should be noted that the objectives for 2010, based on the Stage 2 EU Limit Values have not been included in the Air Quality Regulations for England, and local authorities are not currently required to assess against them. In addition, they were the subject of the European Commission's recent review of the First Daughter Directive.

The Commission is currently consulting on a new consolidated Directive on Ambient Air Quality, which is likely to see changes to the above Limit Values, though the nature of these changes cannot be confirmed at this time.

10.3 CONCLUSIONS OF THE PREVIOUS ROUNDS OF REVIEW AND ASSESSMENT FOR PM₁₀

The following conclusions were given for PM₁₀ in the earlier rounds of Review and Assessment for King's Lynn and West Norfolk:

- Stages 1 and 2: A number of significant sources were identified in Stage 1 for both traffic and industry, many of which were ruled out at Stage 2. Two fugitive dust sources at King's Lynn docks were identified in Stage 2 as the only processes requiring further assessment for PM₁₀.

- Stage 3 – A further assessment was carried out for the two fugitive dust sources at King's Lynn docks. An exceedence of the objectives was predicted.
- Stage 4: An AQMA was declared in May 2002, and further monitoring and modelling of particulate matter was undertaken. PM₁₀ concentrations at South Quay confirmed that the 24-hour objective for PM₁₀ would not be met at residential locations on the quayside. A detailed assessment was not required. A number of measures for reducing the number of exceedences of the 24-hour objective for particulate matter were considered including improved control of dust emissions during loading operations, a reduction in the number of ship loading operations and improved housekeeping.
- Updating and Screening Assessment (2003): Because the modelling undertaken very recently at Stage 4 (2003) was far more comprehensive than the approach to be taken in the Updating and Screening Assessment, the Stage 4 conclusion was reiterated here. An exceedence of the PM₁₀ objectives was predicted and it was therefore recommended that the Borough Council proceed to an air quality action plan and update the progress of this in annual progress reports.
- The Progress Report (2004) noted that PM₁₀ results from the automatic site at South Quay had exceeded the daily PM₁₀ objective for 2002 and 2003, but may meet the objectives during 2004 due to the effective application of an Air Quality Action Plan.
- Recent automatic monitoring data has led to the South Quay AQMA being revoked on 29th June 2006 due to the air quality action plan implemented by the Borough Council.

10.4 SCREENING ASSESSMENT OF PM₁₀

10.4.1 Checklist for PM₁₀

The Technical Guidance LAQM.TG(03) requires assessment of PM₁₀ to consider the following sources, data or locations:

- Monitoring data outside an AQMA
- Monitoring data within an AQMA
- Junctions
- Roads with high flow of buses and/or HGVs
- New roads constructed or proposed since last round of review and assessment
- Roads close to the objective during the last round of review and assessment
- Roads with significantly changed traffic flows, or new relevant exposure
- New industrial sources
- Industrial sources with substantially increased emissions, or new relevant exposure
- Areas with domestic solid fuel burning
- Quarries, landfill sites, opencast coal, handling of dusty cargoes at ports etc
- Aircraft

These are evaluated in the following sections.

10.4.2 Background Concentrations of PM₁₀

The 2004 average background PM₁₀ concentration in King's Lynn and West Norfolk, estimated from the UK background maps (<http://www.airquality.co.uk/archive/laqm/tools.php>), was 18.1 µg m⁻³, with a maximum concentration of 29.0 µg m⁻³. In 2010 it is estimated that the average PM₁₀ concentration will be 16.8 µg m⁻³, with a maximum of 25.1 µg m⁻³.

10.4.3 Screening Assessment of Monitoring Data

Particulate matter (PM₁₀) concentrations have been monitored at South Quay since March 2001 using a Tapered Element Oscillating Microbalance (TEOM) analyser. The analyser is located approximately 30 m from the quayside and approximately 10 m from the nearest residential property to the ship loading operation. The monitoring site is owned and operated by the Borough Council of King's Lynn and West Norfolk. Quality assurance audits are carried out at six monthly

intervals by **netcen**, who also manage and ratify the data, applying similar quality assurance procedures to those employed by the national automatic networks.

Particulate matter (PM₁₀) concentrations have been monitored at the Railway Road monitoring site since September 2002, again using a TEOM analyser. The analyser is located at a roadside location at the junction between Railway Road and Market Street. Market Street provides the main road access to King's Lynn bus station. The site is owned and operated by the Council and is subject to the same quality control procedures as the South Quay monitoring site.

Measured concentrations have been corrected by a factor of 1.3 to make them equivalent to measurements made with a gravimetric analyser. Results of the monitoring are summarised below in Table 10.1, and in more detail in Appendix 1.

Table 10.1 Summary of 2005 automatic PM₁₀ monitoring data

Site name	Data capture %	2005 measurements (gravimetric)		
		Annual mean (µgm ⁻³)	Max. fixed 24-hr mean (µgm ⁻³)	Exceedences of fixed 24-hr mean objective
Railway Road	95.7	15	35	0
South Quay	97.9	15	128	2

The Railway Road site recorded no exceedences of the 2004 objectives, and it is predicted that the proposed 2010 objectives will also be met. The South Quay monitoring site recorded two fixed 24-hour mean exceedences, which is well within the 2004 objective of 35. These results are below those estimated by the NAEI background maps, but are considered to reflect local conditions more accurately.

10.4.4 Screening Assessment of Road Traffic Sources

Traffic flow data were taken from the NAEI roads database and 2005 traffic count data provided by Norfolk County Council (Appendix 2). For screening purposes, receptor distances based on the closest property where public exposure was likely and annual average speeds for the roads were estimated. Default speeds of 30 km/h and receptor distances of 5 m were used, however these were increased/reduced depending on the census point or type of road (for example if the census point was close to a junction or on a narrow, congested street).

Table 10.2 shows predicted PM₁₀ annual mean concentrations and predicted annual exceedences of the 24-hour mean in 2005 and 2010 calculated using the DMRB for roads in King's Lynn and West Norfolk. Exceedences are shown in **bold red** font.

The DMRB indicates 24 exceedences of the 2004 24-hour mean objective along the A47 Saddlebow roundabout, and 31 exceedences where the A47 joins the A17. The A47 is a dual carriageway at both census locations, and while a very conservative nearest receptor distance has been used, it is unlikely that there is any relevant exposure for the 24-hour mean objective. The DMRB does not indicate any exceedences of the 24-hour or annual mean objectives for 2005.

Predictions for 2010 indicate that the annual mean objective of 20 µgm⁻³ will be exceeded at over half of the roadside locations in the borough, and that the 24-hour mean objective is also unlikely to be met at many locations. It must be remembered that the objectives for 2010 are not part of the Air Quality Regulations for England, and local authorities are not currently required to assess against them. Exceedences predicted for 2010 are for information only and have not been highlighted.

Table 10.2 Modelled annual mean PM₁₀ concentrations and 24-hour exceedences along roads in King's Lynn and West Norfolk

ID	Data source	Road	Distance from link centre to receptor (m)	2005 AADTF (combined veh/day)	Annual average speed (km/h)	Total HDV (%)	Annual mean concentration (µgm ⁻³)		24-hour mean exceedences	
							2005	2010	2005	2010
1	NAEI	A148	10	16076	50	5.63	23.0	20.2	8	4
2	NAEI	A1101	10	7249	80	5.68	21.3	19.2	5	2
3	NAEI	A10	5	11926	50	13.15	23.4	20.3	9	4
4	NAEI	A148	5	9882	50	8.76	20.8	18.4	4	2
5	NAEI	A149	10	23716	80	8.52	26.2	22.9	16	8
6	NAEI	A1122	10	7917	80	8.53	22.4	20.2	7	4
7	NAEI	A47	10	36642	30	11.67	30.9	25.4	31	13
8	NAEI	A148	5	8814	50	8.10	20.9	18.5	5	2
9	NAEI	A149	5	12726	50	2.97	20.7	18.4	4	2
10	NAEI	A1122	5	6197	50	11.08	20.9	18.6	5	2
11	NAEI	A17	10	15531	60	14.89	25.9	22.0	15	6
12	NAEI	A148	5	25368	40	2.67	26.6	23.4	16	9
13	NAEI	A10	15	10392	80	7.12	20.9	18.7	5	2
14	NAEI	A47	5	13642	50	12.92	23.7	20.3	9	4
15	NAEI	A134	5	10131	50	16.64	23.1	19.9	8	3
16	NAEI	A148	5	6975	80	11.74	20.2	17.9	4	1
17	NAEI	A148	5	12318	40	2.21	22.4	20.1	7	3
18	NAEI	A149	5	20412	50	9.56	24.6	20.9	11	5
19	NAEI	A1101	5	3526	50	6.46	19.6	17.8	3	1
20	NAEI	A1122	5	10779	50	10.60	22.6	19.8	7	3
21	NAEI	A1078	5	15334	40	5.06	23.7	20.7	10	4
22	NAEI	A47	5	15118	50	12.13	24.5	20.8	11	4
23	NAEI	A10	10	10601	80	7.38	21.1	18.8	5	2
24	NAEI	A47	10	27599	30	14.87	29.0	24.6	24	11
25	NAEI	A134	5	5776	30	21.65	22.8	19.6	8	3
26	NAEI	A148	5	10078	30	8.62	22.2	19.3	7	3
27	NAEI	A149	5	3642	30	2.60	18.4	16.7	2	1
28	NAEI	A1076	5	16210	20	2.87	25.3	22.0	13	6
29	NAEI	A149	5	21395	30	3.23	27.4	23.9	19	10
30	NAEI	A134	5	7542	50	15.66	27.5	25.0	19	12
31	NAEI	A10	5	15625	50	13.77	25.7	21.7	14	6
32	NAEI	A148	3	22312	30	3.32	26.7	23.3	17	9
33	NAEI	A1101	5	9757	30	8.51	23.2	20.3	9	4
34	NAEI	A148	5	10987	30	4.52	26.2	23.1	15	8
35	NAEI	A148	3	17194	30	3.34	27.6	24.1	19	10
36	NAEI	A1078	5	11394	30	4.62	25.6	22.7	14	8
37	NAEI	A1078	5	14945	30	4.68	26.5	23.2	16	8
38	NAEI	A1101	5	2827	30	10.40	19.6	17.7	3	1
39	NAEI	A10	5	7633	80	10.89	20.9	18.6	5	2
40	NAEI	A148	5	16793	30	5.73	23.5	20.2	9	4
41	NAEI	A134	5	6025	30	21.14	22.9	19.6	8	3
42	NAEI	A148	5	10129	30	6.79	26.5	23.3	16	9
43	Council	A1078	5	16946	30	3.3	25.3	22.2	13	7
44	Council	A1076	5	16623	30	1.63	24.6	21.9	12	6
45	Council	A149	5	22710	30	2.05	25.2	22.2	13	7
46	Council	A148	5	26505	30	1.82	25.3	22.3	13	7
47	Council	A148	5	11528	30	2.63	24.1	21.5	10	6
48	Council	C80	5	8462	30	0.88	23.0	20.9	8	5
49	Council	A148	5	15422	30	1.07	24.3	21.7	11	6

The following items from the checklist for PM₁₀ have also been considered:

- Roads with "an unusually high proportion of HDVs": Box 8.4 of the Technical Guidance LAQM.TG(03) describes this as greater than 25 % buses and/or HGVs for PM₁₀. The A134 at both Stradsett and Lynn Road, Shouldham Thorpe (IDs 25 and 41 respectively) was considered in the above screening assessment for road transport sources.

- New roads constructed or proposed since the last round of review and assessment: no new roads have been constructed.
- Roads close to the objective during the last round of review and assessment.
- Roads with significantly changed traffic flows or new, relevant exposure: changes to the traffic flows since the last round of review and assessment have been considered in the above screening assessment.

10.4.5 Busy Junctions

Annual average PM₁₀ concentrations and daily mean exceedences at receptors near busy road junctions in the city have been estimated for 2005 and 2010 using the DMRB model (table 10.3). Junctions and receptors are the same as those modelled for NO₂ in table 8.5.

Table 10.3 Modelled annual mean PM₁₀ concentrations and 24-hour exceedences at busy road junctions in King's Lynn and West Norfolk in 2005 and 2010

Receptor number	Road Name	Distance from receptor (m)	2005 AADTF (combined veh/day)	Annual average speed (km/h)	Total HDV (%)	Annual mean concentration (µgm ⁻³)		24-hour mean exceedences	
						2005	2010	2005	2010
1	Hardwick Road	15	21302	10	3.23	30.0	24.8	27	12
	London Road	40	18722	10	4.52				
2	Gayton Road	16	16140	10	2.87	31.0	25.7	31	14
	Lynn Road	7	25258	10	2.67				
	Wootton Road	9	12264	20	2.21				
3	East of roundabout	15	27480	80 ^a	14.87	28.3	23.9	22	10
	Saddlebow Road	25	10939	30	4.52				
4	Downham Road	5	6170	50 ^b	11.08	26.9	23.1	17	8
	Stradsett	20	5999	20	21.14				
5	Queen Elizabeth Way	64	23614	20	8.52	23.7	22.2	9	7
	Hardwick Road	64	17443	20	12.92				
	Winch Road	266	15558	20	13.77				
6	Low Road	11	15268	10	5.06	31.0	25.4	31	13
	Wootton Road	20	12264	10	2.21				

^a Speed representative of traffic continuing along A47 dual carriageway

^b Speed representative of traffic continuing along A1122

The DMRB screening model indicates that the annual mean objective of 40 µgm⁻³ for PM₁₀ was met at all relevant receptors close to junctions assessed in 2005. There may, however, be possible sources of error in the values calculated due to uncertainties in the speeds used, exact distances to receptors and lack of definitive information about queuing and congestion.

The predictions for 2010 indicate that the annual mean objective of 20 µgm⁻³ is unlikely to be met at any of the junctions assessed, and that the number of daily mean exceedences is also likely to be much greater than the target of seven per year. This is due, in part, to the background contribution predicted by the NAEI for PM₁₀ being approximately the same as the objective. It should also be remembered that the objectives for 2010 have not yet been included in the Air Quality Regulations for England, and local authorities are not currently required to assess against them. Exceedences predicted for 2010 are for information only and have therefore not been highlighted.

10.4.6 Screening Assessment of Industrial Sources

The Guidance LAQM.TG(03) lists the following processes as significant potential sources of PM₁₀:

Part A (percentage of total emissions from all UK plant in this sector to the UK total in brackets)

Iron and steel (61)
Petroleum processes (4)
Combustion processes (13)
Cement/lime manufacture (7)
Carbonisation (2)
Gasification (4)
Non-ferrous metals (4)
Fertilizer production

Part B

Combustion plant 20-50 mwth
Furnaces 20-50 mwth
Coal and coke processes
Quarry Process
Roadstone coating
Rubber processes
China and clay processes
Coating powder
Coil coating

No industrial processes were identified during previous rounds of review and assessment with the potential to emit significant quantities of PM₁₀, and no new processes have been identified since. None of the existing processes have reported substantially increased emissions.

A screening exercise near Grampian Country Feeds Ltd (formerly Favor Parker) in Stoke Ferry has not indicated any likelihood of PM₁₀ being an issue at that location.

10.4.7 Quarries and Landfill Sites

Any operating quarries with relevant exposure 'near' to the source of the dust emission must be considered further. 'Near' is defined by Box 8.4 of LAQM.TG(03) as being within 200 m for areas with 2004 background PM₁₀ concentrations of < 26 µg m⁻³. There are currently no operating quarries or landfill sites within King's Lynn and West Norfolk with relevant public exposure within 200 m.

Any developments for possible future extension of these quarries should be kept under review in the next Progress Report.

10.4.8 Domestic Solid Fuel Burning

There are no data for domestic coal burning available for the district but solid fuel use continues to decline throughout the area. The Borough Council of King's Lynn and West Norfolk has advised that it is unlikely that there are any areas with 50 houses using these fuels in a 500m x 500m square.

10.4.9 Screening Assessment of Other Transport Sources

Airports

There are no airports in King's Lynn and West Norfolk or neighbouring authorities that have a throughput of 5 million passengers per year and/or 500,000 tonnes of freight. This source therefore does not need to be considered further.

10.5 CONCLUSIONS FOR PM₁₀ CONCENTRATIONS IN BOROUGH

The DMRB screening model indicates that the annual mean objective of 40 µgm⁻³ for PM₁₀ was met at all relevant receptors adjacent to roads and junctions in 2005. Automatic monitoring data recorded no exceedences of the annual mean objective or the fixed 24-hr mean objective for PM₁₀.

The 2010 annual mean may exceed 20 µgm⁻³ at many relevant locations in 2010, due, in part, to the background PM₁₀ contribution predicted by the NAEI being almost as high as the objective itself throughout King's Lynn and West Norfolk. The fixed 24-hour mean objective in 2010 is also likely to be widely exceeded at roadside locations across the borough. However, it should be remembered that the objectives for 2010 have not yet been included in the Air Quality Regulations for England, and local authorities are not currently required to assess against them. Exceedences predicted for 2010 are presented for information only.

A Detailed Assessment is not required for King's Lynn and West Norfolk.

	Source, location or data that need to be assessed	Updating and Screening Assessment
A	Monitoring data outside an AQMA	PM ₁₀ concentrations are measured at Railway Road and South Quay automatic monitoring sites. The 2005 annual mean concentrations recorded for PM ₁₀ are within the 2004 objectives.
B	Monitoring data within an AQMA	Not applicable – the South Quay AQMA has now been revoked
C	Busy roads and junctions in Scotland	Not applicable
D	Junctions	'Busy' junctions have been considered in this assessment. No exceedences of the objectives were seen at the relevant receptors at these locations.
E	Roads with high flow of buses and/or HGVs	The A134 at both Stradsett and Lynn Road, Shouldham Thorpe was considered in the above screening assessment as having proportions of buses and/or HGVs greater than 25 %. No exceedences were identified.
F	New roads constructed or proposed since first round of review and assessment	No new roads have been identified
G	Roads close to the objective during the first round of review and assessment	No roads were identified as meeting this criterion
H	Roads with significantly changed traffic flows	No roads have seen significant (> 25 %) changes to traffic flows since the previous round of review and assessment. Changes predicted from any proposed developments in the borough should be considered in the next progress report.
I	New industrial sources	No new industrial sources of PM ₁₀ have been identified
J	Industrial sources with substantially increased emissions	No industrial sources of PM ₁₀ have been identified as increasing their emissions by > 30 %.
K	Areas with domestic solid fuel burning	The Borough Council has advised that it is unlikely that there are any areas in King's Lynn and West Norfolk with 50 houses using these fuels in a 500m x 500m square.
L	Quarries, landfill sites, opencast coal, handling of dusty cargoes at ports etc	No relevant exposure has been identified near (within 200 m) to the sources of dust emissions (quarries) in King's Lynn and West Norfolk.
M	Aircraft	There are no airports in the Borough of King's Lynn and West Norfolk or neighbouring authorities that have a throughput of 5 million passengers per year and/or 500,000 tonnes of freight.
	Conclusion	There have been no significant changes with regards to PM ₁₀ in this Authority. A detailed assessment is not required for King's Lynn and West Norfolk.