Land South of M62 (Site 19) - Air Quality Appraisal

Thornhill Estates

December 2008

WSP

QM

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1 Introduction

1.1 LOCAL AIR QUALITY APPRAISAL

1.1.1 WSP Environmental Ltd (WSP) has been commissioned to carry out an appraisal of the local air quality conditions at land south of M62, Calderdale in order to promote in order to promote its viability for residential or mixed use development within the Calderdale Local Development Framework.

1.1.2 The appraisal involves a desktop review of readily available data for existing and estimated pollutant concentrations in the area and detailed modelling of pollutant concentrations across the site using traffic flow information of the adjacent roads to characterise the air quality at the site. The appraisal also provides an indication of the potential exposure of future residents of the site to air pollution.

2 Relevant legislation and guidance

2.1 THE EUROPEAN AIR QUALITY FRAMEWORK DIRECTIVE AND DAUGHTER DIRECTIVES

2.1.1 The European Air Quality Framework Directive (Directive 96/62/EC) establishes a strategic framework for setting Europe-wide limit values for twelve pollutants. The pollutants are sulphur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter smaller than 10 micrometres (µm) in aerodynamic diameter (PM_{10}), lead (Pb), carbon monoxide (CO), benzene (C_6H_6), ozone (O_3), polycyclic aromatic hydrocarbons (PAHs), cadmium (Cd), arsenic (As), nickel (Ni) and mercury (Hg).

2.1.2 Limit values for each pollutant are established by a series of Daughter Directives and based on recommendations made by the World Health Organisation (WHO). Legally binding limit values for Member States to achieve have already been set for SO_2, NO_2, nitrogen oxides (NO_x), PM_{10}, Pb, CO and C_6H_6. The European Commission is currently working on proposals for the remaining pollutants identified in the Air Quality Framework Directive.

2.1.3 The new Air Quality Directive 2008/50/EC came into force on the 11th June 2008. This new directive merged four existing Directives and one Council Decision into a single Directive on air quality. It also sets new standards and target dates for reducing concentrations of fine particles. Under the new Directive Member States are required to reduce exposure to $PM_{2.5}$ in urban areas by an average of 20% by 2020 based on 2010 levels, and obliges them to reduce exposure levels below 20ug/m^3 by 2015 in these areas.

2.2 AIR QUALITY STRATEGY FOR ENGLAND, SCOTLAND, WALES & NORTHERN IRELAND

2.2.1 The Government's policy on air quality within the UK is set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (AQS) published in July 2007[1]. The AQS sets out a framework for reducing hazards to health from air pollution and ensuring that international commitments are met in the UK. The AQS is designed to be an evolving process that is monitored and regularly reviewed.

2.2.2 The AQS sets standards and objectives for nine main air pollutants to protect health, vegetation and ecosystems. These are C_6H_6, 1,3 butadiene (C_4H_6), CO, Pb, NO_2, PM_{10}, SO_2, O_3, and PAHs.

2.2.3 The air quality standards are concentration limits which represent negligible or zero risk to health, based on medical and scientific evidence reviewed by the Expert Panel on Air Quality Standards (EPAQS) and the WHO. Above these limits sensitive members of the public (e.g. children, the elderly and the unwell) might experience adverse health effects.

2.2.4 The air quality objectives are medium-term policy based targets set by the Government which take into account economic efficiency, practicability, technical feasibility and timescale. Some objectives are equal to the EPAQS recommended standards or WHO guideline limits, whereas others involve a margin of tolerance, i.e. a limited number of permitted exceedences of the standard over a given period.

2.2.5 For some pollutants, (e.g. NO_2), there is both a long-term (annual mean) standard and a short-term standard. In the case of NO_2, the short-term standard is for a 1-hour averaging period, whereas for PM_{10} it is for a 24-hour averaging period. These

[1] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2) – July 2007.

periods reflect the varying impacts on health of differing exposures to pollutants, for example temporary exposure on the pavement adjacent to a busy road, compared with the exposure of residential properties adjacent to a road.

2.2.6 Of the pollutants included in the AQS, NO_2 and PM_{10} will be particularly relevant to this appraisal as road traffic is a major source and concentrations of these pollutants tend to be close to air quality objectives in urban locations. Local authorities undertaking review and assessments of air quality are finding that, where road traffic is the dominant source of air pollution, the objectives for these pollutants are likely to be the most difficult to achieve. It is also generally considered that, where concentrations of NO_2 and PM_{10} meet their respective objectives, and there are no other local sources of air pollution, such as from industrial processes, objectives for the other pollutants included the regulations will also be achieved.

2.3 AIR QUALITY (ENGLAND) REGULATIONS

2.3.1 Many of the objectives in the AQS have been made statutory in England with the *Air Quality (England) Regulations 2000*[2] and the *Air Quality (England) (Amendment) Regulations 2002*[3] for the purpose of Local Air Quality Management (LAQM). The standards and objectives for each pollutant in the AQS and the Regulations are given in **Appendix A**.

2.4 LOCAL AIR QUALITY MANAGEMENT (LAQM)

2.4.1 Under Part IV of the *Environment Act 1995*, local authorities must review and document local air quality within their area by way of staged appraisals and respond accordingly, with the aim of meeting the air quality objectives by the years defined in the Regulations. Where the objectives of the Air Quality Regulations are not likely to be achieved by the objective year, an authority is required to designate an Air Quality Management Area (AQMA). For each AQMA the local authority is required to draw up an Air Quality Action Plan (AQAP) to secure improvements in air quality and show how it intends to work towards achieving air quality standards in the future.

2.4.2 The Department for Environment, Food and Rural Affairs (DEFRA) has published technical guidance for use by local authorities in their review and assessment work[4]. This guidance, referred to in this report as LAQM.TG(03), has been used where appropriate in the assessment presented herein.

2.5 NATIONAL PLANNING POLICY

Planning Policy Statement 1 (PPS1): Delivering Sustainable Development

2.5.1 This policy guidance sets out objectives for the planning system regarding air quality. In particular it states that policies 'should take account of environmental issues such as air quality and pollution'. PPS1 also contains guidance on general principles for pollution issues; which include:

- Significant adverse impacts on the environment should be avoided and alternative options should be pursued. Mitigatory measures can be used;
- The polluter pays principle should be employed; and
- The causes and impacts of pollution should both be addressed.

[2] The Air Quality (England) Regulations 2000 - Statutory Instrument 2000 No.928

[3] The Air Quality (England) (Amendment) Regulations 2002 - Statutory Instrument 2002 No.3043

[4] Department for Environment, Food and Rural Affairs (DEFRA): *Part IV The Environment Act 1995 Local Air Quality Management Review and Assessment Technical Guidance LAQM.TG(03)* (Feb 2003).

Planning Policy Statement 23 (PPS23): Planning and Pollution Control

2.5.1 Policy guidance for local planning authorities (in England only) regarding local air quality and new development is provided in PPS23[5]. PPS23 advises on the policies and practices that should be taken into account by those involved in the planning of any development that has the potential to cause pollution.

2.5.2 With regard to emissions to air, and specifically local air quality management, Appendix 1G of Annex 1 in PPS23 states that *'any air quality consideration that relates to land use and its development is capable of being a material planning consideration'*. This is most likely to be the case in situations where the proposed development could produce an exceedence of the AQS objectives and result in an AQMA designation, or where development is proposed in an AQMA, or where a proposed development renders a Local Authority's AQAP unworkable. PPS23 also re-iterates that the presence of an AQMA should not result in the sterilisation of a site from development.

2.6 LOCAL PLANNING POLICY

Replacement Calderdale Unitary Development Plan (Adopted August 2006)

2.6.1 The replacement Calderdale Unitary Development Plan (UDP) replaces the former UDP adopted in April 1997. The policies contained within the replacement UDP are intended to control and shape development and to provide certainty as to the circumstances in which development proposals will be supported. The replacement UDP contains a number of policies that relate specifically to air quality. Policy EP1 Protection of air quality states:

> *'Development which might cause air pollution (including that from modes of transport) will only be permitted if:-*
>
> *i. it would not harm the health and safety of users of the site and surrounding area; and*
>
> *ii. it would not harm the quality and enjoyment of the environment.*
>
> *Where permission is granted, appropriate conditions and/or planning obligations will be attached to ensure that the air quality is maintained.'*

2.6.2 Policy EP2 Development within an Air Quality Management Area states:

> *'Within a declared Air Quality Management Area, development will be permitted provided it can be demonstrated that the pollution levels, if any, would be consistent with the objectives and/or targets of an Action Plan and would not lead to unacceptable pollution levels.'*

[5] Communities and Local Government: *Planning Policy Statement 23: Planning and Pollution Control* (Oct 2004).

3 Baseline Conditions

3.1.1 Calderdale Metropolitan Borough Council (CMBC) has completed the first and second rounds of the review and assessment process and declared an AQMA due to measured exceedences of the annual mean objectives for NO_2.

3.1.2 CMBC has also undertaken the third round of review and assessment. Through work undertaken during this round CMBC declared a further two areas as AQMAs due to exceedences of the annual NO_2 objective and identified a further four areas that required further detailed assessment.

3.1.3 CMBC completed their detailed assessment in 2006 and as a result a further three AQMAs were declared for exceedences of the NO_2 objective. None of the six AQMAs are in the immediate vicinity of the proposed development site.

3.3 LOCAL EMISSIONS SOURCES

3.3.1 Review of CMBC's Updating and Screening Assessment of Air Quality 2005 shows that there are no Part A2/B[6] industrial pollution sources in the immediate vicinity of the site that will affect air quality. There are also no part A1[7] processes within the vicinity of the site that will influence air quality either. The closest process is a Surface Treating Metals process operated by Carrington Wire Ltd located approximately 2km away to the northeast. Emissions from road traffic will therefore be the main source of pollution at the site.

3.4 BACKGROUND AIR QUALITY DATA

3.4.1 There are no automatic air quality monitoring sites in the immediate vicinity of the site from which background concentrations can be obtained. Therefore suitable estimates from the National Air Quality Archive (UKAQA) were obtained.

3.4.2 **Table 1** shows the estimated background concentrations of oxides of nitrogen (NO_x), NO_2, and PM_{10} that were used in the appraisal. Background values for NO_x are presented, as they are required in the conversion of modelled NO_x concentrations to total NO_2. Concentrations have been factored forward to those years considered in this assessment, using scaling factors given on the UKAQA.

TABLE 1 Estimated background concentrations used in the assessment ($\mu g/m^3$)

Pollutant	2008	2010
NO_x	34.4	32.3
NO_2	22.3	21.9
PM_{10}	21.1	20.8

3.4.3 The table above shows that for all years estimated background concentrations of NO_2 are below the objective limit of $40\mu g/m^3$ to be achieved by 2005 and thereafter. Estimated background concentrations of PM_{10} meet the objective limit of $40\mu g/m^3$ to be achieved by 2004 and thereafter.

3.4.4 Concentrations of NO_2 measured at more distant automatic monitoring stations within the administrative boundary of CMBC are provided in **Table 2**.

[6] Small scale industrial processes requiring authorisation from the Local Authority

[7] Large scale industrial processes requiring authorisation from the Environment Agency

TABLE 2 Concentrations measured at nearby automatic monitoring stations ($\mu g/m^3$)

Pollutant	2007
Romon 1 – Salterhebble Hill	
Annual mean NO_2 ($\mu g/m^3$)	53.5
Number of hourly mean NO_2 > 200$\mu g/m^3$	3
Romon 2 – Salterhebble Hil	
Annual mean NO_2 ($\mu g/m^3$)	50.6
Number of hourly mean NO_2 > 200$\mu g/m^3$	2
Romon 3 – Market St, Hebden Bridge	
Annual mean NO_2 ($\mu g/m^3$)	46.2
Number of hourly mean NO_2 > 200$\mu g/m^3$	1
Romon 4 – Wharf Street, Sowerby Bridge	
Annual mean NO_2 ($\mu g/m^3$)	49.2
Number of hourly mean NO_2 > 200$\mu g/m^3$	0

3.4.5 At all monitoring locations the annual mean objective for NO_2 was exceeded in 2007. The monitoring sites represent roadside locations within the Borough. There have been no breaches of the hourly mean NO_2 objective at any of the monitoring locations.

3.5 LOCAL AIR QUALITY MONITORING DATA

3.5.1 CMBC has also undertaken diffusion tube monitoring at two sites in close proximity to the site. Results from these sites over the last full year when data were available are given in **Table 3**.

TABLE 3 CMBC NO_2 diffusion tube monitoring results

Site	Distance from site	Grid reference	2007
HTA H; House, Hill Top Avenue (Roadside)	500m	411494, 419594	47$\mu g/m^3$
AT2; drainpipe Lindley Moor Road (Roadside)	600m	411355, 419400	44$\mu g/m^3$

4 Appraisal methodology

4.1 SCOPE

4.1.1 The scope of the appraisal has been determined in the following way:

- consultation with the Environmental Health Department of CMBC to discuss the availability of monitoring data, the appraisal methodology to be applied and obtain a copy of their latest review and assessment report;
- review of air quality data for the area surrounding the site, including data from the UK Air Quality Archive (UKAQA)[8] and the Environment Agency[9]; and
- review of the traffic flow data provided by WSP Development and Transportation Ltd (WSPD&T), which has been used as an input to the appraisal.

4.2 METHODOLOGY

4.2.1 The future occupants of the site will be exposed to pollutant concentrations from road traffic emissions from the local road network. The main pollutants of concern for road traffic are generally considered to be NO_2, PM_{10}, CO and C_6H_6. Of these pollutants, emissions of NO_2 and PM_{10} are most likely to result in exceedences of the relevant air quality standards or objectives in urban areas. Indeed, CMBC has declared six AQMAs due to measured exceedences of the objective for NO_2. This air quality assessment will therefore only consider NO_2 and PM_{10}.

4.2.2 The dispersion model ADMS Roads has been used to predict concentrations of NO_2 and PM_{10} across the site. The ADMS Roads dispersion model has been widely validated for this type of assessment and is considered to be fit for purpose.

4.2.3 Meteorological data, such as wind speed and direction, is used by the model to determine pollutant transportation and levels of dilution by the wind. Meteorological data used in the model was obtained from the Met Office observing station at Elmley Moor. This station is considered to provide data representative of the conditions at the site. The meteorological data used for this appraisal was from 2007, a windrose is provided in **Appendix B**.

4.2.4 Three scenarios were modelled, as follows:

- 2007 "model verification";
- 2008 "baseline"; and
- 2010 "future baseline".

4.2.5 A summary of the traffic data used in the dispersion modelling can be found in **Appendix C**. It includes details of Annual Average Daily Traffic flows (AADT), average vehicle speeds and the percentage of Heavy Duty Vehicles (HDVs) for the local road network in all years considered.

4.2.6 Modelled annual mean oxides of nitrogen (NO_x) concentrations were converted to annual mean NO_2 concentrations for direct comparison with the AQS objectives using the method given in LAQM.TG(03).

4.2.7 LAQM.TG(03) does not provide a method for the conversion of annual mean NO_2 concentrations to 1 hour mean NO_2 concentrations. However, research[10] has

[8] http://www.airquality.co.uk

[9] http://www.environment-agency.gov.uk

[10] D Laxen and B Marner: *Analysis of the relationship between 1-hour and annual mean nitrogen dioxide at UK roadside and kerbside monitoring sites* (July 2003).

concluded that exceedences of the 1 hour mean objective are unlikely to occur where annual mean concentrations do not exceed 60µg/m^3.

Model validation and verification

4.2.8 Model validation undertaken by the software developer will not have included validation in the vicinity of the site considered in this assessment. It is therefore necessary to perform a comparison of modelled results with local monitoring data at relevant locations. This process of verification attempts to minimise modelling uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results.

4.2.9 Suitable local monitoring data for the purpose of verification is available for concentrations of NO_2 at the location shown in **Table 4** below. Local monitoring data is not available for concentrations of PM_{10}.

TABLE 4 Local monitoring data sources suitable for model verification

Location	Distance from the proposed development	2007 measured concentrations
HTA H; House, Hill Top Avenue	500m	47µg/m^3

4.2.10 Model verification has been undertaken following the methodology specified in LAQM.TG(03) using the monitoring data shown in the table above and traffic flow information for the roads adjacent to this site.

4.2.11 The results of the model verification are discussed in Section five. The verification factor of 1.13 obtained during this process has been applied to the modelling results for both NO_2 and PM_{10} and the verification calculation is shown in **Appendix D**.

5 Appraisal of potential constraints

5.1.1 Contour plots showing the predicted concentrations across the site in 2008 and 2010 are provided in **Figures 1 – 4** and a summary is provided below.

Annual mean NO_2 concentrations

5.1.2 The objective for annual mean NO_2 concentrations is 40µg/m^3 to be achieved by the end of 2005. **Figure 1** shows that in the 2008 baseline case concentrations exceed the annual mean objective at locations close to the M62 and meet the objective further from the road. Concentrations exceed the annual objective in the north eastern corner of the site up to 30m from the M62; at distances further from the road concentrations meet the annual mean objective across the site.

5.1.3 By 2010, the year in which the EU limit value for NO_2 is to be met, concentrations are reduced from the 2008 baseline. **Figure 2** show that concentrations again exceed the annual mean objective at locations close to the M62. Concentrations exceed the annual objective in the north eastern corner of the site up to 20m from the M62; at distances further from the road concentrations meet the annual mean objective across the site.

5.1.4 It is understood that the site is intended to be developed for predominantly residential use. In order to ensure that future residents are not exposed to poor air quality, it is recommended that residential properties are not built in locations where pollutant concentrations are predicted to exceed the statutory AQS objective levels.

5.1.5 Locating commercial buildings closest to the motorway would be suitable in terms of the averaging period for this objective and this could be considered. The objective for annual mean NO_2 concentrations does not apply to *'building facades of offices or other places of work where members of the public are not regularly present'* (LAQM.TG(03)). Therefore, annual mean NO_2 concentrations at the Site are not a constraint to commercial development near the motorway edge.

5.1.6 It should be noted, however, that this distance should reduce with time beyond 2010 due to an expected future improvement (i.e. decrease) in background concentrations and vehicle emissions associated with technological advancements and replacement of the vehicle fleet.

5.1.7 Given the results of the modelling and the lack of air quality monitoring data for the area in which the site is located, it is recommended that an on-site monitoring programme is undertaken for a minimum of three months in order to establish baseline NO_2 concentrations across the Site and confirm the predictions made in this assessment. The monitoring data could also be used to inform formulation of the masterplan for the proposed development and any air quality modelling that is undertaken in support of a future planning application.

Hourly mean NO_2 concentrations

5.1.8 The annual mean NO_2 concentrations predicted by the model were all below 60µg/m^3, and therefore exceedences of the hourly mean NO_2 concentration objective are unlikely to occur.

Annual mean PM_{10} concentrations

5.1.9 The objective for annual mean PM_{10} concentrations is a concentration of 40µg/m^3 to be achieved by the end of 2004. **Figure 3** shows that in the 2008 baseline case concentrations are predicted to easily meet the objective at the site.

5.1.10 By 2010, predicted are reduced from the 2008 baseline case. Concentrations are predicted to easily meet the objective across the site.

6 Summary

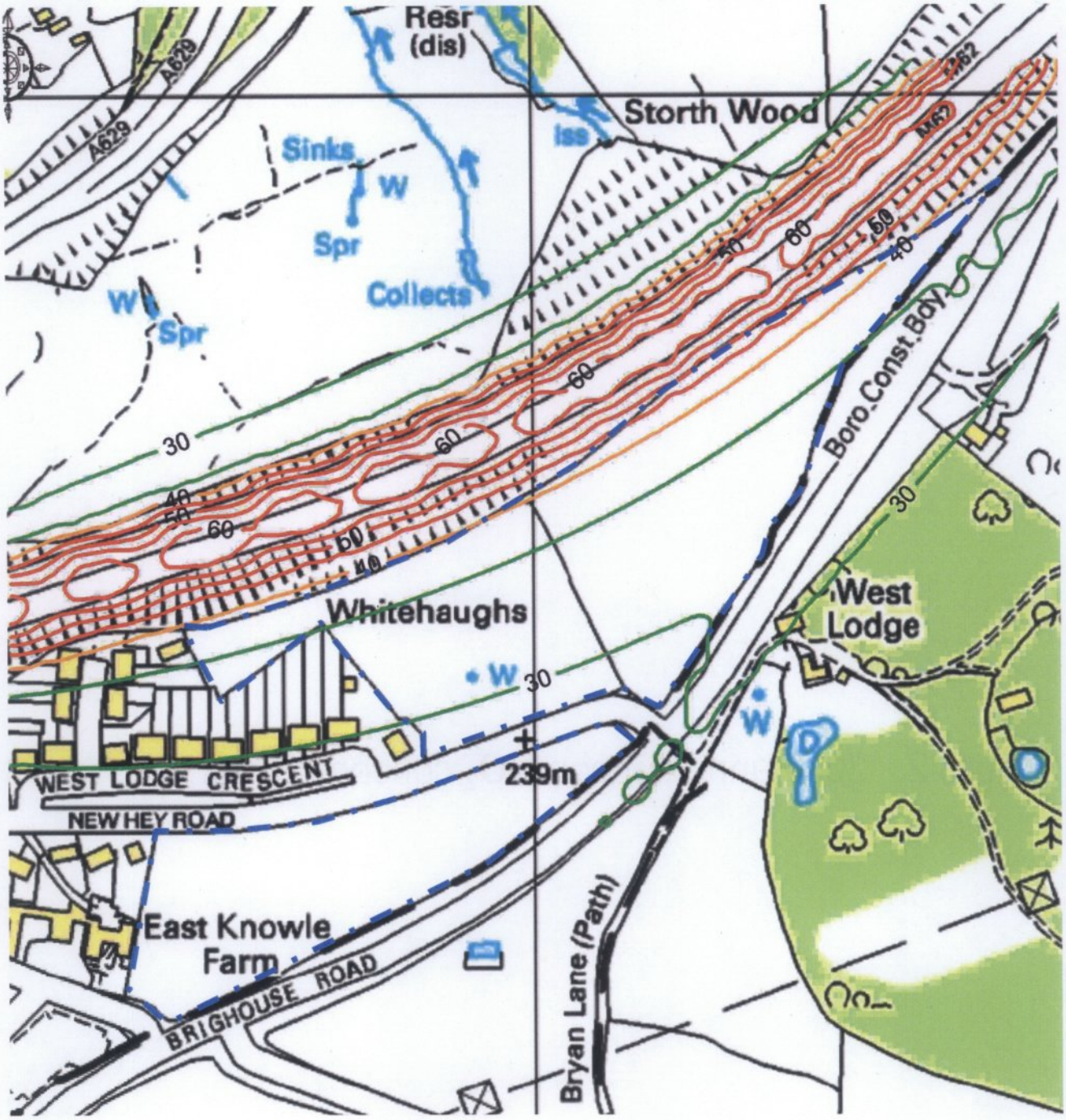
6.1.1 The annual mean objectives for both NO_2 and PM_{10} are not predicted to be exceeded at the site in either 2008 or 2010. Any potential development of the site will increase traffic flows on the road network and this will increase pollutant concentrations on the site.

6.1.2 The results of the assessment indicate that in 2010 annual mean NO_2 concentrations are predicted to meet the objective across the majority of the site but exceedances of the objective are predicted close to the motorway edge (up to a distance of approximately 20m southwest of the edge of the M62 carriageway into the site). In order to ensure that future residents are not exposed to poor air quality, it is recommended that no residential properties are built in locations where pollutant concentrations are predicted to exceed the statutory objective level.

6.1.3 However, given the results of the modelling and expected future improvement (i.e. decrease) in background concentrations and vehicle emissions beyond 2010, the site is suitable for future residential development. However, it is recommended that an on-site air quality monitoring programme is undertaken for a minimum of three months in order to establish baseline NO_2 concentrations and to confirm the predictions made in this appraisal. The monitoring data could also be used to inform the formulation of the masterplan for any proposed development and verify any air quality modelling that is undertaken in support of a future planning application.

6.1.4 Predicted annual mean concentrations of PM_{10} and hourly mean NO_2 concentrations in 2010 are below the current statutory objective levels across the whole of the site.

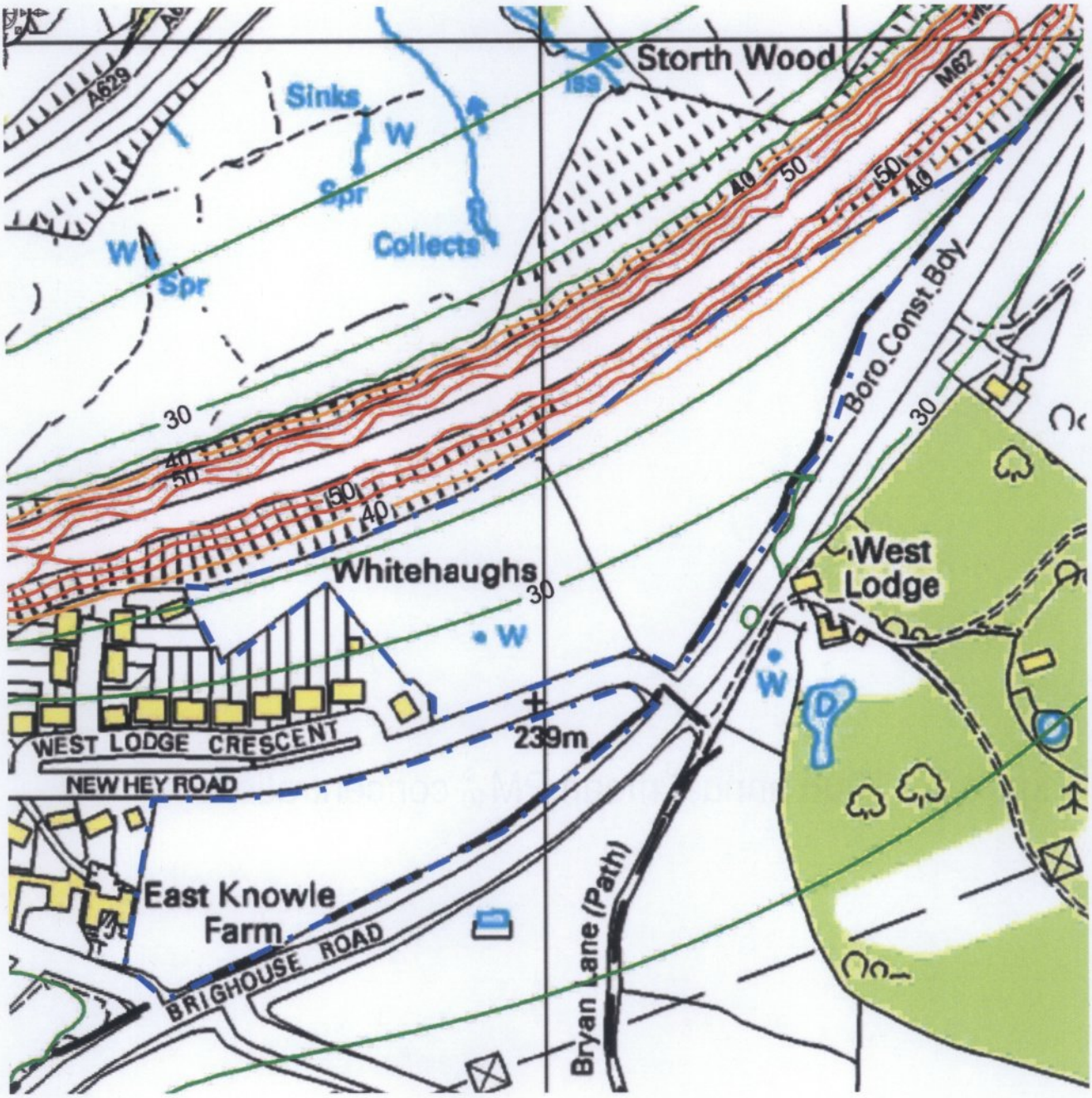
Figure 1 2008 annual mean NO_2 concentrations



Key

Site Boundary

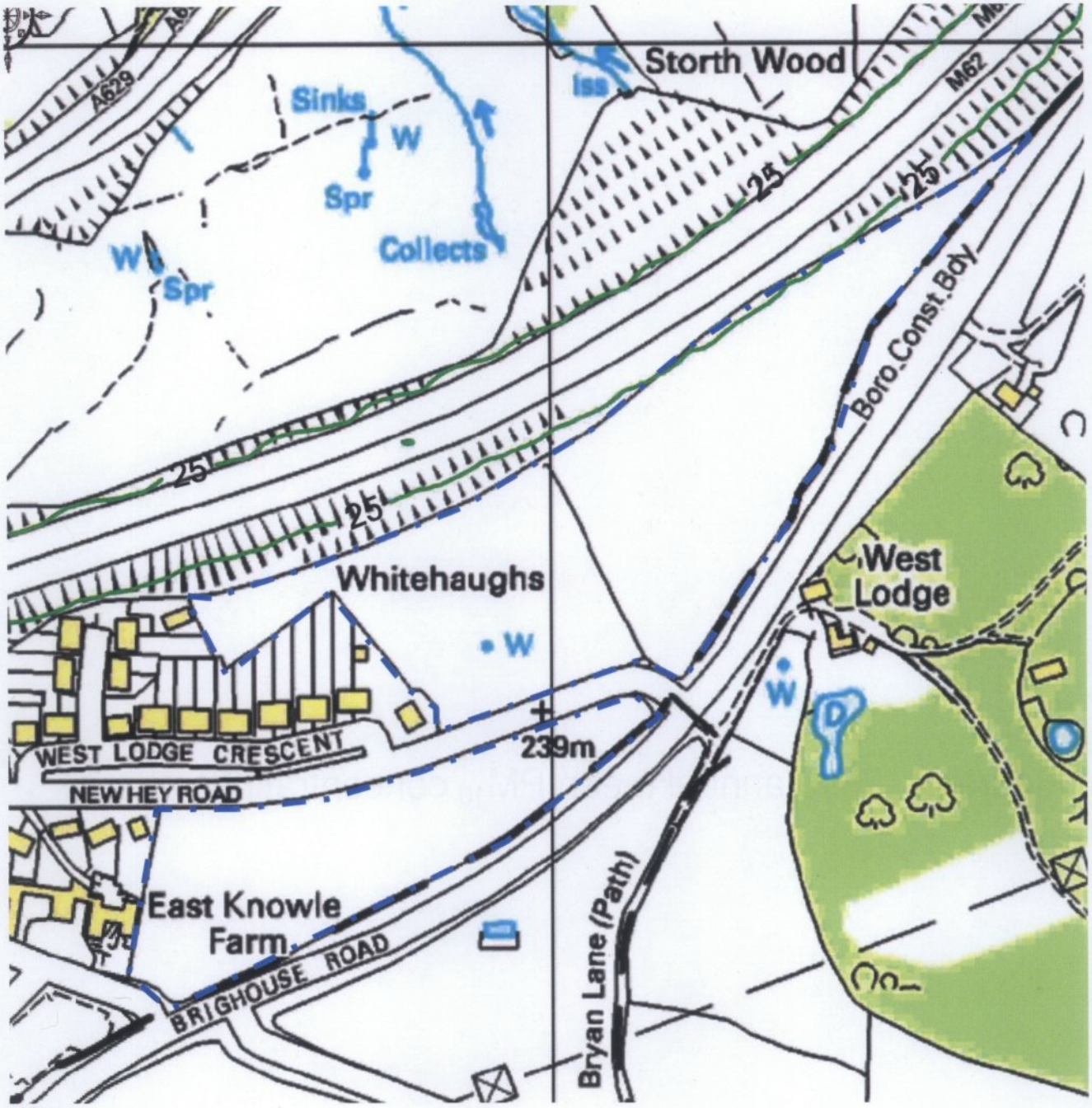
Figure 2 2010 annual mean NO_2 concentrations



Key

Site Boundary

Figure 3 2008 annual mean PM_{10} concentrations


Storth Wood
Sinks
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A629
M62
25
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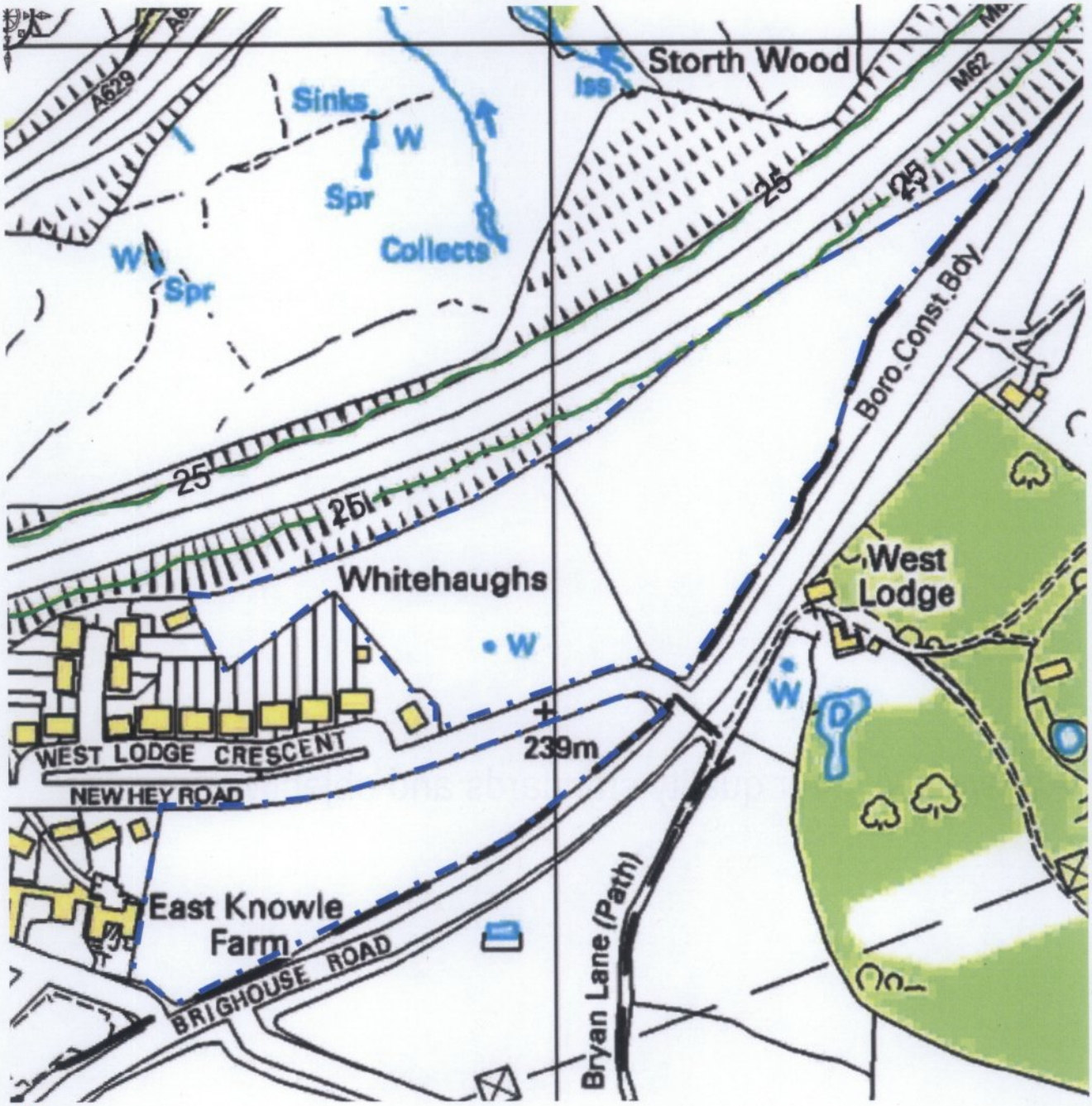
Whitehaughs
W
West Lodge
W
WEST LODGE CRESCENT
NEW HEY ROAD
239m
East Knowle Farm
BRIGHOUSE ROAD
Bryan Lane (Path)
Key
Site Boundary

Figure 4 2010 annual mean PM_{10} concentrations


Storth Wood
Sinks
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Collects
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M62
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25
Boro.Const.Bdy
Whitehaughs
W
West Lodge
W
239m
WEST LODGE CRESCENT
NEW HEY ROAD
East Knowle Farm
BRIGHOUSE ROAD
Bryan Lane (Path)
Key
Site Boundary

Appendix A Air quality standards and objectives

Air quality standards and objectives

A summary of the current air quality objectives for the seven pollutants detailed in the *Air Quality Regulations 2000 and (Amendment) Regulations 2002* for the purpose of Local Air Quality Management is provided below.

Air Quality Objectives currently included in the Air Quality Regulations 2000 and (Amendment) Regulations 2002 for the purpose of Local Air Quality Management (LAQM)						
Pollutant	**Applies to**	**Standard**		**Objective**		**EU AQ Daughter Directive**
		Concentration	*Measured as*	*Annual exceedences allowed*	Target date	
Benzene (C_6H_6)	All UK	16.25µg/m^3	running annual mean		31.12.2003	
	England and Wales	5µg/m^3	annual mean		31.12.2010	As standard. target: 01.01.2010
	Scotland	3.25µg/m^3	running annual mean		31.12.2010	
1,3-Butadiene (C_4H_6)	All UK	2.25µg/m^3	running annual mean		31.12.2003	
Carbon monoxide (CO)	All UK	10mg/m^3	maximum daily running 8 hour mean		31.12.2003	As standard. target: 01.01.2005
Lead (Pb)	All UK	0.5µg/m^3	annual mean		31.12.2004	As standard. target: 01.01.2005[10]
	All UK	0.25µg/m^3	annual mean		31.12.2008	
Nitrogen dioxide (NO_2)[1]	All UK	200µg/m^3	1 hour mean	18	31.12.2005	As objective. target: 01.01.2010
	All UK	40µg/m^3	annual mean		31.12.2005	As standard. target: 01.01.2010
Particulate Matter (PM_{10}) (gravimetric)[2]	All UK	40µg/m^3	annual mean		31.12.2004	As standard. target: 01.01.2005
	All UK	50µg/m^3	24 hour mean	35	31.12.2004	As objective. target: 01.01.2005
	Scotland	50µg/m^3	24 hour mean	7	31.12.2010	As objective. target: 01.01.2010
	Scotland	18µg/m^3	annual mean		31.12.2010	
Sulphur dioxide (SO_2)	All UK	266µg/m^3	15 minute mean	35	31.12.2005	
	All UK	350µg/m^3	1 hour mean	24	31.12.2004	As objective. target: 01.01.2005
	All UK	125µg/m^3	24 hour mean	3	31.12.2004	As objective. target: 01.01.2005

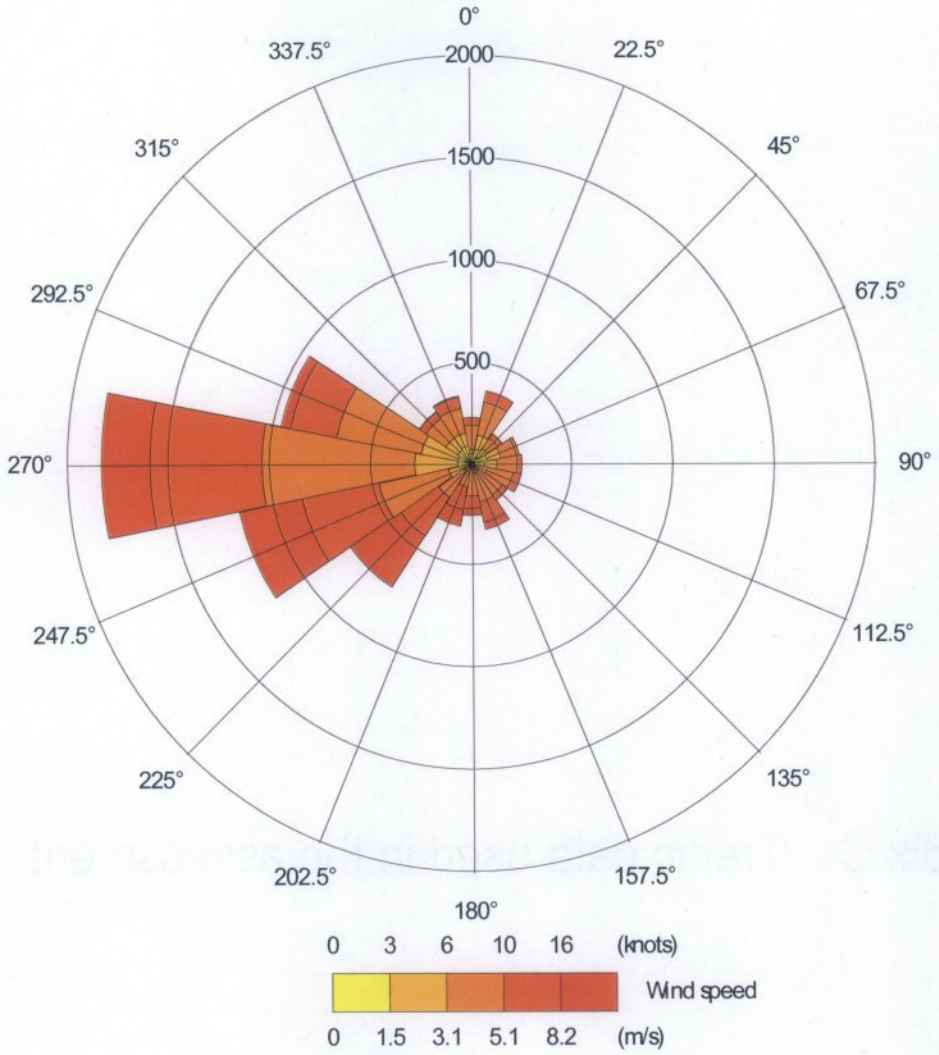
Provisional Air Quality Objectives currently NOT included in the Air Quality Regulations 2000 and (Amendment) Regulations 2002 for the purpose of Local Air Quality Management (LAQM)						
Pollutant	**Applies to**	**Standard**		**Objective**		**EU AQ Daughter Directive**
		Concentration	*Measured as*	*Annual exceedences allowed*	Target date	
Polycyclic aromatic hydrocarbons (PAHs)[4]	All UK	0.25ng/m^3 B[a]P[5]	annual mean		31.12.2010	

Other Air Quality Strategy Objectives						
Pollutant	**Applies to**	**Standard**		**Objective**		**EU AQ Daughter Directive**
		Concentration	*Measured as*	*Annual exceedences allowed*	Target date	
For the protection of human health						
Ozone (O_3)[6]	All UK	100µg/m^3	maximum daily running 8 hour mean	10	31.12.2005	As objective; but 25 annual exceedences target: 01.01.2010
For the protection of vegetation and ecosystems[7]						
Nitrogen oxides (NO_X)[8]		30µg/m^3	annual mean		31.12.2000[9]	As standard. target: 19.07.2001
Sulphur dioxide (SO_2)		20µg/m^3	annual mean		31.12.2000[9]	As standard. target: 19.07.2001
		20µg/m^3	winter mean (1 October to 31 March)		31.12.2000[9]	As standard. target: 19.07.2001

Explanation:
ng/m^3 = nanogrammes per cubic metre;
$\mu g/m^3$ = microgrammes per cubic metre;
mg/m^3 = milligrams per cubic metre (i.e. microgrammes per cubic meter x 1,000);
1 Objectives for this pollutant are provisional but still included in regulations.
2 Measured using the European gravimetric transfer sampler or equivalent.
3 Only proposed to be achieved where cost-effective and proportional local action can be identified.
4 Objective to be set in regulations in the future.
5 Concentration of Benzo[a]pyrene (B[a]P) to be measured as a marker for the total mixture of PAHs.
6 The objective for this pollutant is provisional and must be tackled at a national level due to its transboundary nature.
7 Only applies to those parts of the UK > 20km from an agglomeration; and > 5km from Part A processes, motorways and built up areas of > 5,000 people.
8 Assuming NO_X is taken as NO_2.
9 These objectives have successfully been achieved.
10 Also an EU AQ Directive Limit Value of $1\mu g/m^3$ to be achieved by 01.01.2010 in the immediate vicinity (1000 m) of certain named industrial sources situated on sites contaminated by decades of industrial activities.

The Air Quality Strategy states that further review and assessment and consultation in relation to air quality will be a rolling process, with additional revisions to the objectives for selected pollutants as appropriate, or where there is new evidence in relation to the effects of pollutants on health or ecosystems. New pollutants may be introduced through future reviews.

Appendix B Windrose for Elmley Moor (2007)


0°
22.5°
45°
67.5°
90°
112.5°
135°
157.5°
180°
202.5°
225°
247.5°
270°
292.5°
315°
337.5°
2000
1500
1000
500
0 3 6 10 16 (knots)
Wind speed
0 1.5 3.1 5.1 8.2 (m/s)

Appendix C Traffic data used in the assessment

Summary of the traffic data used in the assessment

2007 Verification

Road link	Speed (km/hour)	Annual Average Hourly Flows (AAHT)	LDVs	HDVs
A634 New Hey Road	45	424	417	7
A629 Huddersfield Road	45	1384	1294	90
M62 Eastbound	110	2192	1835	357
M62 Westbound	110	2192	1835	357

2008 Baseline

Road link	Speed (km/hour)	Annual Average Hourly Flows (AAHT)	LDVs	HDVs
A634 New Hey Road	45	431	424	7
A629 Huddersfield Road	45	1406	1314	92
M62 Eastbound	110	2226	1864	362
M62 Westbound	110	2226	1864	362

2010 Baseline

Road link	Speed (km/hour)	Annual Average Hourly Flows (AAHT)	LDVs	HDVs
A634 New Hey Road	45	444	437	7
A629 Huddersfield Road	45	1450	1355	95
M62 Eastbound	110	2295	1922	373
M62 Westbound	110	2295	1922	373

Appendix D Verification calculation

Ainley Top Diffusion Tube

Monitored conc at receptor in 2007	47
Assumed background NO_2 in 2007	23.39
Assumed background NO_x in 2007	35.97
Modelled NO_x(roads) concentration at receptor in 2007	113.92
Assuming LAQM.TG(03) Nox to NO2 conversions	
Required NO_2(road) (i.e. Monitored NO_2 - background NO_2)	23.61
Required modelled NO_x to get monitored NO_2 concentration	129.2
Validated NO_2(road)	23.61

Calculated validation factor	1.13