Air Quality Assessment

Lidl Food Store

Botwell Lane, Hayes

For Lidl UK GmbH

Quality Management

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Executive Summary

The Botwell Lane Lidl development is located within the administrative area of the London Borough of Hillingdon (LBH). The development comprises a Lidl foodstore on the site of the former swimming pool at Botwell Lane in Hayes, Middlesex.

LBH has designated as an Air Quality Management Area (AQMA) the *'area from the southern boundary north to the border defined by, the A40 corridor from the western borough boundary, east to the intersection with the Yeading Brook north until its intersection with the Chiltern-Marylebone railway line and then east along the railway line to the eastern borough boundary',* due to high levels of nitrogen dioxide (NO2) attributable to road traffic emissions. The Application Site is located within this AQMA.

This Air Quality Assessment, undertaken to accompany the planning application, considers the air quality impacts from the construction phase and once the Proposed Development is fully operational.

The assessment has been undertaken based upon appropriate information on the Proposed Development provided by Lidl UK and its project team. In undertaking this assessment, RPS experts have exercised professional skills and judgement to the best of their abilities and have given professional opinions that are objective, reliable and backed with scientific rigour. These professional responsibilities are in accordance with the code of professional conduct set by the Institution of Environmental Sciences for members of the Institute of Air Quality Management (IAQM).

For the construction phase, the most important consideration is dust. Without appropriate mitigation, dust could cause temporary soiling of surfaces, particularly windows, cars and laundry. The mitigation measures provided within this report should ensure that the risk of adverse dust effects is reduced to a minimum.

For the operational phase, arrivals at and departures from the Proposed Development may change the number, type and speed of vehicles using the local road network. Changes in road vehicle emissions are the most important consideration during this phase of the development.

Detailed atmospheric dispersion modelling has been undertaken for the first year in which the development is expected to be fully operational, 2016. The operational impact of the Proposed Development on existing receptors is predicted to be "slight adverse" taking into account the changes in pollutant concentrations and absolute levels. Using the significance criteria adopted for this assessment together with professional judgement, the operational air quality effects are considered to be 'not significant' overall.

The Botwell Lane Lidl development does not, in air quality terms, conflict with national or local policies, or with measures set out in LBH's Air Quality Action Plan. There are no constraints to the development in the context of air quality.

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1 Introduction

1.1 This report details the air quality assessment undertaken for the proposed Lidl foodstore on the site of the former swimming pool at Botwell Lane in Hayes, Middlesex. The report complements the accompanying RPS report *'Air Quality Neutral Calculation: Lidl Food Store, Botwell Lane, Hayes'* dated 28 July 2016. That air quality neutral calculation report quantifies the emissions of atmospheric pollutants from the development at source (i.e. from vehicles and building plant) and compares the emissions with official benchmark levels that define neutrality. In contrast, this report considers the impacts of the development on ambient air quality at the point of exposure (i.e. at sensitive receptor locations) by comparing predicted levels with Air Quality Strategy objectives and EU Limit Values.

1.2 The proposed foodstore would be located within the administrative area of London Borough of Hillingdon (LBH). LBH has designated as an Air Quality Management Area (AQMA) the '*area from the southern boundary north to the border defined by, the A40 corridor from the western borough boundary, east to the intersection with the Yeading Brook north until its intersection with the Chiltern-Marylebone railway line and then east along the railway line to the eastern borough boundary*', due to high levels of nitrogen dioxide (NO_2) attributable to road traffic emissions. The Application Site is located within this AQMA.

1.3 This air quality assessment covers the:

- Construction phase - an evaluation of the temporary effects from fugitive construction dust and construction-vehicle exhaust emissions; and the
- Operational phase – an evaluation of the impacts of the development traffic on the local area.

1.4 This report begins by setting out the policy and legislative context for the assessment. The methods and criteria used to assess potential air quality effects have then been described. The baseline air quality conditions have been established taking into account Defra estimates, local authority documents and the results of any local monitoring. The results of the assessment of air quality impacts have been presented. A conclusion has been drawn on the significance of the residual construction-phase effects and the residual operational-phase effects.

2 Policy and Legislative Context

Ambient Air Quality Legislation and National Policy

The Ambient Air Quality Directive and Air Quality Standards Regulations

2.1 The 2008 Ambient Air Quality Directive (2008/50/EC) [1] aims to protect human health and the environment by avoiding, reducing or preventing harmful concentrations of air pollutants; it sets legally binding concentration-based limit values, as well as target values. There are also information and alert thresholds for reporting purposes. These are to be achieved for the main air pollutants: particulate matter (PM_{10} and $PM_{2.5}$), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), ozone (O_3), carbon monoxide (CO), lead (Pb) and benzene. This Directive replaced most of the previous EU air quality legislation and in England was transposed into domestic law by the Air Quality Standards (England) Regulations 2010 [2], which in addition incorporates the 4th Air Quality Daughter Directive (2004/107/EC) that sets targets for ambient air concentrations of certain toxic heavy metals (arsenic, cadmium and nickel) and polycyclic aromatic hydrocarbons (PAHs). Equivalent regulations exist in Scotland, Wales and Northern Ireland. Member states must comply with the limit values (which are legally binding on the Secretary of State) and the Government and devolved administrations operate various national ambient air quality monitoring networks to measure compliance and develop plans to meet the limit values.

UK Air Quality Strategy

2.2 The Environment Act 1995 established the requirement for the Government and the devolved administrations to produce a National Air Quality Strategy (AQS) for improving ambient air quality, the first being published in 1997 and having been revised several times since, with the latest published in 2007 [3]. The Strategy sets UK air quality standards[♦] and objectives[#] for the pollutants in the Air Quality Standards Regulations plus 1,3-butadiene and recognises that action at national, regional and local level may be needed, depending on the scale and nature of the air quality problem. There is no legal requirement to meet objectives set within the UK AQS except where equivalent limit values are set within the EU Directives.

2.3 The 1995 Environment Act also established the UK system of Local Air Quality Management (LAQM), that requires local authorities to go through a process of review and assessment of air quality in their areas, identifying places where objectives are not likely to be met, then declaring Air Quality Management Areas (AQMAs) and putting in place Air Quality Action Plans to improve

[♦] Standards are concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. Standards, as the benchmarks for setting objectives, are set purely with regard to scientific evidence and medical evidence on the effects of the particular pollutant on health, or on the wider environment, as minimum or zero risk levels.

[#] Objectives are policy targets expressed as a concentration that should be achieved, all the time or for a percentage of time, by a certain date.

air quality. These plans also contribute, at local level, to the achievement of EU limit values. Defra is currently reviewing the LAQM process.

2.4 For the purposes of this assessment, the limit values set out in the Air Quality Standards Regulations 2010 and the objective levels specified under the current UK AQS have been used.

2.5 The limit values and objectives relevant to this assessment are summarised in Table 2.1.

Table 2.1 Summary of Relevant Air Quality Limit Values and Objectives

Pollutant	Averaging Period	Objectives/ Limit Values	Not to be Exceeded More Than	Target Date
Nitrogen Dioxide (NO_2)	1 hour	200 µg.m^{-3}	18 times per calendar year	-
	Annual	40 µg.m^{-3}	-	-
Particulate Matter (PM_{10})	24 Hour	50 µg.m^{-3}	35 times per calendar year	-
	Annual	40 µg.m^{-3}	-	-
Particulate Matter ($PM_{2.5}$)	Annual	Target of 15% reduction in concentrations at urban background locations	-	Between 2010 and 2020 (a)
		Variable target of up to 20% reduction in concentrations at urban background locations (c)		Between 2010 and 2020 (b)
	Annual	25 µg.m^{-3}	-	01.01.2020 (a)
		25 µg.m^{-3}		01.01.2015 (b)

(a) Target date set in UK Air Quality Strategy 2007

(b) Target date set in Air Quality Standards Regulations 2010

(c) Aim to not exceed 18 µg.m^{-3} by 2020

National Planning Policy

National Planning Policy Framework

2.6 The National Planning Policy Framework (NPPF) [4] is a material consideration for local planning authorities and decision-takers in determining applications. At the heart of the NPPF is a presumption in favour of sustainable development. For determining planning applications, this means approving development proposals if they accord with the local development plan, unless material considerations indicate otherwise. If the development plan is absent, silent or the policies are out of date, then planning permission should be granted unless any adverse impacts would significantly outweigh the benefits, or specific policies in the NPPF indicate development should be restricted.

2.7 The NPPF sets out 12 core land-use planning principles. The relevant core-principle in the context of this air quality assessment is that planning should "*contribute to conserving and enhancing the natural environment and reducing pollution*". (Paragraph 17)

2.8 Under the heading 'Conserving and Enhancing the Natural Environment', the NPPF states:

"The planning system should contribute to and enhance the natural and local environment by:

- *…*
- *preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability… (Paragraph 109)*

National Planning Practice Guidance

2.9 The National Planning Practice Guidance (NPPG) was issued in March 2014 and is updated periodically by government as a live document. The Air Quality section of the NPPG describes the circumstances when air quality, odour and dust can be a planning concern, requiring assessment.

2.10 The NPPG advises that whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impact in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife).

2.11 The NPPG states that when deciding whether air quality is relevant to a planning application, considerations could include whether the development would:

- *"Significantly affect traffic in the immediate vicinity of the proposed development site or further afield. This could be by generating or increasing traffic congestion; significantly changing traffic volumes, vehicle speed or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; adds to turnover in a large car park; or result in construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more.*
- *Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; or extraction systems (including chimneys) which require approval under pollution control legislation or biomass boilers or biomass-fuelled CHP plant; centralised boilers or CHP plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area;*
- *Expose people to existing sources of air pollutants. This could be by building new homes, workplaces or other development in places with poor air quality.*

- *Give rise to potentially unacceptable impact (such as dust) during construction for nearby sensitive locations.*
- *Affect biodiversity. In particular, is it likely to result in deposition or concentration of pollutants that significantly affect a European-designated wildlife site, and is not directly connected with or necessary to the management of the site, or does it otherwise affect biodiversity, particularly designated wildlife sites."*

2.12 The NPPG provides advice on how air quality impacts can be mitigated and notes *"Mitigation options where necessary will be locationally specific, will depend on the proposed development and should be proportionate to the likely impact. It is important therefore that local planning authorities work with applicants to consider appropriate mitigation so as to ensure the new development is appropriate for its location and unacceptable risks are prevented. Planning conditions and obligations can be used to secure mitigation where the relevant tests are met.*

Regional Policy Guidance – The London Plan

2.13 The Mayor of London is responsible for all strategic planning in London. Amongst the Mayor's duties is the requirement to develop a Spatial Development Strategy for London, known as the London Plan [5]. The current version of the London Plan was published in March 2015 and incorporates Further Alterations to the London Plan published in July 2011. The Plan acts as an integrating framework for a set of strategies, including improvements to air quality.

2.14 The key policy relating to air quality is Policy 7.14: Improving Air Quality:

"Strategic

A. The Mayor recognises the importance of tackling air pollution and improving air quality to London's development and the health and well-being of its people. He will work with strategic partners to ensure that the spatial, climate change, transport and design policies of this plan support implementation of his Air Quality and Transport strategies to achieve reductions in pollutant emissions and minimise public exposure to pollution.

Planning decisions

B Development proposals should:

a. minimise increased exposure to existing poor air quality and make provision to address local problems of air quality (particularly within Air Quality Management Areas (AQMAs) and where development is likely to be used by large numbers of those particularly vulnerable to poor air quality, such as children or older people) such as by design solutions, buffer zones or steps to promote greater use of sustainable transport modes through travel plans (see Policy 6.3)

b. promote sustainable design and construction to reduce emissions from the demolition and construction of buildings following the best practice guidance in the GLA and London Councils' 'The control of dust and emissions from construction and demolition' *c. be at least 'air quality neutral' and not lead to further deterioration of existing poor air quality (such as areas designated as Air Quality Management Areas (AQMAs))*

d. ensure that where provision needs to be made to reduce emissions from a development, this is usually made on-site. Where it can be demonstrated that on-site provision is impractical or inappropriate, and that it is possible to put in place measures having clearly demonstrated equivalent air quality benefits, planning obligations or planning conditions should be used as appropriate to ensure this, whether on a scheme by scheme basis or through joint area-based approaches

e. where the development requires a detailed air quality assessment and biomass boilers are included, the assessment should forecast pollutant concentrations. Permission should only be granted if no adverse air quality impacts from the biomass boiler are identified.

2.15 The Mayor's Air Quality Strategy (MAQS) [6], referred to in Policy 7.14, sets out policies and proposals seeking to improve London's air quality to the point where air pollution no longer poses a significant risk to human health.

2.16 In April 2014, the Greater London Authority (GLA) published Supplementary Planning Guidance (SPG) Sustainable Design and Construction [7]. The SPG reinforces the existing need for a *'conventional'* Air Quality Assessment where pollutant concentrations, at the point of human exposure, are compared with the relevant national objectives; however, the SPG also details how major developments must demonstrate they are achieving the Mayor of London's *'Air Quality Neutral'* Policy 7.14. The Air Quality Neutral calculations have been undertaken for the Proposed Development and are provided in a separate report.

Local Planning Policy

2.17 In September 2004, the Planning & Compulsory Purchase Act [8] introduced a new development plan system intended to streamline the local planning process. Under the new system, Local Plans will be replaced by a Local Development Framework (LDF). The first of the LDF documents, the Core Strategy, was adopted by the Council in November 2012. Policy *EM8: Land, water, air and noise* is relevant to this assessment. Under the heading *Air Quality*, it states that:

"All development should not cause deterioration in the local air quality levels and should ensure the protection of both existing and new sensitive receptors.

All major development within the Air Quality Management Area (AQMA) should demonstrate air quality neutrality (no worsening of impacts) where appropriate; actively contribute to the promotion of sustainable transport measures such as vehicle charging points and the increased provision for vehicles with cleaner transport fuels; deliver increased planting through soft landscaping and living walls and roofs; and provide a management plan for ensuring air quality impacts can be kept to a minimum.

The Council seeks to reduce the levels of pollutants referred to in the Government's National Air Quality Strategy and will have regard to the Mayor's Air Quality Strategy. London Boroughs should also take account of the findings of the Air Quality Review and Assessments and Actions plans, in particular where Air Quality Management Areas have been designated.

The Council has a network of Air Quality Monitoring stations but recognises that this can be widened to improve understanding of air quality impacts. The Council may therefore require new major development in an AQMA to fund additional air quality monitoring stations to assist in managing air quality improvements."

2.18 The approach adopted for this assessment is entirely consistent with this guidance.

3 Assessment Methodology

Approach

3.1 Neither the NPPF nor the NPPG is prescriptive on the methodology for assessing air quality effects or describing significance; practitioners continue to use guidance provided by Defra and non-governmental organisations, including Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM). However, the NPPG does advise that *"Assessments should be proportionate to the nature and scale of development proposed and the level of concern about air quality, and because of this are likely to be locationally specific. The scope and content of supporting information is therefore best discussed and agreed between the local planning authority and applicant before it is commissioned."* It lists a number of areas that might be usefully agreed at the outset.

3.2 This air quality assessment covers the elements recommended in the NPPG. The approach is consistent with the EPUK/IAQM Land-Use Planning & Development Control: Planning For Air Quality document [9], the Mayor of London's Control of Dust and Emissions during Construction and Demolition Supplementary Planning Guidance [10], the IAQM Guidance on the assessment of dust from demolition and construction [11] and, where relevant, or the Mayor of London's Local Air Quality Management Technical Guidance: LLAQM.TG16 [12]. It includes the key elements listed below:

- assessment of the existing air quality in the study area (existing baseline) and prediction of the future air quality without the development in place (future baseline), using official government estimates from Defra, publically available air quality monitoring data for the area, and relevant Air Quality Review and Assessment (R&A) documents;
- a qualitative assessment of likely construction-phase impacts with mitigation and controls in place; and
- a quantitative prediction of the future operational-phase air quality impact with the development in place (with any necessary mitigation), encompassing the impacts of the development traffic on the local area.

3.3 In line with the guidance set out in the NPPG, the Environmental Health Department at LBH was asked to agree the scope and methodology for the original assessment, undertaken by RPS in November 2013.

3.4 Air quality guidance advises that the organisation engaged in assessing the overall risks should hold relevant qualifications and/or extensive experience in undertaking air quality assessments. The RPS air quality team members involved at various stages of this assessment have professional affiliations that include Member of the Institute of Air Quality Management, Chartered Chemist, Chartered Scientist, Chartered Environmentalist and Member of the Royal Society of

Chemistry and have the required academic qualifications for these professional bodies. In addition, the Director responsible for authorising all deliverables has over 25 years' experience.

Summary of Key Pollutants Considered

3.5 For the operational phase of the Proposed Development, the main pollutants from road traffic with potential for local air quality impacts are nitrogen oxides (NO_x) and particulate matter (PM_{10}). Emissions of total NO_x from combustion sources comprise nitric oxide (NO) and NO_2. The NO oxidises in the atmosphere to form NO_2. The assessment of operational impacts therefore focuses on changes in NO_2 and PM_{10} concentrations. The impact from fine particulate matter, known as $PM_{2.5}$ (a subset of PM_{10}) concentrations has also been considered.

3.6 For the construction phase of the Proposed Development the key pollutant is dust, covering both the PM_{10} fraction that is suspended in the air that can be breathed, and the deposited dust that has fallen out of the air onto surfaces and which can potentially cause temporary annoyance effects.

3.7 Regarding exhaust emissions from construction-related vehicles (contractors' vehicles and Heavy Goods Vehicles (HGVs), diggers, and other diesel-powered vehicles), these are unlikely to have a significant impact on local air quality [11] except for large, long-term construction sites: the EPUK/IAQM Land-Use Planning & Development Control: Planning For Air Quality document [9] indicates that air quality assessments should include developments increasing annual average daily Heavy Duty Vehicle (HDV) traffic flows by more than 25 within or adjacent to an AQMA and more than 100 elsewhere. The results of the Highways and Access assessment indicates that the aforementioned EPUK/IAQM thresholds are not expected to be exceeded for any individual road during the construction phase of this project; therefore, construction-vehicle exhaust emissions have not been assessed specifically.

Construction Phase - Methodology

3.8 Dust is the generic term used to describe particulate matter in the size range 1-75 µm in diameter [13]. Particles greater than 75 µm in diameter are termed grit rather than dust. Dusts can contain a wide range of particles of different sizes. The normal fate of suspended (i.e. airborne) dust is deposition. The rate of deposition depends largely on the size of the particle and its density; together these influence the aerodynamic and gravitational effects that determine the distance it travels and how long it stays suspended in the air before it settles out onto a surface. In addition, some particles may agglomerate to become fewer, larger particles; whilst others react chemically.

3.9 The effects of dust are linked to particle size and two main categories are usually considered:

- PM_{10} particles, those up to 10 µm in diameter, remain suspended in the air for long periods and are small enough to be breathed in and so can potentially impact on health; and

- Dust, generally considered to be particles larger than 10 µm which fall out of the air quite quickly and can soil surfaces (e.g. a car, window sill, laundry). Additionally, dust can potentially have adverse effects on vegetation and fauna at sensitive habitat sites.

3.10 The IAQM *Guidance on the assessment of dust from demolition and construction* sets out 350 m as the distance from the site boundary and 50 m from the site traffic route(s) up to 500 m of the entrance, within which there could potentially be nuisance dust and PM_{10} effects on human receptors. For sensitive ecological receptors, the corresponding distances are 50 m in both cases. (In this particular application, there are no ecological receptors within the distances and ecological effects have been scoped out). These distances are set to be deliberately conservative.

3.11 Concentration-based limit values and objectives have been set for the PM_{10} suspended particle fraction, but no statutory or official numerical air quality criterion for dust annoyance has been set at a UK, European or World Health Organisation (WHO) level. Construction dust assessments have tended to be risk based, focusing on the appropriate measures to be used to keep dust impacts at an acceptable level.

3.12 The Mayor of London's Control of Dust and Emissions during Construction and Demolition Supplementary Planning Guidance [10] (hereafter referred to as the Construction and Demolition SPG) provides information relating to the approach to the assessment, recommended mitigation measures and appropriate monitoring strategies. In particular, the Construction and Demolition SPG states that the assessment methodology provided in the current version of the Institute of Air Quality Management (IAQM) *Guidance on the assessment of dust from demolition and construction* should be used.

3.13 The IAQM dust guidance aims to estimate the impacts of both PM_{10} and dust through a risk-based assessment procedure. The IAQM dust guidance document states: *"The impacts depend on the mitigation measures adopted. Therefore the emphasis in this document is on classifying the risk of dust impacts from a site, which will then allow mitigation measures commensurate with that risk to be identified."*

3.14 The IAQM dust guidance provides a methodological framework, but notes that professional judgement is required to assess effects: *"This is necessary, because the diverse range of projects that are likely to be subject to dust impact assessment means that it is not possible to be prescriptive as to how to assess the impacts. Also a wide range of factors affect the amount of dust that may arise, and these are not readily quantified."*

3.15 Consistent with the recommendations in the IAQM dust guidance, a risk-based assessment has been undertaken for the development, using the well-established source-pathway-receptor approach:

- The dust impact (the change in dust levels attributable to the development activity) at a particular receptor will depend on the magnitude of the dust source and the effectiveness of the pathway (i.e. the route through the air) from source to receptor.

- The effects of the dust are the results of these changes in dust levels on the exposed receptors, for example annoyance or adverse health effects. The effect experienced for a given exposure depends on the sensitivity of the particular receptor to dust. An assessment of the overall dust effect for the area as a whole has been made using professional judgement taking into account both the change in dust levels (as indicated by the Dust Impact Risk for individual receptors) and the absolute dust levels, together with the sensitivities of local receptors and other relevant factors for the area.

The detail of the dust assessment methodology is provided in Appendix A.

3.16 The dust risk categories that have been determined for each of the four activities (demolition, earthworks, construction and trackout) have been used to define the appropriate site-specific mitigation measures based on those described in the Mayor of London’s SPG. The Mayor of London’s SPG states that with the recommended dust mitigation measures in place the residual impact will be *“minimised”*.

3.17 This assessment does not consider the air quality impacts of dust from any contaminated land or buildings. If contaminated land is identified on the Application Site, the impacts will be assessed in other technical discipline reports.

Operational Phase - Methodology

Atmospheric Dispersion Modelling of Pollutant Concentrations

3.18 In urban areas, pollutant concentrations are primarily determined by the balance between pollutant emissions that increase concentrations, and the ability of the atmosphere to reduce and remove pollutants by dispersion, advection, reaction and deposition. An atmospheric dispersion model is used as a practical way to simulate these complex processes; such a model requires a range of input data, which can include emissions rates, meteorological data and local topographical information. The model used and the input data relevant to this assessment are described in the following sub-sections.

3.19 The atmospheric pollutant concentrations in an urban area depend not only on local sources at a street scale, but also on the background pollutant level made up of the local urban-wide background, together with regional pollution and pollution from more remote sources brought in on the incoming air mass. This background contribution needs to be added to the fraction from the modelled sources, and is usually obtained from measurements or estimates of urban background concentrations for the area in locations that are not directly affected by local emissions sources. Background pollution levels are described in detail in Section 4.

3.20 The ADMS-Roads model has been used in this assessment to predict the air quality impacts from changes in traffic on the local road network. This is a version of the Atmospheric Dispersion Modelling System (ADMS), a formally validated model developed in the United Kingdom (UK) by Cambridge Environmental Research Consultants Ltd (CERC) and widely used in the UK and internationally for regulatory purposes.

Modelled Scenarios

3.21 The following scenarios were modelled:

- Without Development – without the Proposed Development in the first year that the development is expected to be fully operational year, 2016; and
- With Development – with the Proposed Development in the first year that the development is expected to be fully operational year, 2016.

Model Input Data

Traffic Flow Data

3.22 Traffic data used in the assessment have been provided by the project's transport consultants, Gateway TSP. The traffic flow data provided for this assessment are summarised in Table 3.1. The modelled road links are illustrated in Figure 1.

3.23 The traffic flow data take into account local consented developments, including the consented Lidl store at Botwell Lane (planning ref. 1942/APP/2013/3565). The proposed development would replace that consented store.

Table 3.1 Traffic Data Used Within the Assessment

Road Link ID	Road Link Name	Speed ($km.hr^{-1}$)	Daily Two Way Vehicle Flow			
			Without Development		With Development	
			LDV	HDV	LDV	HDV
1	Church Road	35.7	6238	394	6469	394
2	Central Avenue	30.7	4046	119	5786	119
3	Botwell Lane (North)	44.1	15747	750	16494	750
4	Botwell Lane (South)	44.4	14029	802	14739	802

Notes: ($km.hr^{-1}$) = kilometres per hour

HDV = Heavy Duty Vehicle - vehicles greater than 3.5 t gross vehicle weight including buses

LDV = Light Duty Vehicle

3.24 The average speed on each road has been reduced by 10 $km.hr^{-1}$ to take into account the possibility of slow moving traffic near junctions and at roundabouts in accordance with LLAQM.TG16.

Car Park Emissions

3.25 Emissions from vehicle movements in the car parks have been modelled as area sources in ADMS-Roads, derived from the expected arrivals and departures in each hour provided by the project's traffic consultants.

3.26 The data provided by the project's traffic consultants are shown in Table 3.8. These data are the predicted arrivals and departures into the car park are over the course of a typical Friday trading period, and represent a conservative prediction since Friday is the busiest weekday for Lidl.

Table 3.2 Car Park Traffic Data Used Within the Assessment

Period	Arrivals	Departures
0-1	0	0
1-2	0	0
2-3	0	0
3-4	0	0
4-5	0	0
5-6	0	0
6-7	0	0
7-8	0	0
8-9	105	78
9-10	117	102
10-11	92	98
11-12	123	115
12-13	133	129
13-14	117	133
14-15	116	102
15-16	106	117
16-17	114	117
17-18	109	117
18-19	95	104
19-20	84	93
20-21	75	85
21-22	0	0
22-23	0	0
23-24	0	0

3.27 Vehicles have been assumed to travel around the car park at an average speed of 5 $km.hr^{-1}$. For the purposes of this assessment, it has been assumed that a vehicle using the car park will on average travel a total distance equal to the perimeter of the car park.

Traffic Emission Factors

3.28 The modelling has been undertaken using Defra's 2016 emission factor toolkit (version 7.0) which draws on emissions generated by the European Environment Agency (EEA) COPERT 4 (v11) emission calculation tool.

Meteorological Data

3.29 ADMS-Roads requires detailed meteorological data as an input. The most representative observing station for the region of the study area that supplies all the data in the required format is London Heathrow approximately 4 km south-west of the Application Site. Meteorological data from that station for 2014 have been used within the dispersion model. The wind rose is presented in Figure 2.

Receptors

3.30 The air quality assessment predicts the impacts at locations that could be sensitive to any changes. For assessing human-health impacts, such sensitive receptors should be selected where the public is regularly present and likely to be exposed over the averaging period of the objective. LLAQM.TG16 [12] provides examples of exposure locations and these are summarised in Table 3.3.

Table 3.3 Example of Where Air Quality Objectives Apply

Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
Annual-mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building's façades), or any other location where public exposure is expected to be short-term.
Daily-mean	All locations where the annual-mean objective would apply, together with hotels. Gardens of residential properties.	Kerbside sites (as opposed to locations at the building's façade), or any other location where public exposure is expect to be short-term.
Hourly-mean	All locations where the annual and 24 hour mean would apply. Kerbside sites (e.g. pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations to which the public might reasonably be expected to spend 1-hour or longer.	Kerbside sites where the public would not be expected to have regular access

3.31 Sensitive receptors for this assessment have been selected at representative properties where pollutant concentrations and/or changes in pollutant concentrations are anticipated to be greatest, as listed in Table 3.4. These are all residential receptors.

Table 3.4 Modelled Sensitive Receptors

ID	Description	x	y
1	Central Avenue 1	509864.8	180192
2	Botwell Lane 1	509812.3	179919
3	Neild Road	509668.3	180028.2
4	Church Road 1	509670.3	180154.7
5	Church Road 2	509702.1	180167.4
6	Church Road 3	509658.3	180119
7	Central Avenue 2	509841.8	180215.1

3.32 The annual, daily and hourly-mean AQS objectives apply at the front and rear façades of all residential properties. The approaches used to predict the concentrations for these different averaging periods are described below.

Long-Term Pollutant Predictions

3.33 Annual-mean NO_x and PM_{10} concentrations have been predicted at selected sensitive receptors using ADMS-Roads, then added to relevant background concentrations. Primary NO in the NO_X emissions is converted to NO_2 to a degree determined by the availability of atmospheric oxidants locally and the strength of sunlight. For road traffic sources, annual-mean NO_2 concentrations have been derived from the modelled road-related annual-mean NO_x concentration using the Defra's calculator [14].

Short-Term Pollutant Predictions

3.34 In order to predict the likelihood of exceedences of the hourly-mean AQS objectives for NO_2 and the daily-mean AQS objective for PM_{10}, the following relationships between the short-term and the annual-mean values at each receptor have been considered.

Hourly-Mean AQS Objective for NO_2

3.35 Research undertaken in support of LLAQM.TG16 has indicated that the hourly-mean limit value and objective for NO_2 is unlikely to be exceeded at a roadside location where the annual-mean NO_2 concentration is less than 60 $\mu g.m^{-3}$. In May 2008, a re-analysis of the relationship between annual and hourly-mean NO_2 concentrations was undertaken using data collated between 2003 and 2007 [15]. The conclusions and recommendations of that report are:

"Analysis shows that statistically, on the basis of the dataset available here, the chance of measuring an hourly nitrogen dioxide objective exceedence whilst reporting an annual-mean NO_2 of less than 60 $\mu g.m^{-3}$ is very low….

It is therefore recommended that local authorities continue to use the threshold of 60 $\mu g.m^{-3}$ NO_2 as the guideline for considering a likely exceedence of the hourly-mean nitrogen dioxide objective."

Daily-Mean AQS Objective for PM_{10}

3.36 The number of exceedences of the daily-mean AQS objective for PM_{10} of 50 $\mu g.m^{-3}$ may be estimated using the relationship set out in LLAQM.TG16:

Number of Exceedences of Daily Mean of 50 $\mu g.m^{-3} = -18.5 + 0.00145 * (\text{Predicted Annual-mean } PM_{10})^3 + 206 / (\text{Predicted Annual-mean } PM_{10} \text{ Concentration})$

3.37 This relationship suggests that the daily-mean AQS objective for PM_{10} is likely to be met if the predicted annual-mean PM_{10} concentration is 31.8 $\mu g.m^{-3}$ or less..

3.38 The daily mean objective is not considered further within this assessment if the annual-mean PM_{10} concentration is predicted to be less than 31.5 $\mu g.m^{-3}$.

Fugitive PM_{10} Emissions

3.39 Transport PM_{10} emissions arise from both the tailpipe exhausts and from fugitive sources such as brake and tyre wear and re-suspended road dust. Improvements in vehicle technologies are reducing PM_{10} exhaust emissions; therefore, the relative importance of fugitive PM_{10} emissions is increasing. Current emission factors for particulate matter include brake dust and tyre wear (which studies suggest may account for approximately one-third of the total particulate emissions from road transport); however, no allowance is made for re-suspended road dust as this remains unquantified.

Significance Criteria for Development Impacts on the Local Area

3.40 The EPUK/IAQM Land-Use Planning & Development Control: Planning For Air Quality document [9] advises that:

"The significance of the effects arising from the impacts on air quality will depend on a number of factors and will need to be considered alongside the benefits of the development in question. Development under current planning policy is required to be sustainable and the definition of this includes social and economic dimensions, as well as environmental. Development brings opportunities for reducing emissions at a wider level through the use of more efficient technologies and better designed buildings, which could well displace emissions elsewhere, even if they increase at the development site. Conversely, development can also have adverse consequences for air quality at a wider level through its effects on trip generation."

3.41 When describing the air quality impact at a sensitive receptor, the change in magnitude of the concentration should be considered in the context of the absolute concentration at the sensitive receptor. Table 3.5 provides the EPUK/IAQM approach for describing the human-health air quality impacts at sensitive receptors.

Table 3.5 Impact Descriptors for Individual Sensitive Receptors

Long term average concentration at receptor in assessment year	% Change in concentration relative to Air Quality Assessment Level			
	1	**2-5**	**6-10**	**>10**
75 % or less of AQAL	Negligible	Negligible	Slight	Moderate
76 -94 % of AQAL	Negligible	Slight	Moderate	Moderate
95 - 102 % of AQAL	Slight	Moderate	Moderate	Substantial
103 – 109 % of AQAL	Moderate	Moderate	Substantial	Substantial
110 % or more than AQAL	Moderate	Substantial	Substantial	Substantial

1. AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'.
2. The table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The user is encouraged to treat the numbers with recognition of their likely accuracy and not assume a false level of precision. Changes of 0%, i.e. less than 0.5% will be described as negligible.
3. The table is only designed to be used with annual mean concentrations.
4. Descriptors for individual receptors only; the overall significance is determined using professional judgement. For example, a 'moderate' adverse impact at one receptor may not mean that the overall impact has a significant effect. Other factors need to be considered.
5. When defining the concentration as a percentage of the AQAL, use the 'without scheme' concentration where there is a decrease in pollutant concentration and the 'with scheme;' concentration for an increase.
6. The total concentration categories reflect the degree of potential harm by reference to the AQAL value. At exposure less than 75% of this value, i.e. well below, the degree of harm is likely to be small. As the exposure approaches and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL.
7. It is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQAL. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainty, which is why there is a category that has a range around the AQAL, rather than being exactly equal to it.

3.42 The human-health impact descriptors above apply at individual receptors. The EPUK/IAQM guidance states that the impact descriptors *"are not, of themselves, a clear and unambiguous guide to reaching a conclusion on significance. These impact descriptors are intended for application at a series of individual receptors. Whilst it maybe that there are 'slight', 'moderate' or 'substantial' impacts at one or more receptors, the overall effect may not necessarily be judged as being significant in some circumstances."*

3.43 Professional judgement by a competent, suitably qualified professional is required to establish the significance associated with the consequence of the impacts. This judgement is likely to take into account the extent of the current and future population exposure to the impacts and the influence and/or validity of any assumptions adopted during the assessment process.

Uncertainty

3.44 All air quality assessment tools, whether models or monitoring measurements, have a degree of uncertainty associated with the results. The choices that the practitioner makes in setting-up the model, choosing the input data, and selecting the baseline monitoring data will decide whether the final predicted impact should be considered a central estimate, or an estimate tending towards the upper bounds of the uncertainty range (i.e. tending towards worst-case).

3.45 The atmospheric dispersion model itself contributes some of this uncertainty, due to it being a simplified version of the real situation: it uses a sophisticated set of mathematical equations to approximate the complex physical and chemical atmospheric processes taking place as a pollutant is released and as it travels to a receptor. The predictive ability of even the best model is limited by how well the turbulent nature of the atmosphere can be represented.

3.46 Each of the data inputs for the model, listed earlier, will also have some uncertainty associated with them. Where it has been necessary to make assumptions, these have mainly been made towards the upper end of the range informed by an analysis of relevant, available data.

3.47 The atmospheric dispersion model used for this assessment, ADMS Roads, has been validated by its supplier and is widely used by professionals in the UK and overseas. A site-specific verification (calibration) provides additional certainty and is particularly important when air quality levels are close to exceeding the objectives/limit values.

3.48 LLAQM.TG16 requires that local authorities verify the results of any detailed modelling undertaken for the purposes of fulfilling their R&A duties. Model verification refers to the checks that are carried out on model performance at a local level. Modelled concentrations are compared with the results of monitoring. Where there is a disparity between modelled and monitored concentrations, the first step is to review the appropriateness of the data inputs to determine whether the performance of the model can be improved. Once reasonable efforts have been made to reduce the uncertainties in the data inputs, an adjustment may be established and applied to reduce any remaining disparity between modelled and monitored concentrations. No adjustment factor is deemed necessary where the modelled concentrations are within 25% of the monitored concentrations.

3.49 For the verification and adjustment of NOx/NO_2 concentrations for R&A purposes, it is recommended that the comparison involves a combination of automatic and diffusion monitoring, rather than a single automatic monitor. This is to ensure any adjustment factor derived is representative of all locations modelled and not unduly weighted towards the characteristics at a single site. Where only diffusion tubes are used for the model verification, the study should consider a broad spread of monitoring locations across the study area to provide sufficient information relating to the spatial variation in pollutant concentrations.

3.50 Local Authorities generally implement a broad spread of monitoring, particularly in areas that are known to be sensitive to changes in air quality. Consequently, Local Authorities are usually able to verify the models they use for R&A purposes; however for individual developments, there is less likely to be a broad range of monitoring locations within the relevant study area.

3.51 In this case, a broad spread of monitoring data in the study area is not currently available to allow the model to be verified.

3.52 The main components of uncertainty in the total predicted concentrations, made up of the background concentration and the modelled fraction, include those summarised in Table 3.6.

Table 3.6 Approaches to Dealing with Uncertainty used Within the Assessment

Concentration	Source of Uncertainty	Approach to Dealing with Uncertainty	Comments
Background Concentration	Characterisation of current baseline air quality conditions	The background concentration used within the assessment is the most conservative measured/Defra mapped concentration estimate.	The background concentration is the major proportion of the total predicted concentration. The conservative assumptions adopted ensure that the background concentration used within the model is towards the top of the uncertainty range, rather than a central estimate.
	Characterisation of future baseline air quality (i.e. the air quality conditions in the future assuming that the development does not proceed)	The future background concentration used in the assessment is the same as the current background concentration and no reduction has been assumed. This is a conservative assumption as, in reality, background concentrations are likely to reduce over time as cleaner vehicle technologies form an increasing proportion of the fleet.	
Fraction from Modelled Sources	Traffic flow estimates	Traffic flows provided have all been based on traffic counts, rather than flows derived from a traffic model. High growth assumptions have been used to develop the traffic dataset used within the model.	The modelled fraction is a minor proportion of the total predicted concentration. The modelled fraction is likely to be between a central estimate and the top of the uncertainty range.
	Traffic speed estimates	Measured average traffic speeds have been used within the model. The average speed has been reduced in congested areas to take account of slow-moving and queuing traffic.	
	Road-related emission factors – projection to future years	The most recently published emission factors have been used within the modelling and these are based on the current and best understanding of the variation in emission factors in future years.	
	Meteorological Data	Uncertainties arise from any differences between the conditions at the met station and the development site, and between the historical met years and the future years. These have been minimised by using meteorological data collated at a representative measuring site. The model has been run for a full year of meteorological conditions. This means that the conditions in 8,760 hours have been considered in the assessment.	
	Receptors	Receptor locations have been identified where concentrations are highest or where the greatest changes are expected.	

3.53 The analysis of the component uncertainties indicates that, overall, the predicted total concentration is likely to be towards the top of the uncertainty range rather than being a central estimate. The actual concentrations that will be found when the development is operational are unlikely to be higher than those presented within this report and are more likely to be lower.

4 Baseline Air Quality Conditions

Overview

4.1 The background concentration often represents a large proportion of the total pollution concentration, so it is important that the background concentration selected for the assessment is realistic. National Planning Practice Guidance and EPUK/IAQM guidance highlight public information from Defra and local monitoring studies as potential sources of information on background air quality. LLAQM.TG16 recommends that Defra mapped concentration estimates are used to inform background concentrations in air quality modelling and states that: "*Where appropriate these data can be supplemented by and compared with local measurements of background, although care should be exercised to ensure that the monitoring site is representative of background air quality*".

4.2 For this assessment, the background air quality has been characterised by drawing on information from the following public sources:

- Defra maps [16], which show estimated pollutant concentrations across the UK in 1 km grid squares; and
- published results of local authority Review and Assessment (R&A) studies of air quality, including local monitoring and modelling studies.

4.3 A detailed description of how the baseline air quality has been derived for this Proposed Development site is summarised in the following paragraphs.

Review and Assessment Process

4.4 The LBH has designated the area *"from the southern boundary, north to the border defined by, the A40 corridor from the western borough boundary, east to the intersection with the Yeading Brook north until its intersection with the Chiltern-Marylebone railway line and then east along the railway line to the eastern borough boundary"* as an AQMA due to high levels of NO_2 attributable to road traffic emissions. The proposed development is located within the designated AQMA.

4.5 In 2004, the LBH developed an Air Quality Action Plan (AQAP) setting out the measures and actions it intends to take to improve air quality within the AQMA. Progress on the AQAP is reviewed on an annual basis. Up to 86% of the measures within the AQAP have now been fully adopted [17].

Local Urban Background Monitoring

4.6 Monitors at urban background locations measure concentrations away from the local influence of emission sources and are therefore broadly representative of residential areas within large conurbations. Monitoring at local urban background locations is considered an appropriate source of data for the purposes of describing baseline air quality for this Proposed Development site.

4.7 LBH carries out automatic monitoring of air quality at one urban background location, for NO_2 only. The most recent measured annual-mean concentrations are presented in Table 4.1.

Table 4.1 Automatically Monitored Urban Background Annual-Mean NO_2 Concentrations

Monitor Name	Approx. Distance from Application Site (km)	Concentration ($\mu g.m^{-3}$)				
		2010	2011	2012	2013	2014
Hillingdon Sipson	3.7	38	37	35	37	37

4.8 In addition, LBH manually monitors NO_2 concentrations at a number of urban background locations using passive diffusion tubes and the most measured annual-mean concentrations are presented in Table 4.2.

Table 4.2 Passively Monitored Urban Background Annual-Mean NO_2 Concentrations

Monitor Code	x	y	Approx. Distance from Application Site (km)	Concentration ($\mu g.m^{-3}$)				
				2010	2011	2012	2013	2014
HD41	***509377***	***181224***	***1.1***	***29***	***Discontinued***			
HD49	508650	182274	2.4	27	26	26	25	26
HD51	506334	180266	3.4	35	33	36	34	36
HD52	505157	183231	5.5	37	33	37	38	37
HD53	506241	185652	6.5	41	41	45	40	46
HD56	***509796***	***178633***	***1.4***	***36***	***35***	***37***	***35***	***35***
HD57	508756	177717	2.5	39	37	39	38	40
HD58	508412	177124	3.2	40	39	40	38	42
HD59	507294	177322	3.6	34	34	36	35	33
HD60	505753	177760	4.5	31	29	32	31	32
HD61	504848	176770	5.8	38	35	34	37	37
HD65	506081	177071	4.7	33	33	38	31	34
HD66	507305	177518	3.5	34	31	36	-	-
HD67	505729	180290	4.0	32	30	29	30	30
HD68	505775	182565	4.6	30	27	30	-	-
HD70	505291	190935	11.7	26	24	25	24	24
HD72	507236	177927	3.2	32	32	35	-	-
HD73	511825	185655	5.9	28	26	28	27	28
HD75	510103	186133	6.0	29	28	29	28	28
HD77	511108	189742	9.7	28	25	29	-	-
HD80b	***508542***	***179650***	***1.2***	***36***	***Discontinued***			
HD202	***510361***	***179820***	***0.6***			***33***	***36***	***35***
HD204	506108	180493	3.6			39	38	39
HD205	506503	179510	3.2			42	40	42
HD206	507141	179628	2.6			29	29	35
HD207	507580	179812	2.1			31	35	38
HD208	***510761***	***180766***	***1.2***	-		***30***	***29***	***30***
HD209	511828	182023	2.8			35	32	33
HD211	506143	185395	6.4			34	36	38
HD213	508773	177352	2.8			40	40	39
HD214	509499	178370	1.6			40	40	50
HD302	***509755***	***179934***	***0.1***			***-***	***-***	***39***
Maximum			11.7	41	41	48	43	50
Minimum			0.5	26	24	25	24	24

All concentrations have been adjusted using a bias factor established using three local collocation studies at: Hillingdon AURN, Hillingdon 1 and Hillingdon 2.
Bold italics – sites within 1.5 km of proposed development

4.9 The results show a significant degree of variation in the background NO_2 concentrations: across all the monitoring sites, the measured annual-mean NO_2 concentrations range from 24 µg.m^{-3} to 50 µg.m^{-3} between 2010 and 2014. For monitoring sites within 1.5 km of the proposed development, there is somewhat less variation: between 29 µg.m^{-3} and 37 µg.m^{-3}.

4.10 Regarding particulate matter, monitoring is undertaken at just one urban background location within Hillingdon – London Harmondsworth Osiris. PM_{10} is measured automatically at a number of sites classified as roadside locations and $PM_{2.5}$ is measured at a number of locations influenced by London Heathrow airport. Concentrations of particulate matter are much more evenly distributed across the UK compared to emissions of nitrogen oxides. This reflects the wide range of PM_{10} sources and the contribution of secondary particulate matter, as reported by the Air Quality Expert Group in their report Particulate Matter in the UK [18] commissioned by Defra. On that basis, consideration has been also been given to the results of particulate matter monitoring undertaken in 'non-urban background' locations. The measured concentrations are provided in Table 4.3 and Table 4.4.

Table 4.3 Monitored Annual-Mean PM_{10} Concentrations

Site Name	**x**	**y**	**Approx. Distance to Site (km)**	**Concentration (µg.m-3)**				
				2010	**2011**	**2012**	**2013**	**2014**
London Harmondsworth Osiris	505671	177605	4.7	24	-		17	12
Hillingdon 1	510770	184960	4.9	22	24	24	23	23
Hillingdon 3	509557	176994	3.0	20	23	22	21	22
Hillingdon Hayes	510283	178905	1.2	24	25	25	29	35
Maximum			**4.9**	**24**	**25**	**25**	**29**	**35**
Minimum			**1.2**	**20**	**23**	**22**	**21**	**12**

Table 4.4 Monitored Annual-Mean $PM_{2.5}$ Concentrations

Site Name	**x**	**y**	**Approx. Distance to Site (km)**	**Concentration (µg.m-3)**				
				2010	**2011**	**2012**	**2013**	**2014**
London Harmondsworth Osiris	505671	177605	4.7	**-**				**7**
London Harlington	508300	177800	2.6	13	16	13	14	14
Heathrow Green Gates	505630	176930	5.1	10	10	10	10	10
Heathrow Oaks Road	505714	174503	6.8	11	10	10	10	10
London Heathrow	508399	176746	3.5	11	11	11	11	10
Maximum			**6.8**	**13**	**16**	**13**	**14**	**14**
Minimum			**2.6**	**10**	**10**	**10**	**10**	**7**

Defra Mapped Concentration Estimates

4.11 Defra's total annual-mean NO_2 concentration estimates have been collected for the 1 km grid squares of the automatic monitoring site, the passive monitoring sites that are within 1.5 km, and the Proposed Development and are summarised in Table 4.5.

Table 4.5 Defra Mapped Annual-Mean Background NO_2 Concentration Estimates

Monitor Name	Approx. Distance from Site (km)	Concentration ($\mu g.m^{-3}$)	
		Range of Monitored	Estimated Defra Mapped
Hillingdon Sipson	3.7	35 – 37	36
HD41	1.1	29	27
HD56	1.4	35 – 37	36
HD80b	1.2	36	34
HD202	0.6	33 – 36	36
HD208	1.2	29 - 30	30
HD302	0.1	39	34
Application site	-	-	28

4.12 Similarly, the Defra total annual-mean PM_{10} and $PM_{2.5}$ concentration estimates have been collected for the grid square of the monitoring sites and the Proposed Development and are summarised in Table 4.6 and Table 4.7.

Table 4.6 Defra Mapped Annual-Mean Background PM_{10} Concentration Estimates

Monitor Name	Distance to Site (km)	Concentration ($\mu g.m^{-3}$)	
		Range of Monitored	Estimated Defra Mapped
London Harmondsworth Osiris	4.7	12 – 24	19
Hillingdon 1	4.9	22 – 24	20
Hillingdon 3	3.0	20 – 23	18
Hillingdon Hayes	1.2	24 – 35	21
Application site	-	-	18

Table 4.7 Defra Mapped Annual-Mean Background $PM_{2.5}$ Concentration Estimates

Site Name	Distance to Site (km)	Concentration ($\mu g.m^{-3}$)	
		Range of Monitored	Estimated Defra Mapped
London Harmondsworth Osiris	4.7	7	14
London Harlington	2.6	13 – 16	14
Heathrow Green Gates	5.1	10	15
Heathrow Oaks Road	6.8	10 – 11	13
London Heathrow	3.5	10 – 11	15

Site Name	Distance to Site (km)	Concentration (µg.m^{-3})	
		Range of Monitored	Estimated Defra Mapped
Application site	-	-	13

Appropriate Background Concentrations for the Development Site

4.13 Table 4.5 shows that, for NO_2, there is reasonably good agreement between the Defra mapped background concentration estimates and the range of concentrations measured at monitoring sites. Neither the maps nor the monitoring results are consistently higher than the other and could be considered in all cases to represent the worst case. The closest monitoring site to the proposed development, HD202, measured an annual-mean NO_2 concentration of 36 µg.m^{-3}; this monitored concentration is the same as the Defra mapped estimate. Taking this into account, the background annual-mean NO_2 concentration in the opening year of the development has been derived from the Defra mapped estimated of 36 µg.m^{-3}.

4.14 For PM_{10} the estimated Defra mapped background concentrations are below the range of concentrations measured at monitoring sites at all but one location. Therefore, the annual-mean PM_{10} concentration at the Application Site has been derived from the average monitored annual-mean PM_{10} concentration (a value of 27 µg.m^{-3}) at the closest monitoring site (Hillingdon Hayes) to the Application Site.

4.15 For $PM_{2.5}$ the estimated Defra mapped background concentrations are in some cases higher and in other cases lower than the concentrations measured at monitoring sites. However, the highest of the measured annual-mean $PM_{2.5}$ concentrations (16 µg.m^{-3}) was recorded at the closest monitoring station to the Application Site. Therefore, for a conservative assessment, the background annual-mean $PM_{2.5}$ concentration in the opening year of the development will be derived from this value of 16 µg.m^{-3}.

4.16 Historically the view has been that background traffic-related NO_2 concentrations in the UK would reduce over time, due to the progressive introduction of improved vehicle technologies and increasingly stringent limits on emissions. However, the results of recent monitoring across the UK suggest that background annual-mean NO_2 concentrations have not decreased in line with expectations. Inspection of the results of local monitoring presented here indicates suggest that there is no particular trend over time for concentrations of either NO_2, PM_{10} or $PM_{2.5}$ in the vicinity of the Application Site.

4.17 To ensure that the assessment presents conservative results, no reduction in the background has been applied for future years.

4.18 Table 4.8 summarises the annual-mean background concentrations for NO_2, PM_{10} and $PM_{2.5}$ used in this assessment.

Table 4.8 Summary of Background Annual-Mean (Long-term) Concentrations used in the Assessment

Pollutant	Data Source	Concentration ($\mu g.m^{-3}$)
NO_2	HD202	36
PM_{10}	Hillingdon Hayes	27
$PM_{2.5}$	London Harlington	16

5 Assessment of Construction-Phase Air Quality Impacts

Construction Dust

5.1 Whilst no detailed construction phase information is currently available, the type of activities that could cause fugitive dust emissions are: demolition; earthworks; handling and disposal of spoil; wind-blown particulate material from stockpiles; handling of loose construction materials; and movement of vehicles, both on and off site.

5.2 The level and distribution of construction dust emissions will vary according to factors such as the type of dust, duration and location of dust-generating activity, weather conditions and the effectiveness of suppression methods.

5.3 The main effect of any dust emissions, if not mitigated, could be annoyance due to soiling of surfaces, particularly windows, cars and laundry. However, it is normally possible, by implementation of proper control, to ensure that dust deposition does not give rise to significant adverse effects, although short-term events may occur (for example, due to technical failure or exceptional weather conditions). The following assessment, using the IAQM methodology, predicts the risk of dust impacts and the level of mitigation to minimise air quality impacts.

Risk of Dust Impacts

Source

5.4 The former swimming pool has already been demolished and the site has been cleared and hoarded. As the demolition work is largely complete, demolition has not been considered further in this assessment.

5.5 The site area is 9,710 m^2. As this is between 2,500 and 10,000 m^2, the dust emission magnitude for the earthworks phase is classified as medium.

5.6 The total volume of the buildings to be constructed would be below 25,000 m^3, and so the dust emission magnitude for the construction phase is classified as small.

5.7 Assuming that the maximum number of outwards movements in any one day is between 10 and 50 HDVs, the dust emission magnitude for trackout would be classified as medium.

Table 5.1 Dust Emission Magnitude for Earthworks, Construction and Trackout

Earthworks	Construction	Trackout
Medium	Small	Medium

Pathway and Receptor - Sensitivity of the Area

5.8 All demolition, earthworks and construction activities are assumed to occur within the site boundary. As such, receptors at distances within 350 m of the site boundary have been identified and are illustrated in Figure 1. The sensitivity of the area has been classified and the results are provided in Table 5.2 below.

Table 5.2 Sensitivity of the Surrounding Area for Demolition, Earthworks and Construction

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Soiling	Medium	10 – 100 high sensitivity receptors located within 50 m of the site boundary (Table A4)
Human Health	Medium	10 – 100 high sensitivity receptors located within 20 m of the site boundary and PM_{10} concentration is 27 $\mu g.m^{-3}$, i.e. between 24 and 28 $\mu g.m^{-3}$ (Table A5)

5.9 The Dust Emission Magnitude for trackout is classified as medium and trackout may occur on roads up to 200 m from the site. The major routes within 200 m of the site are Botwell Lane, Central Avenue and Abbott Road. The sensitivity of the area has been classified and the results are provided in Table 5.3 below.

Table 5.3 Sensitivity of the Surrounding Area for Trackout

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Soiling	High	10 – 100 high sensitivity receptors located within 20 m of the roads (Table A4)
Human Health	High	Background PM_{10} concentrations for the assessment = 27 $\mu g.m^{-3}$ 10 – 100 high sensitivity receptors located within 20 m of the roads and PM_{10} concentrations between 24 and 28 $\mu g.m^{-3}$ (Table A5)

Overall Dust Risk

5.10 The Dust Emission Magnitude has been considered in the context of the Sensitivity of the Area (Tales 3.8 to 3.11) to give the Dust Impact Risk. Table 5.4 summarises the Dust Impact Risk for the four activities.

Table 5.4 Dust Impact Risk for Earthworks, Construction and Trackout

Source	Earthworks	Construction	Trackout
Dust Soiling	Medium	Low	Medium
Human Health	Medium	Low	Medium
Risk	Medium	Low	Medium

5.11 Taking the site as a whole, the overall risk is deemed to be medium. The mitigation measures appropriate to a level of risk for the site as a whole and for each of the phases are set out in Section 7.

5.12 Provided this package of mitigation measures is implemented, the residual construction dust effects will not be significant. The IAQM guidance states that "*For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective* *mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'."* The IAQM guidance recommends that significance is only assigned to the effect after the activities are considered with mitigation in place.

6 Assessment of Operational-Phase Air Quality Impacts

Assessment of Air Quality Impacts on Surrounding Area

6.1 This section of the report summarises the future operational-phase air quality impacts of the key pollutants associated with the development traffic of the proposed scheme.

Nitrogen Dioxide (NO_2)

6.2 Table 6.1 presents the annual-mean NO_2 concentrations predicted at the façades of existing receptors.

Table 6.1 Predicted Annual-Mean NO_2 Impacts at Existing Receptors

Receptor ID	Concentration (µg.m^{-3})		With - Without Dev as % of the AQS Objective	Impact Descriptor
	Without Development	With Development		
1	37.3	37.6	1	Negligible
2	40.6	40.8	1	Slight
3	38.5	38.7	0	Negligible
4	38.0	38.1	0	Negligible
5	37.9	38.1	0	Negligible
6	37.8	37.9	0	Negligible
7	37.4	37.7	1	Negligible
Maximum	40.6	40.8	1	-

6.3 Predicted annual-mean NO_2 concentrations in the opening year at the façades of the existing receptors are below the AQS objective for NO_2 at all but one receptor, where the predicted NO_2 concentration is slightly above the AQS objective for NO_2 both with and without the proposed development. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor ranges from 'negligible' to 'slight adverse'.

6.4 As all predicted annual-mean NO_2 concentrations are below 60 µg.m^{-3}, the hourly-mean objective for NO_2 is likely to be met at al receptors. The short-term NO_2 impact can be considered 'negligible' and is not considered further within this assessment.

6.5 Overall, the impact on the surrounding area from NO_2 is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement.

Particulate Matter (PM_{10})

6.6 Table 6.2 presents the annual-mean PM_{10} concentrations predicted at the façades of existing receptors.

Table 6.2 Predicted Annual-Mean PM_{10} Impacts at Existing Receptors

Receptor ID	Concentration (µg.m^{-3})		With - Without Dev as % of the AQS Objective	Impact Descriptor
	Without Development	With Development		
1	27.2	27.3	0	Negligible
2	27.8	27.8	0	Negligible
3	27.5	27.5	0	Negligible
4	27.3	27.3	0	Negligible
5	27.3	27.3	0	Negligible
6	27.3	27.3	0	Negligible
7	27.2	27.3	0	Negligible
Maximum	27.8	27.8	0	-

6.7 Predicted annual-mean PM_{10} concentrations in the opening year at the façades of the existing receptors are well below the AQS objective for PM_{10}. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is categorised as 'negligible' at all receptors.

6.8 As all predicted annual mean PM_{10} concentrations are below 31.5 µg.m^{-3}, the daily-mean PM_{10} objective is expected to be met at all receptors and the short-term PM_{10} impact is not considered further within this assessment.

6.9 Overall, the impact on the surrounding area from PM_{10} is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement.

Fine Particulate Matter ($PM_{2.5}$)

6.10 Table 6.3 presents the annual-mean $PM_{2.5}$ concentrations predicted at the façades of existing receptors.

Table 6.3 Predicted Annual-Mean $PM_{2.5}$ Impacts at Existing Receptors

Receptor ID	Concentration (µg.m^{-3})		With - Without Dev as % of the AQS Objective	Impact Descriptor
	Without Development	With Development		
1	16.1	16.2	0	Negligible
2	16.5	16.5	0	Negligible
3	16.3	16.3	0	Negligible
4	16.2	16.2	0	Negligible
5	16.2	16.2	0	Negligible
6	16.2	16.2	0	Negligible
7	16.1	16.2	0	Negligible

Receptor ID	Concentration (µg.m^{-3})		With - Without Dev as % of the AQS Objective	Impact Descriptor
	Without Development	With Development		
Maximum	16.5	16.5	0	-

AQS objective = 25 µg.m^{-3}

6.11 Predicted annual-mean $PM_{2.5}$ concentrations in the opening year at the façades of the existing receptors are well below the AQS objective for $PM_{2.5}$ at all receptors. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is categorised as 'negligible' at all receptors.

6.12 Overall, the impact on the surrounding area from $PM_{2.5}$ is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement.

6.13 As the maximum predicted annual-mean $PM_{2.5}$ concentration is below 25 µg.m^{-3} in the opening year, and concentrations of $PM_{2.5}$ are expected to decrease in future years, the AQS objective for $PM_{2.5}$ is expected to be met by a wide margin by its target date of 2020.

Significance of Effects

6.14 As set out in Section 3, it is generally considered good practice that, where possible, an assessment should communicate effects both numerically and descriptively. Professional judgement by a competent, suitably qualified professional is required to establish the significance associated with the consequence of the impacts.

6.15 The impacts predicted at individual receptors and the geographical extent over which such impacts occur, can be used to inform the judgement on the impact on the surrounding area as a whole, and whether the resulting overall effect is significant or not. The IAQM guidance states, *"Whilst it may be that there are 'slight', 'moderate', or 'substantial' impacts at one or more receptors, the overall effect may not necessarily be judged as being significant in some circumstances."* and *"…a 'moderate' or 'substantial' impact may not have a significant effect if it is confined to a very small area and where it is not obviously the cause of harm to human health."*

6.16 The results of the modelling indicate that with the development, the predicted PM_{10} and $PM_{2.5}$ concentrations at existing receptors are below the relevant long and short-term AQS objectives. Predicted annual-mean NO_2 concentrations in the opening year at the façades of the existing receptors are below the AQS objective for NO_2 at all but one receptor, where the predicted NO_2 concentration is slightly above the AQS objective for NO_2 both with and without the proposed development. When the magnitude of change in annual-mean NO_2 , PM_{10} and $PM_{2.5}$ concentrations is considered in the context of the absolute predictions, the air quality impacts of the development on existing receptors are categorised as 'negligible' to 'slight adverse'. Taking into account the geographical extent of the impacts predicted in this study, the overall impact of the development on the surrounding area as a whole is considered to be 'slight', using the descriptors adopted for this assessment.

6.17 Using professional judgement, the resulting air quality effect is considered to be 'not significant' overall.

Sensitivity and Uncertainty

6.18 Section 3 provided an analysis of the sources of uncertainty in the results of the assessment. The conclusion of that analysis was that, overall, the predicted total concentration is likely to be towards the top of the uncertainty range rather than being a central estimate. The actual concentrations that will be found when the development is operational are unlikely to be higher than those presented within this report and are more likely to be lower.

6.19 The impacts at existing receptors are shown to be not significant even for this conservative scenario. Consequently, further sensitivity analysis has not been undertaken and, in practice, the impacts at sensitive receptors are likely to be lower than those reported in this conservative assessment.

7 Mitigation

Mitigation During Construction

7.1 The Mayor of London's Control of Dust and Emissions during Construction and Demolition Supplementary Planning Guidance lists mitigation measures for low, medium and high dust risks.

7.2 As summarised in Table 5.4, the predicted Dust Impact Risk is classified as medium for earthworks and trackout but low for construction. The general site measures described as 'highly recommended' for medium risks are listed below:

Site Management
Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
Develop a Dust Management Plan.
Display the name and contact details of person(s) accountable for air quality pollutant emissions and dust issues on the site boundary.
Display the head or regional office contact information.
Record and respond to all dust and air quality pollutant emissions complaints.
Make a complaints log available to the local authority when asked.
Carry out regular site inspections to monitor compliance with air quality and dust control procedures, record inspection results, and make an inspection log available to the local authority when asked.
Increase the frequency of site inspections by those accountable for dust and air quality pollutant emissions issues when activities with a high potential to produce dust and emissions and dust (sic) are being carried out, and during prolonged dry or windy conditions.
Record any exceptional incidents that cause dust and air quality pollutant emissions, either on or off the site, and the action taken to resolve the situation is recorded in the log book.
Preparing and maintaining the site
Plan site layout: machinery and dust causing activities should be located away from receptors.
Erect solid screens or barriers around dust activities or the site boundary that are, at least, as high as any stockpiles on site.
Fully enclosure site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
Avoid site runoff of water or mud.
Keep site fencing, barriers and scaffolding clean using wet methods.
Remove materials from site as soon as possible.
Cover, seed or fence stockpiles to prevent wind whipping.
Agree monitoring locations with the Local Authority.
Where possible, commence baseline monitoring at least three months before phase begins.
Put in place real-time dust and air quality pollutant monitors across the site and ensure they are checked regularly.
Operating vehicle/machinery and sustainable travel
Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone.

Ensure all non-road mobile machinery (NRMM) comply with the standards set within this guidance.
Ensure all vehicles switch off engines when stationary – no idling vehicles.
Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where possible.
Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).
Operations
Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
Ensure an adequate water supply on the site for effective dust/particulate matter mitigation (using recycled water where possible).
Use enclosed chutes, conveyors and covered skips.
Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Waste management
Reuse and recycle waste to reduce dust from waste materials.
Avoid bonfires and burning of waste materials.
Measures specific to trackout
Regularly use a water-assisted dust sweeper on the access and local roads, as necessary, to remove any material tracked out of the site.
Avoid dry sweeping of large areas.
Ensure vehicles entering and leaving sites are securely covered to prevent escape of materials during transport.
Record all inspections of haul routes and any subsequent action in a site log book.
Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems and regularly cleaned.
Inspect haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
Access gates to be located at least 10m from receptors where possible.

7.3 The IAQM document also provides measures described as ‘desirable’ and these may be required by the local planning authority:

Install green walls, screens or other green infrastructure to minimise the impact of dust and pollution.
Carry out regular dust soiling checks of buildings within 100m of site boundary and cleaning to be provided if necessary.
Impose and signpost a maximum-speed-limit of 10 mph on surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).

Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces.
Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil.
Only remove secure covers in small areas during work and not all at once.
Avoid scabbling (roughening of concrete surfaces) if possible.
Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.
Apply dust suppressants to locations where a large volume of vehicles enter and exit the construction site.

7.4 The Mayor of London's SPG states that with the recommended dust mitigation measures in place the residual impact will be *"minimised"*, and recommends the mitigation is secured by for a condition or Section 106 agreement as appropriate.

Mitigation for the Operational Impact of the Development on the Surrounding Area

7.5 When the change in concentration at existing sensitive receptors is considered in the context of the absolute concentration, the overall air quality impact on the surrounding area as a whole is categorised as "negligible" and the resulting effect is considered to be "not significant". On that basis, no mitigation measures are considered necessary.

8 Conclusions

8.1 This assessment has considered dust effects during the construction phase and the air quality impacts during the operational phase of the Botwell Lane Lidl development.

8.2 Impacts during the construction of the Botwell Lane Lidl development, such as dust generation and plant vehicle emissions, are predicted to be of short duration and only relevant during the construction phase. The results of the risk assessment of construction dust impacts undertaken using the Mayor of London's guidance indicates that before the implementation of mitigation and controls, the risk of dust impacts will be low. Implementation of the highly-recommended mitigation measures described in the Mayor of London's Supplementary Planning Guidance *"should ensure the air quality impacts of construction and demolition are minimised and any mitigation measures employed are effective"*.

8.3 Regarding the operational impact of the Botwell Lane Lidl development on the surrounding area, detailed atmospheric dispersion modelling has been undertaken for the first year in which the development is expected to be fully operational, 2016. The operational impact of the Botwell Lane, Lidl development on existing receptors in the local area is predicted to be 'negligible' to 'slight' taking into account the changes in pollutant concentrations and absolute levels. Using the criteria adopted for this assessment together with professional judgement, the overall operational impact on the area as a whole is considered to be 'slight' and the resulting air quality effect is considered to be "not significant" overall.

8.4 The 'golden thread' running through the NPPF is a presumption in favour of sustainable development. For determining planning applications, this means approving development proposals if they accord with the local development plan, unless material considerations indicate otherwise. If the development plan is absent, silent or the policies are out of date, then planning permission should be granted unless any adverse impacts would significantly outweigh the benefits, or specific policies in the NPPF indicate development should be restricted.

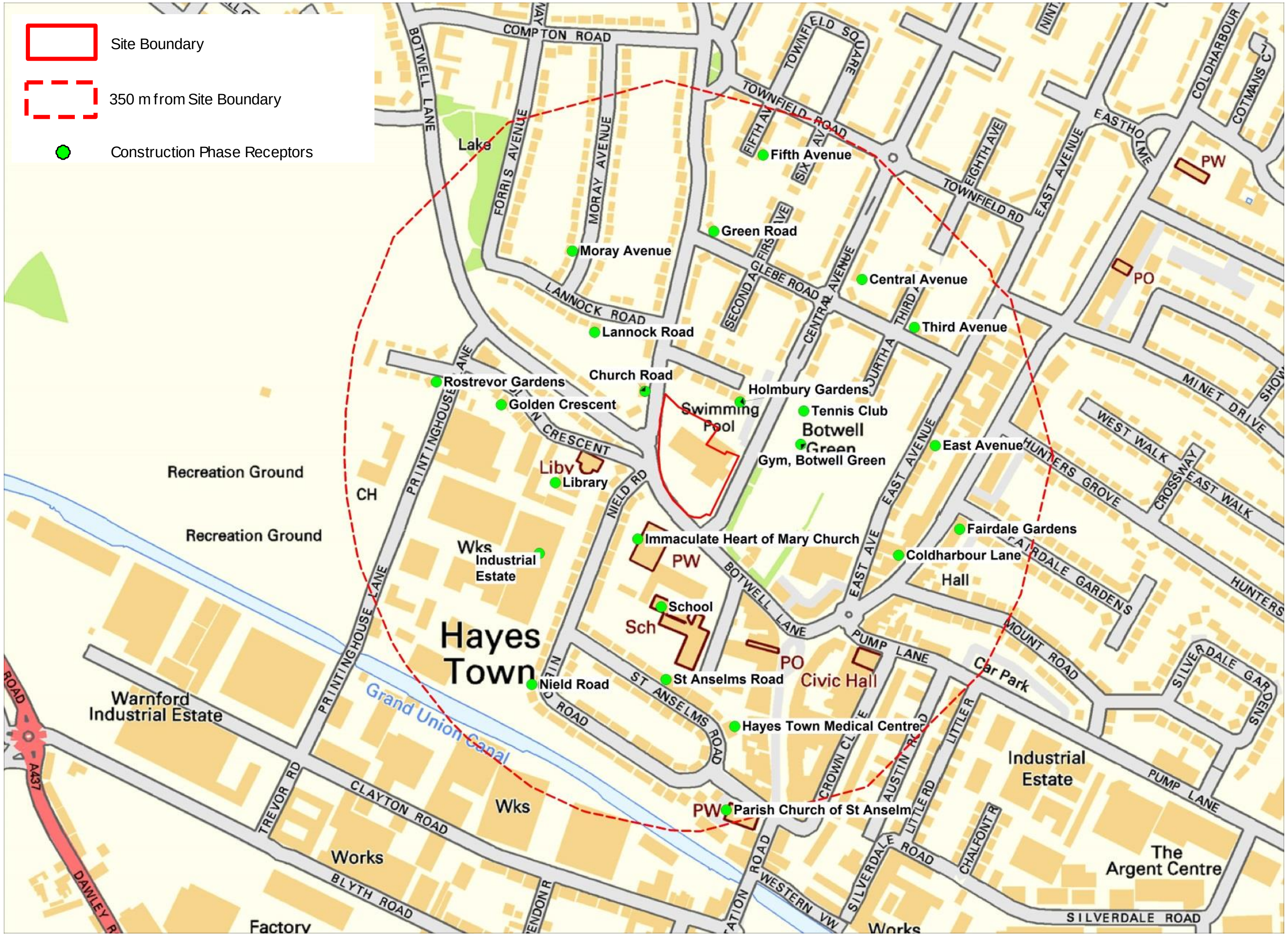
8.5 The nPPG advises that in considering planning permission, the relevant question for air quality is *"will the proposed development (including mitigation) lead to an unacceptable risk from air pollution, prevent sustained compliance with EU limit values or national objectives for pollutants or fail to comply with the requirements of the Habitats Regulations?"* The proposed development will not.

8.6 The Botwell Lane Lidl development does not, in air quality terms, conflict with national or local policies, or with measures set out in LBH's Air Quality Action Plan. There are no constraints to the development in the context of air quality.

Glossary

AADT	Annual Average Daily Traffic Flow
ADMS	Atmospheric Dispersion Modelling System
AQMA	Air Quality Management Area
AQS	Air Quality Strategy
Deposited Dust	Dust that has settled out onto a surface after having been suspended in air.
DMP	Dust Management Plan
Dust	Solid particles suspended in air or settled out onto a surface after having been suspended in air
Effect	The consequences of an impact, experienced by a receptor
EPUK	Environmental Protection UK
HGV	Heavy Goods Vehicle
IAQM	Institute of Air Quality Management
Impact	The change in atmospheric pollutant concentration and/or dust deposition. A scheme can have an 'impact' on atmospheric pollutant concentration but no effect, for instance if there are no receptors to experience the impact.
LGV	Light Goods Vehicle
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
R&A	Review and Assessment
Receptor	A person, their land or property and ecologically sensitive sites that may be affected by air quality.
Risk	The likelihood of an adverse event occurring
Trackout	The transport of dust and dirt from the construction/demolition site onto the public road network, where it may be deposited and then re-suspended by vehicle using the network

Figures



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Project: Lidl Food Store, Botwell Lane

Job Ref: JAP 7645

File location:

Date: 16 June 2014	**Rev: 1**
Drawn: RC	**Checked: JP**

Figure 1: Construction Receptors Modelled

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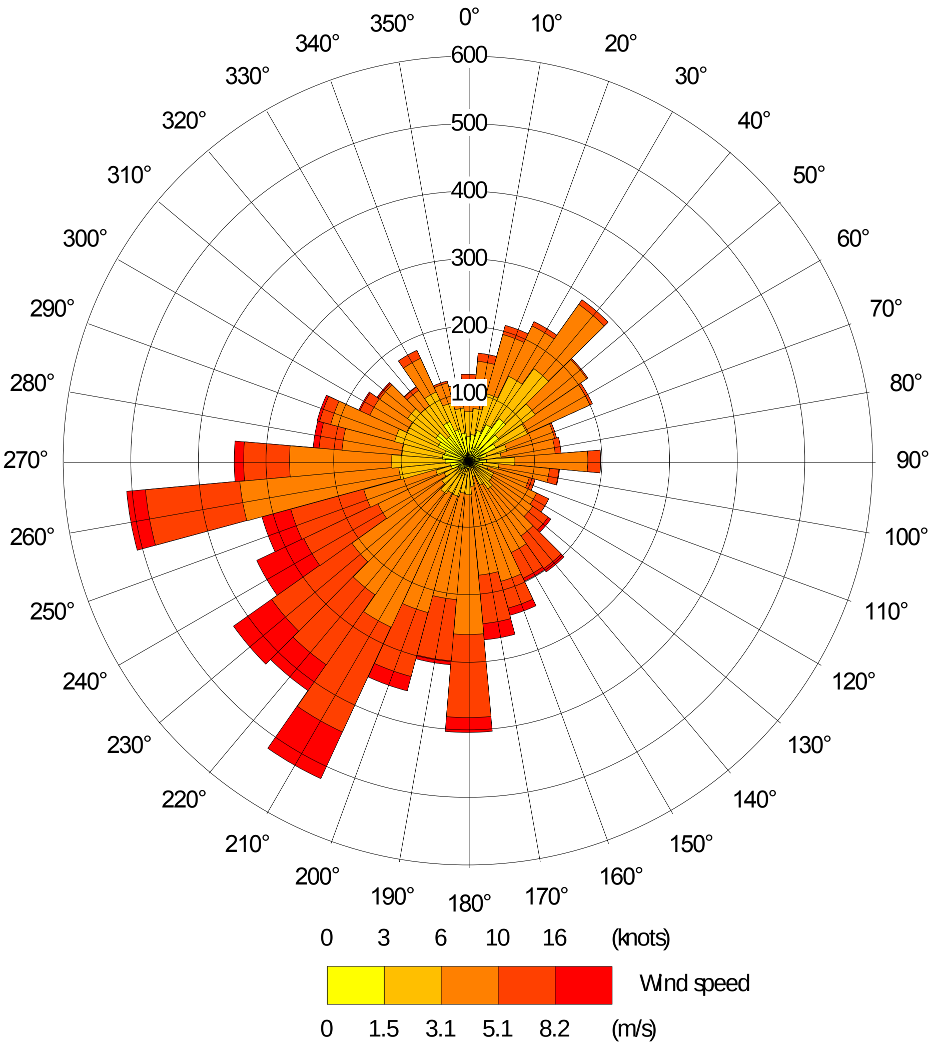

Figure 2: Wind Rose – London Heathrow 2014					
Project Number	**JAP 7465**	**Project Title**	**Lidl Food Store, Botwell Lane**		
Client:	**Lidl UK GmbH**	**Rev :**	**1**	**Drawn By:**	**RC**
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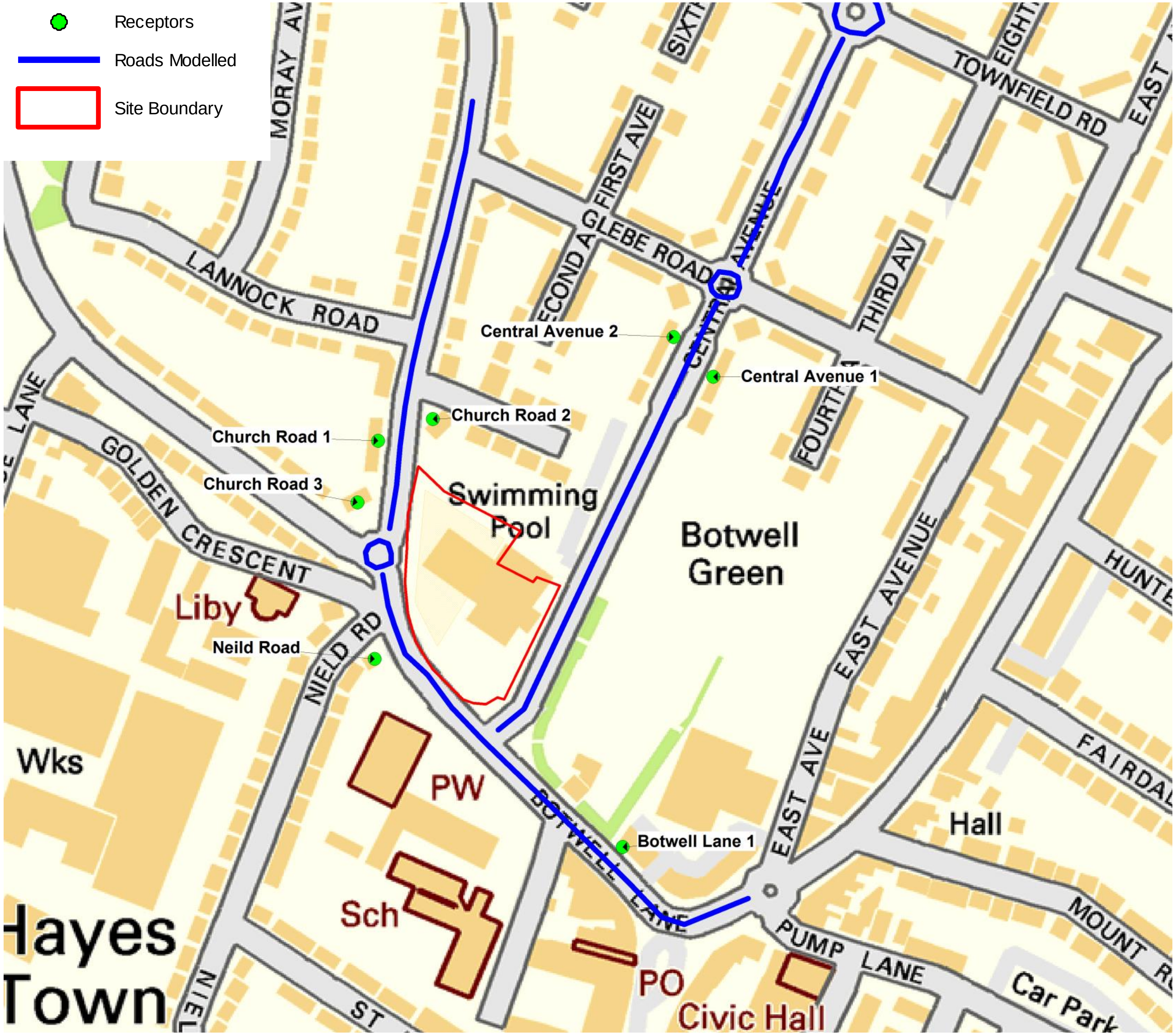

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Figure 3: Roads and Receptors Modelled	

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Appendices

Appendix A: Detailed Construction Dust Assessment Methodology

Source

The IAQM guidance gives examples of the dust emission magnitudes for demolition, earthworks and construction activities and trackout. These example dust emission magnitudes are based on the site area, building volume, number of HDV movements generated by the activities and the materials used. These example magnitudes have been combined with details of the period of construction activities to provide the ranking for the source magnitude that is set out in Table A1.

Table A1 Risk Allocation – Source (Dust Emission Magnitude)

Features of the Source of Dust Emissions	Dust Emission Magnitude
Demolition - building over 50,000 m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities > 20 m above ground level. **Earthworks** – total site area over 10,000 m^2, potentially dusty soil type (e.g. clay), >10 heavy earth moving vehicles active at any one time, formation of bunds > 8 m in height, total material moved > 100,000 tonnes. **Construction** - total building volume over 100,000 m^3, activities include piling, on-site concrete batching, sand blasting. Period of activities more than two years. **Trackout** – 50 HDV outwards movements in any one day, potentially dusty surface material (e.g. High clay content), unpaved road length > 100 m.	Large
Demolition - building between 20,000 to 50,000 m^3, potentially dusty construction material and demolition activities 10 - 20 m above ground level. **Earthworks** – total site area between 2,500 to 10,000 m^2, moderately dusty soil type (e.g. silt), 5 – 10 heavy earth moving vehicles active at any one time, formation of bunds 4 - 8 m in height, total material moved 20,000 to 100,000 tonnes. **Construction** - total building volume between 25,000 and 100,000 m^3, use of construction materials with high potential for dust release (e.g. concrete), activities include piling, on-site concrete batching. Period of construction activities between one and two years. **Trackout** – 10 - 50 HDV outwards movements in any one day, moderately dusty surface material (e.g. High clay content), unpaved road length 50 – 100 m.	Medium
Demolition - building less than 20,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities < 10 m above ground, demolition during winter months. **Earthworks** – total site area less than 2,500 m^2. Soil type with large grain size (e.g. sand), < 5 heavy earth moving vehicles active at any one time, formation of bunds < 4 m in height, total material moved < 10,000 tonnes earthworks during winter months. **Construction** - total building volume below 25,000 m^3, use of construction materials with low potential for dust release (e.g. metal cladding or timber). Period of construction activities less than one year. **Trackout** – < 10 HDV outwards movements in any one day, surface material with low potential for dust release, unpaved road length < 50 m.	Small

Pathway and Receptor - Sensitivity of the Area

Pathway means the route by which dust and particulate matter may be carried from the source to a receptor. The main factor affecting the pathway effectiveness is the distance from the receptor to the source. The orientation of the receptors to the source compared to the prevailing wind direction is a relevant risk factor for long-duration construction projects; however, short-term construction projects may be limited to a few months when the most frequent wind direction might be quite different, so adverse effects can potentially occur in any direction from the site.

As set out in the IAQM guidance, a number of attempts have been made to categorise receptors into high, medium and low sensitivity categories; however there is no unified sensitivity classification scheme that covers the quite different potential effects on property, human health and ecological receptors.

Table A2 and Table A3 sets out the IAQM basis for categorising the sensitivity of people and property to dust and PM_{10} respectively.

Table A2 Sensitivities of People and Property Receptors to Dust

Receptor	Sensitivity
Principles:- ▪ Users can reasonably expect enjoyment of a high level of amenity; or ▪ the appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods as part of the normal pattern of use of the land. Indicative Examples:- ▪ Dwellings. ▪ Museums and other culturally important collections. ▪ Medium and long-term car parks and car showrooms.	High
Principles:- ▪ Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or ▪ the appearance, aesthetics or value of their property could be diminished by soiling; or ▪ the people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. Indicative Examples:- ▪ Parks. ▪ Places of work.	Medium
Principles:- ▪ the enjoyment of amenity would not reasonably be expected; or ▪ there is property that would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or ▪ there is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. Indicative Examples:- ▪ Playing fields, farmland (unless commercially-sensitive horticultural). ▪ Footpaths and roads. ▪ Short-term car parks.	Low

Table A3 Sensitivities of People and Property Receptors to PM_{10}

Receptor	Sensitivity
Principles:- ▪ Locations where members of the public are exposed over a time period relevant to the air quality objective (in the case of the 24-hour objective for PM_{10}, a relevant location would be one where individuals may be exposed for eight hours or more in a day). Indicative Examples:- ▪ Residential properties. ▪ Schools, hospitals and residential care homes.	High
Principles:- ▪ Locations where the people exposed are workers and exposure is over a time period relevant to the air quality objective (in the case of the 24-hour objective for PM_{10}, a relevant location would be one where individuals may be exposed for eight hours or more in a day). Indicative Examples:- ▪ Office and shop workers (but generally excludes workers occupationally exposed to PM_{10} as protection is covered by Health and Safety at Work legislation).	Medium
Principles:- ▪ Locations where human exposure is transient exposure. Indicative Examples:- ▪ Public footpaths. ▪ Playing fields, parks. ▪ Shopping streets.	Low

The IAQM methodology combines consideration of the pathway and receptor to derive the 'sensitivity of the area'. Table A4 and Table A5 show how the sensitivity of the area has been derived for this assessment.

Table A4 Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors [a]	Distance from the Source (m) [b]			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

The sensitivity of the area has been derived for demolition, construction, earthworks and trackout.

a The total number of receptors within the stated distance has been estimated. Only the highest level of area sensitivity from the table has been recorded.

b For trackout, the distances have been measured from the side of the roads used by construction traffic. Without site-specific mitigation, trackout may occur from roads up to 500 m from large sites, 200 m from medium sites and 50 m from small sites, as measured from the site exit. The impact declines with distance from the site, and trackout impacts have only been considered up to 50 m from the edge of the road.

Table A5 Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentration [a]	Number of Receptors [b, c]	Distance from the Source (m) [d]				
			<20	<50	<100	<200	<350
High	> 32 µg.m^{-3}	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28 - 32 µg.m^{-3}	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24 - 28 µg.m^{-3}	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	< 24 µg.m^{-3}	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	-	>10	High	Medium	Low	Low	Low
	-	1-10	Medium	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

The sensitivity of the area has been derived for demolition, construction, earthworks and trackout.

a This refers to the background concentration derived from the assessment of baseline conditions later in this report. The concentration categories listed in this column apply to England, Wales and Northern Ireland but not to Scotland.

b The total number of receptors within the stated distance has been estimated. Only the highest level of area sensitivity from the table has been recorded.

c For high sensitivity receptors with high occupancy (such as schools or hospitals), the approximate number of occupants has been used to derive an equivalent number of receptors.

d For trackout, the distances have been measured from the side of the roads used by construction traffic. Without site-specific mitigation, trackout may occur from roads up to 500 m from large sites, 200 m from medium sites and 50 m from small sites, as measured from the site exit. The impact declines with distance from the site, and trackout impacts have only been considered up to 50 m from the edge of the road.

The IAQM guidance lists the following additional factors that can potentially affect the sensitivity of the area and, where necessary, professional judgement has been used to adjust the sensitivity allocated to a particular area:

- any history of dust generating activities in the area;
- the likelihood of concurrent dust generating activity on nearby sites;
- any pre-existing screening between the source and the receptors;
- any conclusions drawn from analysing local meteorological data which accurately represent the area; and if relevant the season during which the works will take place;

- any conclusions drawn from local topography;
- duration of the potential impact, as a receptor may become more sensitive over time; and
- any known specific receptor sensitivities which are considered go beyond the classifications given in the table above.

The matrices in Table A6, Table A7, Table A8 and Table A9 have been used to assign the risk for each activity to determine the level of mitigation that should be applied. For those cases where the risk category is 'negligible', no mitigation measures are required beyond those mandated by legislation.

Table A6 Risk of Dust Impacts – Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table A7 Risk of Dust Impacts – Earthworks

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table A8 Risk of Dust Impacts – Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table A9 Risk of Dust Impacts – Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

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