Edgbaston Central Campus Development
Hybrid Planning Application

March 2012

Air Quality Assessment

UNIVERSITY OF BIRMINGHAM

University of Birmingham

Edgbaston Central Campus Development

Air Quality Assessment

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Contents

1 Introduction

Ove Arup and Partners Limited (Arup) has been commissioned by the University of Birmingham to undertake an air quality assessment investigating the air quality impacts of the proposed masterplan redevelopment at the University site in Edgbaston, Birmingham.

This report assesses the impact of the proposed redevelopment upon local air quality through the identification and assessment of direct and indirect emission sources. Potential changes to air quality in the area, as a result of the proposals, have been considered in relation to the UK Government's Air Quality Strategy objectives and the Environment Protection UK Guidance to determine their significance. It also outlines the current regulatory system relevant to air quality management, the baseline air quality conditions in the area and the methodology used to assess air quality impacts. Where appropriate, mitigation measures are outlined to ensure any adverse effects on air quality are minimised or avoided.

2 Air Quality Standards

2.1 Air Quality Objectives

Air quality limit values and objectives are quality standards for clean air. They can be used as assessment criteria for determining the significance of any potential changes in local air quality resulting from the development proposals.

European Union (EU) air quality policy sets the scene for national policy. The air quality 'framework' Directive on Ambient Air Quality Assessment and Management came into force in September 1996 and is intended as a strategic framework for tackling air quality consistently, through setting European-wide air quality limit values in a series of daughter directives, superseding and extending existing European legislation. On 9th April 2008 the Directive on Ambient Air Quality and Cleaner Air for Europe was introduced under the Thematic Strategy on Air Pollution[1]. The Directive consolidates and simplifies existing air quality legislation and introduced a new standard for particulate matter of $PM_{2.5}$.

In a parallel national process, the Environment Act was published in 1995[2]. The Act required the preparation of a national air quality strategy setting air quality standards and objectives for specified pollutants and outlining measures to be taken by local authorities through the system of Local Air Quality Management (LAQM) and by others *"to work in pursuit of achievement"* of these objectives. A *National Air Quality Strategy* (NAQS) was published in 1997 and subsequently reviewed and revised in 2000, as the *Air Quality Strategy for England, Scotland, Wales and Northern Ireland* and an addendum to the Strategy was published in 2003. The current *Air Quality Strategy for England, Scotland, Wales and Northern Ireland* was published in July 2007. The air quality objectives have been introduced in England through the Air Quality (England) Regulations 2000 and 2002.

2.2 Air Quality Limit Values

Air quality limit values and objectives are quality standards for clean air. They can be used as assessment criteria for determining the significance of any potential changes in local air quality resulting from the development proposals.

Some pollutants have objectives expressed as annual mean concentrations due to the chronic way in which they affect health of the natural environment (i.e. effects occur after a prolonged period of exposure to elevated concentrations) and others have objectives expressed as 24-hour, one-hour or 15-minute mean concentrations due to the acute way in which they affect health or the natural environment (i.e. after a relatively short period of exposure). Some pollutants have objectives expressed in terms of both long-term and short-term concentrations (e.g. nitrogen dioxide and fine particulate matter).

In the majority of cases the air quality limit values and air quality objectives have the same pollutant concentration threshold and date for compliance. The key difference is that the Secretary of State for the Environment is required under European Law to ensure the air quality limit values are complied with whereas

[1] Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe
[2] The Environment Act 1995, HMSO

local authorities (including the Mayor of London) are only obliged under national legislation to undertake best efforts to comply with the air quality objectives. To assist local authorities in demonstrating best efforts, the Environment Act 1995 requires that when carrying out their local air quality management functions, local authorities shall have regard to guidance issued by the Secretary of State. Table 1 sets out the EU air quality limit values and national air quality objectives for the pollutants relevant to this assessment namely nitrogen dioxide (NO_2) and fine particles (PM_{10}).

In the majority of cases the air quality limit values and air quality objectives have the same pollutant concentration threshold and date for compliance. The key difference is that the Secretary of State for the Environment is required under European Law to ensure the air quality limit values are complied with whereas local authorities (including the Mayor of London) are only obliged under national legislation to undertake best efforts to comply with the air quality objectives. To assist local authorities in demonstrating best efforts, the Environment Act 1995 requires that when carrying out their local air quality management functions, local authorities shall have regard to guidance issued by the Secretary of State.

Table 1: UK and EU Air Quality Objectives and Limit Values

Pollutant	Averaging Period	Limit Value/Objective	Date for Compliance	Basis
Nitrogen dioxide	1 hour mean	200 µg/m^3, not to be exceeded more than 18 times a year (99.8th percentile)	31stDec 2005	UK
			1st Jan 2010	EU
	Annual mean	40 µg/m^3	31stDec 2005	UK
			1st Jan 2010	EU
Fine particulates (PM_{10}) **Measurement technique: Gravimetric**	Daily mean	50 µg/m^3, not to be exceeded more than 35 times a year (90.4th percentile)	31st Dec 2004	UK
			None specified	EU
	Annual mean	40 µg/m^3	31st Dec 2004	UK
			None specified	EU

Performance against these objectives is to be monitored where people are regularly present and might be exposed to air pollution and it is the responsibility of each local authority to undertake such duties. Each local authority is required to undertake a Review and Assessment of local air quality. The process (detailed further in section 5.1) considers the current and the likely future air quality situation, assessing whether the prescribed objectives are likely to be achieved by their target dates.

3 Planning Policy Framework

The land use planning process is a key means to improving air quality, particularly in the long term, through the strategic location and design of new developments. Any air quality consideration that relates to land use and its development can be material planning consideration in the determination of planning applications, dependent upon the details of the proposed development.

3.1 National Planning Policy and Air Quality Guidance

Planning policies particularly relevant to air quality management are set out in PPG13 – Transport[3] and PPS23 - Planning and Pollution Control[4], and in the Local Air Quality Management guidance note on Air Quality and Land Use Planning[5] and the Environmental Protection UK guidance[6].

3.1.1 PPG13: Transport (2011)

PPG13 (Transport)[3] was re-published in January 2011 as an update to the previous version published in March 2001. It provides the Government's transport planning policies, with the objectives of delivering an integrated transport policy, extending transport choices and securing mobility in a way that supports sustainable development. The aim is to integrate planning and transport at a number of levels to promote more sustainable transport choices (for people and freight), to promote accessibility to services and to reduce the need to travel, especially by car. PPG13 states that local air quality is a key consideration in the integration of planning and transport. This is particularly relevant in areas where the Government's national air quality objectives are not expected to be met and air quality action plans are formulated. The PPG advises that well designed traffic management measures are able to contribute to reducing local air pollution and in improving the quality of local neighbourhoods. It encourages the use of alternative fuels and the provision of the infrastructure to support them (e.g. electric vehicle charging points).

3.1.2 PPS23: Planning and Pollution Control (2004)

PPS23: Planning and Pollution Control is intended to complement the new pollution control framework under the Pollution Prevention and Control Act 1999 and The Pollution Prevention and Control (England and Wales) Regulations 2000. PPS23 sets out the Government's core policies and principles on land use planning. It contains an Annex on 'Pollution Control, Air and Water Quality' which considers the links between the land use planning and pollution control systems and how the interaction should be dealt with in planning. Policies and advice contained within PPS23 (including Annexes) should be taken into account in preparing policies for the development and use of land in the region by Regional Planning Bodies, Regional Spatial Strategies and Local Planning Authorities and in determining applications for planning permission. PPS23 also

3 HMSO (2011) Planning Policy Guidance Note 13: Transport.

4 HMSO (2004) Planning and Policy Statement 23: Planning and Pollution Control.

5 DEFRA (2009) Part IV of the Environment Act 1995: Local Air Quality Management: Policy Guidance, LAQM.PG(09), Department for Environment, Food and Rural Affairs, February 2009.

6 Environmental Protection UK (2010). Development Control: Planning for Air Quality.

makes reference to proposed development within designated AQMAs. It states that whilst it is important that the possible impact on air quality to or in an AQMA are considered, it is not the case that all planning applications for development inside or adjacent to AQMAs should be refused if the developments would results in a deterioration of local air quality as this could sterilise development.

3.1.3 Local Air Quality Management Policy Guidance LAQM.PG(09)

Policy guidance note LAQM.PG(09) provides additional guidance on the links between transport and air quality. LAQM.PG(09) describes how road transport contributes to local air pollution and how transport measures may bring improvements in air quality. Key transport related Government initiatives are set out, including regulatory measures and standards to reduce vehicle emissions and improve fuels, tax-based measures and the development of an integrated transport strategy.

LAQM.PG(09) also provides guidance on the links between air quality and the land use planning system. The guidance advises that air quality considerations should be integrated within the planning process at the earliest stage, and is intended to aid local authorities in developing action plans to deal with specific air quality problems and create strategies to improve air quality generally. It summarises the main ways in which land use planning system can help deliver air quality objectives.

3.1.4 Environmental Protection UK Guidance – Development Control: Planning for Air Quality

The Environmental Protection UK (EPUK) guidance note 'Development Control: Planning for Air Quality' (as updated in 2010)[7] responds to the need for closer integration between air quality and development control. It provides a framework for air quality considerations within local development control processes, promoting a consistent approach to the treatment of air quality issues within development control decisions.

The 2010 update to this guidance includes advice provided by the Institute of Air Quality Management on assessing the air quality impacts of a development and provides a useful framework for examining the air quality impacts of a proposal.

3.2 Greater London Authority (GLA) Best Practice Guidance

The GLA Best Practice Guidance[8] provides an approach for the control of dust and emissions from construction and demolition activities. This document is a London focussed document to provide consistent best practice for demolition and construction sites across London, although the principles of best practice can be readily applied to other areas outside London. This is detailed further in Section 4.2.

[7] Environment Protection UK (2010). Development Control: Planning for Air Quality (2010 Update).
[8] GLA and London Councils, 2006. The control of dust and emissions from construction and demolition. Best Practice Guidance, November 2006.

4 Assessment Methodology

The overall approach to this air quality study includes:

- A review of the existing or baseline air quality in the area;
- An assessment of the potential changes in local air quality arising from the construction and operation of the proposed development; and
- Formulation of mitigation measures, where appropriate, to ensure any adverse effects on air quality are minimised.

4.1 Assessment of Baseline

Existing or baseline ambient air quality refers to the concentration of relevant substances that are already present in the environment – these are present from various sources, such as industrial processes, commercial and domestic activities, agriculture, traffic and natural sources. The following data sources have been employed in this assessment:

- Air Information Resource (AIR) website (http://uk-air.defra.gov.uk)
- Birmingham City Council Air Quality Review and Assessment documents; in particular, 2010 Progress Report[9] and Air Quality Action Plan Consultation 2011[10].
- West Midlands Air Quality Group (http://www.wmair.org)

4.2 Construction Effects

The construction effects have been assessed through an investigation of potential sources of air pollutant emissions from construction activities and through the formulation of appropriate mitigation and control measures. An environmental risk assessment of construction impacts has been carried out using the risk based approach described in the GLA Best Practice Guidance[7].

The GLA Best Practice Guidance consolidates existing guidance on emissions from construction and demolition activities and takes into account the latest best practice and new techniques. The guidance provides a method for undertaking a qualitative Air Quality Impact Evaluation, whereby the site is evaluated and depending on the outcome of the assessment (high, medium or low risk), mitigation measures are proposed. The guidelines are detailed in Table 2 overleaf.

9 2010 Air Quality Progress Report for Birmingham City Council. In fulfilment of Part IV of the Environment Act 1995 Local Air Quality Management, June 2010

10 Birmingham City Council, Air Quality Action Plan 2011 (For Consultation). April 2011

Table 2: Construction Site Evaluation Guidelines

Low risk sites
• Development of up to 1,000 square metres of land and; • Development of up to one property and up to a maximum of ten and; • Potential for emissions and dust to have an infrequent impact on sensitive receptors.
Medium risk sites
• Development of between 1,000 and 15,000 square metres of land and; • Development of between 10 to 150 properties and; • Potential for emissions and dust to have an intermittent or likely impact on sensitive receptors.
High risk sites
• Development of over 15,000 square metres of land, or: • Development of over 150 properties or; • Major development referred to the Mayor/ and or the London Development Agency, or; • Major development defined by a London borough (or local planning authority) or; • Potential for emissions and dust to have significant impact on sensitive receptors.

4.3 Operational Effects

4.3.1 Methodology

Air emissions generated by traffic generated during the operation of the development will have potential effects on local air quality. Operational traffic-related emissions have been assessed using the DMRB screening method[11]. The assessment focuses on the two key pollutants related to traffic emissions; NO_2 and PM_{10}. The concentrations for these pollutants have been forecast at sensitive receptors in the vicinity of the proposed development site for the baseline traffic scenario (2012) and for the year of opening (2018) with and without the proposed scheme in place (Do Nothing (DN) and Do Something (DS)).

The DMRB screening method takes into account any changes in traffic flows and speeds on the local network together with any difference in the number of heavy good vehicles (HGVs). It is not intended to be an exact indicator of pollutant concentrations. The method identifies where further assessment is required and provides a tool to compare various scenarios.

Pollutant concentrations were forecast at discrete locations (referred to as receptors) that are in close proximity to affected road links and are representative of other properties in the immediate vicinity. Pollutant concentrations decrease significantly with distance from a road source and, provided that there are no other major sources nearby, would be lower at properties located further from roads than the receptors chosen. Roads more than 200m away from receptor are unlikely to have any impact on pollutant concentrations.

The proposed receptors chosen for the screening assessment are listed in Table 3 and shown in Figure 1.

[11] Design Manual for Roads and Bridges (DMRB). Volume 11, Section 3, Part 1 Air Quality, HA207/07.

Figure 1: Location of Receptors

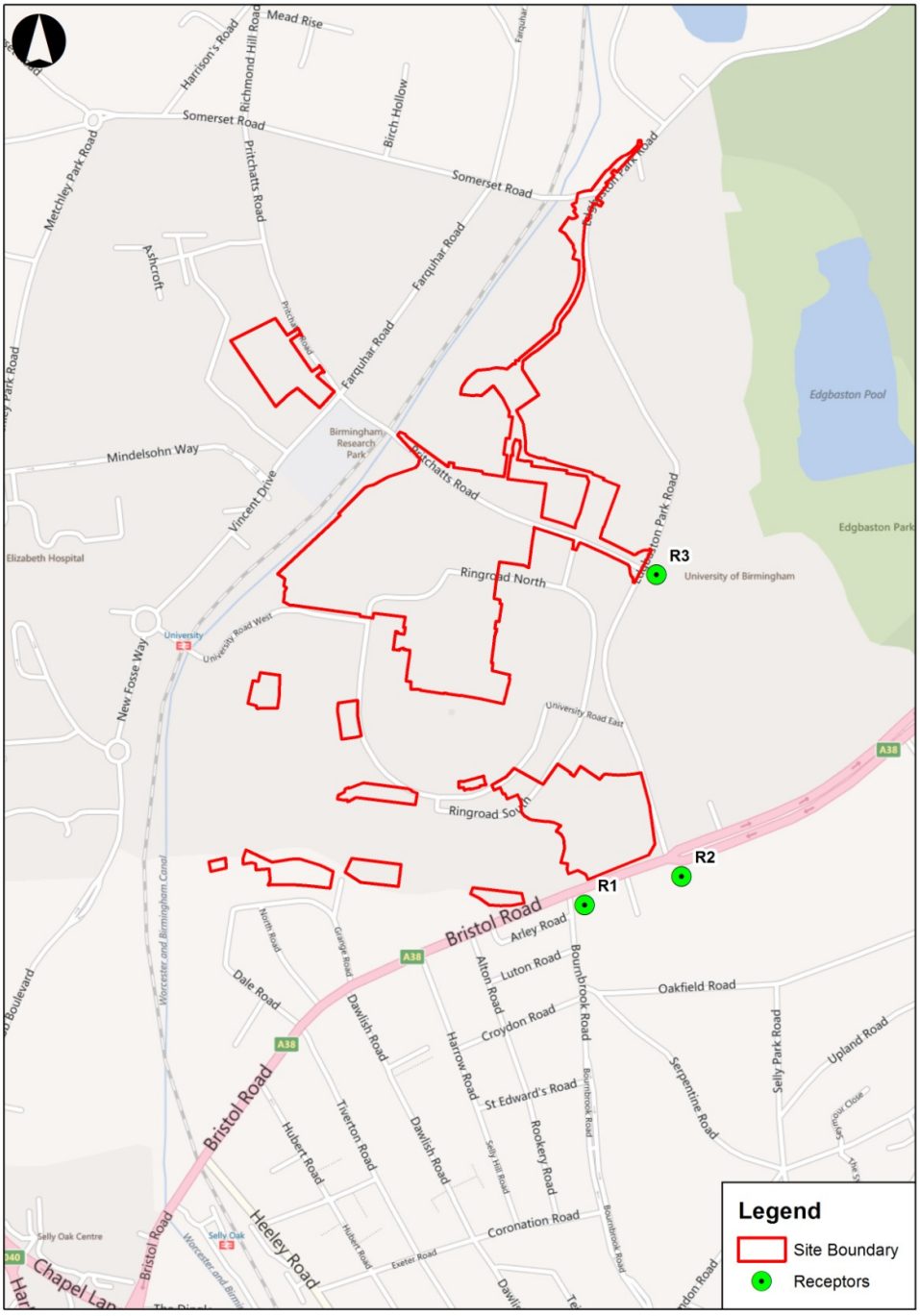


Table 3: Receptor Locations and Distances to Roads

Receptor	Address	OS Grid Reference		Road	Distance from Receptor to Centre of Road (m)	
		X	Y		Existing Scenario	DS Scenario
R1	1 Bournbrook Road	405021	283230	Bournebrook Road	11	11
				Bristol Road	15	15
R2	350? Bristol Road	405214	283284	Bristol Road	26	26
				Edgbaston Park Road	50	50
R3	64 Edgbaston park Road	405144	283772	Edgbaston Park Road	13	13
				Pritchatts Road	25	25

The building on the corner of the South Car Park Access and the Gun Barrels site are current potential receptors, but have not been considered in the assessment as they are proposed for demolition.

The proposed student accommodation on Grange Road is greater than 200m from road network where the increased traffic flows are predicted. Accordingly no receptor points were selected at this location. Due to its distance set back from Bristol Road, the pollutant concentrations at the proposed student accommodation are likely to be less than those at nearby R1, on the corner of Bristol Road.

Traffic data were obtained from WSP. Traffic counts were undertaken for the am and pm peak hours during term time, as this is thought to be worst case scenario, and a factor was applied to derive the 24-hour annual average daily traffic (AADT).

The calculated traffic flows for the roads included in this assessment for 2012 baseline and 2018 DS (Do-something) with development are shown in Table 4. Changes predicted are very small.

Table 4: Traffic Data

Receptor	Road	AADT			% HGVs	Speed (kph)
		2012	2018 DM	2018 DS		
R1	Bournebrook Road	5506	5506	5506	0.9	20*
	Bristol Road	35416	35416	35578	2.0	20*
R2	Bristol Road	36116	36116	36247	2.1	20*
	Edgbaston Park Road	10892	10892	11089	1.0	20*
R3	Edgbaston Park Road	11613	11613	11702	1.3	30†
	Pritchatts Road	8702	8702	8780	1.4	20*

* traffic data provided did not include average speed. As traffic is at a junction, 20 kph is considered appropriate

† traffic data provided did not include average speed. Speed limit for the road has been used

In line with the latest guidance (TG(09)[12]), the NOx to NO_2 conversion spreadsheet available from the UK Air Information Resources website[13] has been used to calculate NO_2 concentrations from calculated NOx concentrations rather than using the factors built into the DMRB screening tool spreadsheet.

4.3.2 Operational Impact Significance

The EPUK Guidance provides an approach to determining the significance of impacts resulting from a proposed development on local air quality both for individual receptors and for a whole scheme. The Guidance provides a basis on how to describe the significance of the impacts predicted from an air quality modelling study, specifically for the pollutants NO_2 and PM_{10}.

The first step is to identify the descriptor of change in ambient concentrations for NO_2 and PM_{10} according to the percentage change in annual mean concentrations (for both NO_2 and PM_{10}) and change in the forecast number of days greater than $50\mu g/m^3$ for PM_{10} (see Table 5 and Table 6 overleaf). The descriptor can then be used to assess the impact significance for the two pollutants in relation to changes in the absolute concentration forecast from the modelling with the proposed development in place (see Table 7 and Table 8).

In terms of overall operational impact, the EPUK Guidance provides an approach for assessing the significance of air quality impacts associated with a given development. This approach suggests factors which should be considered, within Table 9 before a suitably qualified professional can determine, with sufficient justification, whether the overall impact of a potential development should be termed ‘insignificant’, ‘minor’, ‘moderate’ or ‘major’.

The guidance also provides an approach for assessing the significance of the proposals upon air quality, to aid the development control process, by highlighting whether the development has the potential to be a material consideration in the planning application. This approach uses textual descriptions, contained within a flow chart as shown in Figure 2.

[12] DEFRA (2009). Part of the Environment Act 1995: Local Air Quality Management: Technical Guidance (TG09), Department for Environment Food and Rural Affairs, February 2009
[13] http://laqm.defra.gov.uk/tools-monitoring-data/no-calculator.html

Table 5: Descriptors for Changes in Ambient Concentrations of NO_2 (taken from the EPUK 2010 guidance)

Magnitude of Change	Absolute Change in NO_2 Concentrations ($\mu g/m^3$)
Large	Increase/decrease > 4
Medium	Increase/decrease 2 – 4
Small	Increase/decrease 0.4 – 2
Imperceptible	Increase/decrease < 0.4

Table 6: Descriptors for Changes in Ambient Concentrations of PM_{10} (taken from the EPUK 2010 guidance)

Magnitude of Change	Equivalent Absolute Change in PM_{10} Concentrations ($\mu g/m^3$)
Large	Increase/decrease > 4
Medium	Increase/decrease 2 – 4
Small	Increase/decrease 0.4 – 2
Imperceptible	Increase/decrease < 0.4

Table 7: Descriptors for Impact Significance for annual mean NO_2 (taken from the EPUK 2010 guidance)

Absolute Concentration in Relation to Objective/Limit Value	Change in Concentration		
	Small	Medium	Large
Increase with Scheme			
Above Objective/Limit Value with Scheme (> 40 $\mu g/m^3$)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value with Scheme (36-40 $\mu g/m^3$)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value with Scheme (30-36 $\mu g/m^3$)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value with Scheme (<30 $\mu g/m^3$)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value without Scheme (40 $\mu g/m^3$)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value without Scheme (36-40 $\mu g/m^3$)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value without Scheme (30-36 $\mu g/m^3$)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value without Scheme (<30 $\mu g/m^3$)	Negligible	Negligible	Slight Beneficial

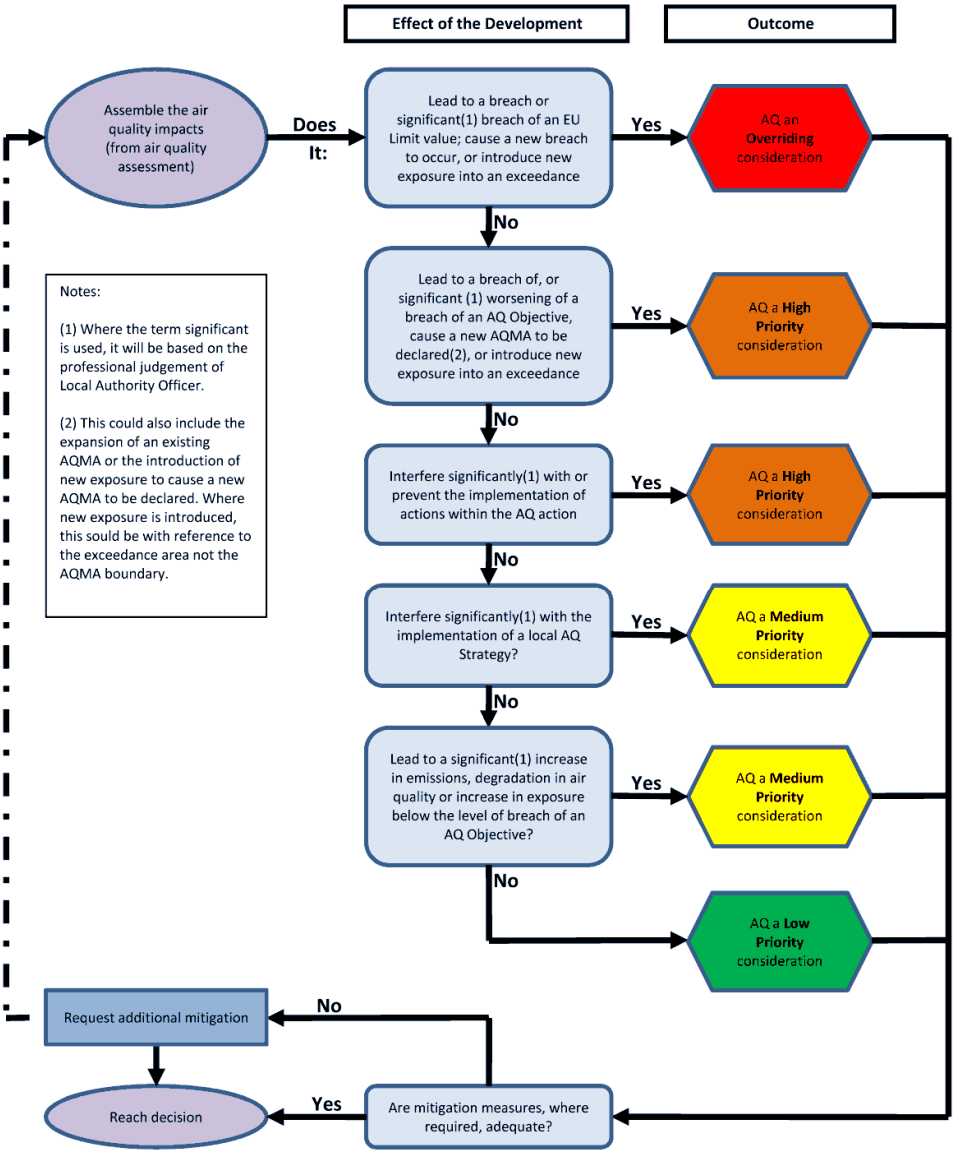
Table 8: Descriptors for Impact Significance for annual mean PM_{10} (taken from the EPUK 2010 guidance)

Absolute Concentration in Relation to Objective/Limit Value	Change in Concentration		
	Small	Medium	Large
Increase with Scheme			
Above Objective/Limit Value with Scheme (> 40 µg/m^3)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value with Scheme (36-40 µg/m^3)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value with Scheme (30-36 µg/m^3)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value with Scheme (<30 µg/m^3)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value without Scheme (40 µg/m^3)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value without Scheme (36-40 µg/m^3)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value without Scheme (30-36 µg/m^3)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value without Scheme (<30 µg/m^3)	Negligible	Negligible	Slight Beneficial

Table 9: EPUK Factors to Judge Significance (taken from the EPUK 2010 Guidance)

- Number of people affected by slight, moderate or major air quality impacts and a judgement on the overall balance;
- Where new exposure is being introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective or limit value will be relevant;
- The magnitudes of the changes and the descriptions of the impacts at the receptors;
- Whether or not an exceedence of an objective or limit value is predicted to arise in the study area where none existed before or an exceedence area is substantially increased;
- Whether or not the study area exceeds an objective or limit value and this exceedence is removed or the exceedence area is reduced;
- Uncertainty, including the extent to which worst-case assumptions have been made; and
- The extent to which an objective or limit value is exceeded e.g. an annual mean NO_2 of 41 µg/m^3 should attract less significance than an annual mean of 51 µg/m^3.

Figure 2: EPUK Steps to Assess the Significance of Impacts of a Development Proposal



5 Baseline Conditions

5.1 Birmingham City Council Review and Assessment of Air Quality

In accordance with the Environment Act 1995, local authorities are required to review and assess air quality with respect to the objectives for seven pollutants specified in the Government's National Air Quality Strategy (NAQS). Local authorities are required to carry out an Updating and Screening Assessment (USA) of their area every three years. If the USA identifies potential hotspot areas likely to exceed air quality objectives, then a Detailed Assessment of those areas is required. Where objectives are not predicted to be met, local authorities must declare the area as an Air Quality Management Area (AQMA). In addition, local authorities are required to produce an Air Quality Action Plan (AQAP) which includes measures to improve air quality within the AQMA.

Birmingham City Council commenced the process of air quality review and assessment in 1998 and concluded the first round of review and assessment in 2004 by declaring the entire city as an AQMA for NO_2.

The second round of review and assessment (2003 to 2005), confirmed the findings of the first round, with respect to predicted exceedances of NO_2 annual average concentrations. In addition, the second round of review and assessment also resulted in the whole of the city being declared an AQMA in October 2004 with respect to PM_{10} particles predicted to exceed the 24 hour mean objective. However, further assessment indicated that PM_{10} levels in the city had complied with the objective.

In 2006, as part of their third round of review and assessment, Birmingham City Council produced an AQAP to address the issues arising from elevated NO_2 and PM_{10}. The AQAP sets out 41 actions identified to reduce levels of NO_2 and PM_{10}; many of which relate to existing council policies, such as the Local Transport Plan. As motor vehicles have been identified as the major contributors of the nitrogen dioxide and particulate air pollution within the city, the AQAP is integrated in to the Local Transport Plan. Birmingham City Council have complied a comprehensive emissions inventory which includes traffic counts and the road network within the West Midlands, and the most recent sets of vehicle emission factors released in February 2007.

In 2007 a Detailed Assessment of $NO_2$and PM_{10} particles in Birmingham concluded that NO_2concentrations recorded between 2001 and 2006 are below the air quality objective ($40\mu g/m^3$) at all background sites, but roadside monitoring of NO_2 continues to record concentrations in excess of the objective. However, since 2000 PM_{10} monitoring had not recorded any concentrations in excess of the objective.

The 2008 Progress Report stated that roadside concentrations of nitrogen dioxide continued to exceed the objective but seemed to be decreasing. It was thought that the decrease may be due to measures introduced in the AQAP, variations in weather and improved engine technology. However, it was noted that the

reduction may or may not be sustained over the forthcoming years, and continued monitoring is required.

The 2011 AQAP examines options to reduce air pollution and identifies short, medium and long term actions for which the council can actually influence change. The focus is on the reduction of nitrogen dioxide and retaining this AQMA. It is also recommendation that the 2010 revocation of the AQMA for PM_{10} be recognised. The plan has been circulated for consultation among relevant internal parties at the council and the public. However, there is limited flexibility to amend the proposed actions, as the majority relate to the comprehensive transport policies across the West Midlands.

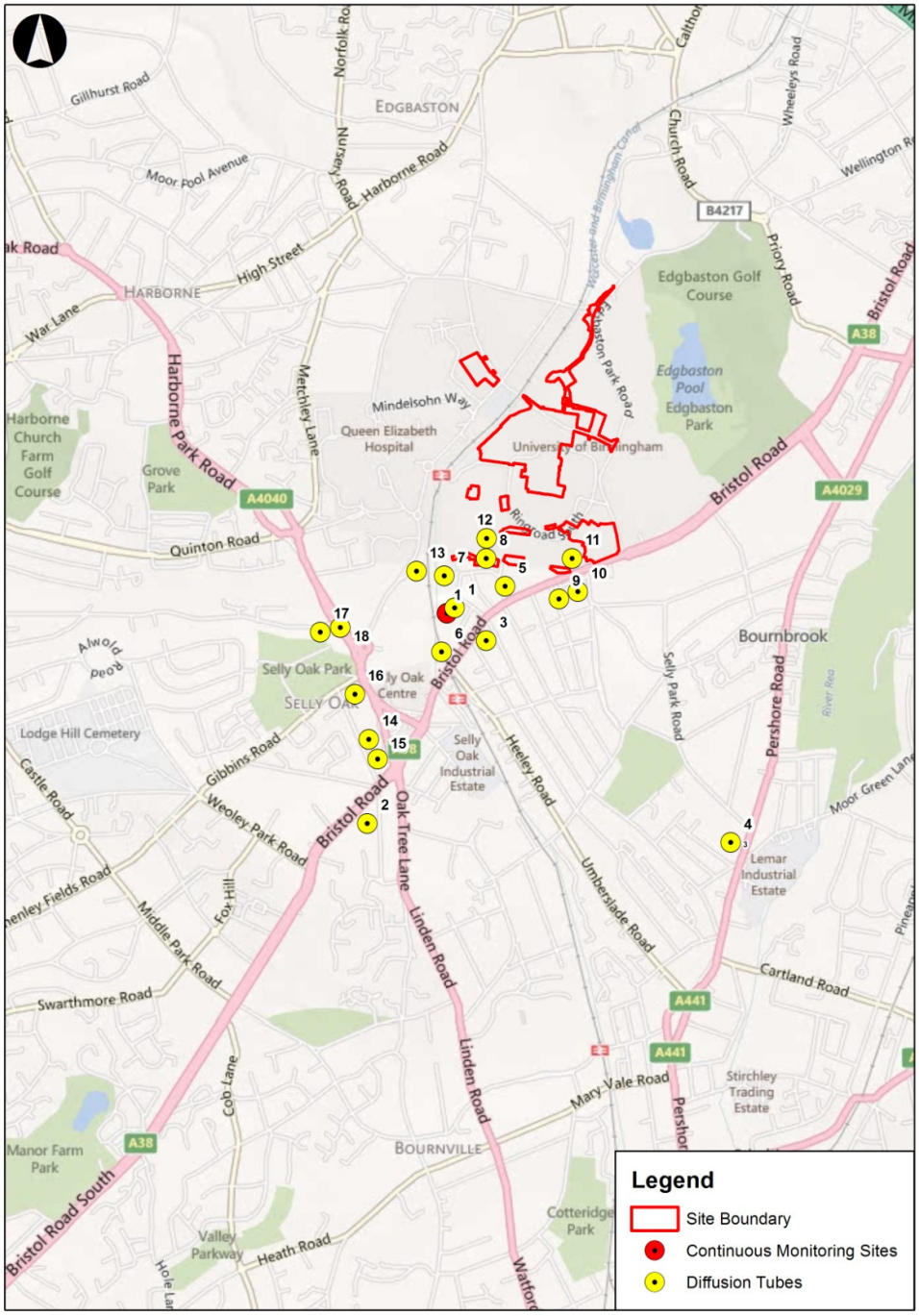
5.2 Local Air Quality Monitoring Data

Birmingham City Council undertakes continuous automatic monitoring of NO_2 and PM_{10} at Selly Oak since 2009. In addition, NO_2 has also monitored by passive diffusion tubes at 18 sites within 1 km of the development site. Details of the NO_2 monitoring sites are presented in Table 10, their locations shown in Figure 3 and the recorded annual mean concentrations are presented in Table 11.

Table 10: Monitoring Locations in the Vicinity of the Proposed Development Site

Site ID	Site Name	Grid Reference	Type
Continuous Monitoring Sites			
1	Selly Oak	404545, 283020	Urban Roadside
NO_2 Passive Diffusion Tube Sites			
1	Monitoring station	404535, 283035	Roadside
2	Langley Road	404076,282131	Urban Background
3	602 Bristol Road	404548, 282994	Roadside
4	Selly Park Tech	405668, 282027	Roadside
5	505 Bristol Road	404734, 283150	Roadside
6	641 Bristol Road	404453, 282899	Roadside
7	102 Dale Road	404489, 283221	Roadside
8	Victoria Halls	404646, 283219	Roadside
9	15 Arley Road	404899, 283178	Roadside
10	4 Arley Road	404946, 283190	Roadside
11	Uni sports ground 1	404974, 283266	Urban Background
12	Uni sports ground 2	404625, 283295	Urban Background
13	Jarrat Halls	404385, 283219	Urban Background
14	53 Rebecca Drive	404101, 282436	Roadside
15	25 Rebecca Drive	404087, 282436	Roadside
16	125 Harbourne Lane	404007, 282740	Roadside
17	171 Harbourne Lane	403960, 282889	Roadside
18	178 Harbourne Lane	403980, 282927	Roadside

Figure 3: Location of Nitrogen Dioxide Diffusion Tubes



5.2.1 Nitrogen Dioxide Results

Results from the Selly Oak automatic monitor show that the annual mean concentration for 2009 was 32µg/m^3, and therefore below the national annual mean objective of 40µg/m^3.

The Langley Road diffusion tube monitoring was discontinued in 2009, as results from 2007 and 2008 have showed annual mean concentrations of 24.9µg/m^3 and 19.1µg/m^3, and therefore significantly below the objective to not warrant further monitoring. However, an annual mean concentration of 43µg/m^3 of nitrogen dioxide was recorded at Langley Road in 2010 (as part of the Selly Oak monitoring programme), which exceeds the annual mean objective and limit value.

Results of diffusion tube monitoring at 602 Bristol Road show annual mean NO_2 concentrations of 55.4µg/m^3, 65.3µg/m^3 and 59.1µg/m^3 recorded in 2007, 2008 and 2009, which are in excess of the annual mean objective (40µg/m^3).

Birmingham City Council currently run a monitoring programme in the Selly Oak area, to assess the impact of Selly Oak New Road. Non bias adjusted[14] data showed concentrations of NO_2 above the annual mean objective at two locations along the Bristol Road (58µg/m^3 at 602 Bristol Road and 43µg/m^3 at 641 Bristol Road).

Concentrations were recorded below the national mean annual objective (40µg/m^3) value at the remaining monitoring locations.

Table 11: Annual Mean NO_2 Monitoring Results

Site ID	Site Name	2007	2008	2009	2010	2011
		(diffusion tube data has been bias adjusted)				(not bias adjusted)
Continuous NO_2 Monitors						
-	Selly Oak	-	-	-	32 µg/m^3	
NO_2 Diffusion Tubes						
1	Monitoring station					32 µg/m^3
2	Langley Road	24.9 µg/m^3	19.1 µg/m^3	-	**43 µg/m^3**	
3	Bristol Road	**55.4 µg/m^3**	**65.3 µg/m^3**	**59.1 µg/m^3**	36.3 µg/m^3	
4	Selly Park Tech			24.0 µg/m^3		
5	505 Bristol Road					35 µg/m^3
6	602 Bristol Road					**58 µg/m^3**
7	102 Dale Road					21 µg/m^3
8	Victoria Halls					22 µg/m^3
9	15 Arley Road					24 µg/m^3

[14] Diffusion tubes are affected by several sources of interference which can result in substantial under or overestimation compared to the continuous monitors. Local authorities using NO2 diffusion tube data are therefore required to quantify this "bias" of their diffusion tube measurements and apply an appropriate bias adjustment factor to the annual mean if required.

Site ID	Site Name	2007	2008	2009	2010	2011
		(diffusion tube data has been bias adjusted)				(not bias adjusted)
10	4 Arley Road					28 µg/m^3
11	Uni sports ground 1					25 µg/m^3
12	Uni sports ground 2					21 µg/m^3
13	641 Bristol Road					**43 µg/m^3**
14	53 Rebecca Drive					19 µg/m^3
15	25 Rebecca Drive					18 µg/m^3
16	125 Harbourne Lane					21 µg/m^3
17	171 Harbourne Lane					19 µg/m^3
18	178 Harbourne Lane					24 µg/m^3
19	Jarrat Halls					18 µg/m^3

Values in bold exceed the relevant air quality objective
a - data available from 17th July to 31st December 2009

5.3 Background Pollutant Concentrations

Defra has produced estimated background air pollution data for 2008 and projections for future years for each 1 x1 km grid for each local authority area. Annual mean NO_2 and PM_{10} concentrations for 2012 and 2018 for the grid square of the proposed development are shown in Table 12. These concentrations are below the annual mean national objectives for NO_2 and PM_{10} (both 40µg/m^3).

Table 12: Background Pollutant Concentrations (µg/m^3) at the Proposed Development Site (Grid Square Centre: 404500, 283500)

Pollutant	2012	2018
Nitrogen oxides, NO_X	27.16	20.77
Nitrogen dioxide, NO_2	17.52	13.94
Particulate matter, PM_{10}	15.61	14.82

It is acknowledged that ambient concentrations of NO_X in many areas have not in recent years experienced the reductions in background concentrations predicted in UK background pollutant mapping[15]. A report titled Trends in NO_X and NO_2 Emissions and Ambient Measurements in the UK[16] analysed monitored NO_X emission rates from vehicles and compared them to emission rates in the national inventory, used to derive the Emissions Factor Toolkit [17] (EFT) factors and used to

15 NO2: Up? Down? You choose, Air Quality Bulletin, November 2010 Issue 55
16 David Carslaw et al (2011), Trends in NOX and NO2 emissions and ambient measurements in the UK, Defra
17 Defra (2010) Emissions Factor Toolkit Version 4.2

create background maps. The investigation found that emissions from vehicles were not declining as predicted in the EFT, due to, amongst other factors:

- A larger proportion of more polluting diesel vehicles on the road than predicted;
- An older vehicle fleet on the road than that assumed; and
- Higher emission rates from vehicles on the road, particularly for older petrol car and diesel vehicles.

Further investigations and guidance from Defra are expected in the future.

6 Assessment of Construction Effects

This section outlines the potential air quality impacts and measures to mitigate possible negative impacts on air quality during the construction phase.

6.1 Predicted Impacts

Atmospheric emissions from construction activities will depend on a combination of the potential for emission (the type of activities) and the effectiveness of control measures. In general terms, there are two sources of emissions that will need to be controlled to minimise the potential for adverse environmental effects:

- Exhaust emissions from site plant, equipment and vehicles; and
- Fugitive dust emissions from site activities.

The operation of vehicles and equipment powered by internal combustion engines results in the emission of waste exhaust gases containing the pollutants NO_x, PM_{10}, volatile organic compounds, and carbon monoxide. The quantities emitted depend on factors such as engine type, service history, pattern of usage and composition of fuel. The operation of site equipment, vehicles and machinery would result in emission to the atmosphere of unquantified levels of waste exhaust gases but such emissions are unlikely to be significant - particularly in comparison to levels of similar emissions from road traffic.

Fugitive dust emissions from construction activities are likely to be variable and would depend upon type and extent of the activity, soil conditions (soil type and moisture), road surface condition and weather conditions. Soils are inevitably drier during the summer period and periods of dry weather combined with higher than average winds have the potential to generate the most dust. The construction activities that are the most significant sources of fugitive emissions are:

- Demolition activities, due to the breaking up and size reduction of concrete, stone and compacted aggregates;
- Earth moving, due to the excavation, handling, storage and disposal of soil and subsoil materials;
- Construction aggregate usage, due to the transport, unloading, storage and use of dry and dusty materials (such as cement powder and sand);
- Movement of heavy site vehicles on dry untreated or hard surfaced surfaces; and
- Movement of vehicles over surfaces contaminated by muddy materials brought off the site - for example, over public roads.

The sensitivity of different land uses and facilities to dust can be categorised from low to high - examples are shown in Table 13.

Table 13: Example of Dust Sensitive Facilities[18]

High Sensitivity	Medium Sensitivity	Low Sensitivity
Hospitals and Clinics	Schools	Farms
High-tech industries	Residential areas	Light and heavy industry
Painting and finishing	Food Retailers	Outdoor storage
Food processing	Greenhouses and nurseries	
	Horticultural land	
	Offices	

The dust sensitive properties within the vicinity of the proposed University redevelopment are predominantly medium sensitivity facilities:

- Residential properties along Pritchatts Road and Edbaston Park Road – within the northern area and eastern areas of the proposed redevelopment;
- Residential and shops along Bristol Road – southern boundary of the development site;
- University buildings – across most of the redevelopment area, including proposed student accommodation at Grange Road.

Airborne dust has a limited ability to remain airborne and readily drops from suspension as a deposit. Research undertaken for the Department of the Environment[19] concluded that large particulate matter (particles over 30 µm in diameter), return to the surface quite rapidly. Under average wind conditions (mean wind speed of 2-6 m/sec), these particles, which comprise around 95% of total dust emissions were found to return to the surface within 60-90m of the emission source[20]. However, this potential risk can be reduced by effective use of dust control measures with the result that adverse effects are unlikely. The dust control measures proposed are outlined in Section 8.

The traffic effects of the proposed development during the construction phase would be limited to a finite period and would be along the traffic routes employed by haulage vehicles, construction vehicles and employees.

6.2 Assessment of Significance

The GLA Best Practice Guidance[8] recommends that a site evaluation is carried out, to establish if the site is a low, medium or high risk site in terms of its potential to create dust nuisance. The criteria given in the report identify the development as a **high** risk site in terms of air quality. This rating has been achieved based on the size of the development (approximately 52,000 m^2 of new build development and approximately 34,000m^2 of demolition) and proximity to sensitive receptors.

[18] Ireland, M. (1992). Dust: Does the EPA go far enough? In: Quarry Management; August 1992, pp23-24.
[19] Study by Arup Environmental for Department for Environment (1995). Environmental Effects of Dust from Surface Mineral Workings, HMSO, 1995
[20] Cowheard et al (1990) Control of Fugitive and Hazardous Dusts, Pollution Technology Review, Noyes Data Corporation.

7 Assessment of Operational Effect

Results of the DMRB screening assessment are presented in Table 14. These results show that the annual mean NO_2 and PM_{10} concentrations are forecast to be below the national objective value (both 40 µg/m^3) at all receptors in all scenarios. Also daily PM_{10} concentrations are not predicted to exceed the daily objective of 50µg/m^3 on any day at all receptors in all scenarios.

Table 14: DMRB Screening Results

Scenario	Annual Mean NO_2 (µg/m^3)	Annual Mean PM_{10} (µg/m^3)	PM_{10} Days> 50 (µg/m^{33})
National Objective	40 µg/m^3 by 12/2005	40 µg/m^3 by 12/2005	35 days by 12/2004
EU Objective	40 µg/m^3 by 12/2005		
Receptor 1 Bournbrook Road			
2012 Baseline	26.31	18.30	1.65
2018 Do-nothing	21.83	17.11	0.81
2018 Do-something	21.84	17.12	0.81
Receptor 2: 350? Bristol Road			
2012 Baseline	24.23	17.61	1.13
2018 Do-nothing	19.92	16.53	0.51
2018 Do-something	19.95	16.54	0.51
Receptor 3: 64 Edgbaston Road			
2012 Baseline	22.64	17.15	0.83
2018 Do-nothing	18.6	16.15	0.36
2018 Do-something	18.64	16.16	0.37

The predicted change in the 2018 annual mean NO_2 and PM_{10} concentrations as a result of the proposed development are very small. The largest predicted change in NO_2 concentration is at Receptor 3 (64 Edgbaston Road), where an increase of 0.04µg/m^3 is predicted. The predicted change in PM_{10} concentrations at all three receptors is 0.01µg/m.

Table 15 and Table 16 present the forecasted changes in concentrations along with the impact significance of these changes at all receptors. The impact significance was undertaken according to the methodology described in Section 4). These results indicate that the proposed development will have **negligible** impacts on all selected receptors.

With regards to the EPUK factors for judging significance (Table 9):

- No sensitive receptors will be exposed to adverse impacts;
- The change in NO_2 and PM_{10} concentrations is small to imperceptible;
- No exceedences of objectives or limit values are predicted to arise in the study area.

In line with the criteria detailed in Figure 2, it is assessed that air quality is a **low priority** consideration in the planning process in relation to the proposed development

Table 15: Impact Significance of Change in NO_2 Annual Mean Concentrations

Receptor	Change (µg/m^3)	Relative Change	Impact Descriptor
R1: 350 Bristol Road	0.03	Imperceptible	Negligible
R2: 1 Bournbrook Road	0.01	Imperceptible	Negligible
R3: 64 Edgbaston Road	0.04	Imperceptible	Negligible

Table 16: Impact Significance of Change in PM_{10} Annual Mean Concentrations

Receptor	Change (µg/m^3)	Relative Change	Impact Descriptor
R1: 350 Bristol Road	0.01	Imperceptible	Negligible
R2: 1 Bournbrook Road	0.01	Imperceptible	Negligible
R3: 64 Edgbaston Road	0.01	Imperceptible	Negligible

8 Mitigation and Residual Impacts

8.1 Mitigation of Effects from Construction

The dust emitting activities outlined in section 6.1. Construction impacts can be greatly reduced or eliminated by applying the site specific mitigation measures for **high** risk sites according to the GLA Best Practice Guidance. Such measures are:

Site Planning

- Erect solid barriers to site boundary;
- No bonfires;
- Plan site layout – machinery and dust causing activities should be located away from sensitive receptors;
- All personnel to be fully trained;
- Trained and responsible manager on site during working times to maintain logbook and carry out site inspections;
- Hard surface site haul routes, where present and practical; and

Construction Traffic

- All vehicles to switch off engines when not required – no idling vehicles;
- Effective vehicle cleaning and specific fixed wheel washing on leaving site and damping down of haul routes;
- All loads entering and leaving site to be covered;
- No site runoff of water or mud;
- On-road vehicles to comply with set emission standards;
- All non road mobile machinery (NRMM) to use ultra low sulphur tax-exempt diesel (ULSD) where available and be fitted with appropriate exhaust after-treatment from the approved list;
- Minimise movement of construction traffic around site; and
- Hard surfacing and effective cleaning of haul routes and appropriate speed limit around site.

Demolition Works

- Use water as dust suppressant;
- Cutting equipment to use water as suppressant or suitable local extract ventilation systems;
- Use enclosed chutes and covered skips; and
- Wrap building(s) to be demolished.

Site Activities

- Minimise dust generating activities;
- Use water as dust suppressant where applicable;
- Cover, seed or fence stockpiles to prevent wind whipping;
- Re-vegetate earthworks and exposed areas; and
- If applicable, ensure concrete crusher or concrete batcher has permit to operate.

The traffic effects of the proposed development during the construction phase would be limited to a finite period and would be along the traffic routes employed by haulage vehicles, construction vehicles and employees.

With these measures in place construction activities would be controlled to reduce as far as possible the potential environmental impacts, therefore limiting residual impacts to **medium/low** according to the GLA guidance.

8.2 Mitigation of Effects from Operation

Given that only negligible effects on local air quality have been predicted due to the operational traffic associated with the development, no air quality specific mitigation measures are proposed with respect to traffic.

8.3 Residual Effects

8.3.1 Residual Effects from Construction

Assuming implementation of the mitigation measures it is not expected that there would be any residual effects from construction. Construction effects are only temporary and short term.

8.3.2 Residual Effects from Operation

There are no residual effects from the operation of the proposed scheme.

9 Conclusions

An air quality assessment has been made of the proposed development at Edgbaston Central Campus. This has used established methods to assess the air quality impacts during construction and operation. The construction effects of the development on local air quality would be primarily events where dust may arise during the duration of construction activities. The assessment has demonstrated that the environmental risk in terms of air quality associated with the construction of the proposed development would be high but could be reduced to low or medium with the application of appropriate mitigation measures.

An air quality screening assessment method has been used to predict changes in air quality as a result of traffic generated by the operation of the development. The assessment has focussed on the road network with the most significant changes, i.e. and is based on term time data; and is therefore considered to be the most conservative assessment.

The pollutants assessed were nitrogen dioxide and fine particulate matter. These pollutants have been forecast at selected residential receptors for baseline year 2012 and in the future year 2018 both without and with the proposed development in place. The forecast concentrations indicate that the effect of the development on local air quality at the selected locations is negligible. In accordance with air quality guidance, air quality is identified as a low priority consideration in the planning process in relation to the proposed development.