Grand Union House, London NW1

Air Quality Assessment

December 2018

Camden Mixed Developments Limited

GRAND UNION HOUSE

Air Quality Assessment

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Camden Mixed Developments Limited

GRAND UNION HOUSE

Air Quality Assessment

WSP

4th Floor
6 Devonshire Square
London
EC2M 4YE

Phone: +44 20 7337 1700

Fax: +44 20 7337 1701

WSP.com

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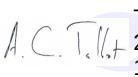
Signature			 Talbot, Andy 2018.12.06 17:53:07 Z	
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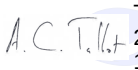
Signature			 Talbot, Andy 2018.12.06 17:53:22 Z	
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EXECUTIVE SUMMARY

WSP has been commissioned by Camden Mixed Developments Limited to undertake an air quality assessment. This air quality assessment for Grand Union House ('the Report') is submitted in support of a detailed planning application ('the Application') made on behalf of Camden Mixed Developments Limited ('the Applicant') for the adaptive re-use, alterations and extensions ('the Proposed Development') to Grand Union House, 16-20 Kentish Town Road, London ('the Site').

The Proposed Development includes partial demolition and redevelopment of the existing building, to provide a new office (Class B1) building with associated roof terraces, ground floor flexible town centre uses (Class A1 and/or A3 and/or D2), and 6 affordable housing units, along with associated landscaping works.

This report presents the findings of the assessment, which addresses the potential air quality impacts during both the construction and operational phases of the Proposed Development. For both phases the type, source and significance of potential impacts were identified, and the measures that should be employed to minimise these proposals.

The air quality assessment has addressed the potential air quality impacts in the construction (including demolition) and operational phases. For both phases, the type, source and significance of potential impacts have been identified, and the measures that should be employed to minimise these described. The potential exposure of future residents of the Proposed Development to ambient air pollutants has also been considered.

The assessment of construction phase impacts associated with fugitive dust and fine particulate matter (PM_{10} and $PM_{2.5}$) emissions has been undertaken in line with the relevant Institute of Air Quality Management guidance. This identified that there is a medium to low risk of both dust soiling and human health effects due to construction activities. However, through good site practice and the implementation of suitable mitigation measures, the effect of dust and particulate matter releases would be significantly reduced. The residual effects of the construction phase on air quality are likely to be not significant.

An assessment of the exposure of the new occupants of the Proposed Development to potentially elevated pollutant concentrations has been undertaken in-line with published methodologies and technical guidance. The levels of pollutants are well above objectives and therefore specific mitigation measures are required to protect new users within the Proposed Development. Details of the ventilation strategy will be available at detailed design stage.

In accordance with the requirements of the Greater London Authority, the assessment shows that the Proposed Development is air quality neutral with regards to both building and transport emissions.

The Proposed Development complies with national and local policy for air quality.

1. INTRODUCTION

1.1.1. WSP has been commissioned by Camden Mixed Developments Limited to undertake an air quality assessment. This air quality assessment for Grand Union House ('the Report') is submitted in support of a detailed planning application ('the Application') made on behalf of Camden Mixed Developments Limited ('the Applicant') for the adaptive re-use, alterations and extensions ('the Proposed Development') to Grand Union House, 16-20 Kentish Town Road, London ('the Site').

1.1.2. The Proposed Development includes partial demolition and redevelopment of the existing building, to provide a new office (Class B1) building with associated roof terraces, ground floor flexible town centre uses (Class A1 and/or A3 and/or D2), and 6 affordable housing units, along with associated landscaping works.

1.1.3. The Site lies within the administrative boundary of the London Borough of Camden (LBC) in an urban setting. To the north is the Grand Union Canal and tow path, to the east is Sainsburys supermarket on Camden Road and St Midgers Church, to the west are residential properties and commercial premises along Kentish Town Road, and to the south are commercial premises. The Site is within LBC's Air Quality Management Area (AQMA) due to poor air quality, particularly in locations close to busy roads as in the immediate surrounding area.

1.1.4. This report presents the assessment of the potential air quality impacts of the Proposed Development. The assessment address both the construction and operational phases. For both phases, the type, source and significance of potential impacts are identified, and the measures that should be employed to minimise these are described. An assessment of the potential exposure of future residents of the Proposed Development to ambient pollution concentrations is also included.

1.1.5. A glossary of terms used in this report is provided in **Appendix A**.

2. LEGISLATION, POLICY & GUIDANCE

2.1. AIR QUALITY LEGISLATION

AIR QUALITY OBJECTIVES AND LIMIT VALUES

2.1.1. Ambient air quality standards are set as objectives in The Air Quality (England) Regulations 2000[1] and The Air Quality (England) (Amendment) Regulations 2002[2] for the purpose of Local Air Quality Management (LAQM).

2.1.2. The objectives apply in the external environment at locations with relevant public exposure:

"…the quality of air at locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present…"

2.1.3. The Air Quality Standards Regulations 2010[3] transpose the European Union Ambient Air Quality Directive (2008/50/EC) into law in England. This Directive sets legally binding limit values for concentrations in outdoor air of major air pollutants that impact public health such as PM_{10}, $PM_{2.5}$ and NO_2. The Secretary of State for Environment, Food and Rural Affairs is responsible for ensuring compliance.

2.1.4. Air quality objectives and limit values are numerically the same. Those that are relevant to this assessment are given in **Table 2-1**.

Table 2-1 - Relevant Air Quality Assessment Levels (Limit Values and Objectives)

Pollutant	Concentration threshold (micrograms per cubic metre, µg/m^3)	Averaging period and requirement
NO_2	40	Annual mean over a calendar year. Not to be exceeded.
	200	1-hour (hourly) mean. Not to be exceeded more than 18 times in a calendar year.
PM_{10} (particulate matter less than 10 micrometres in diameter)	40	Annual mean over a calendar year. Not to be exceeded.

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

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

[3] The Air Quality Standards (Amendment) Regulations 2010- Statutory Instrument 2016 No.1001

Pollutant	Concentration threshold (micrograms per cubic metre, µg/m^3)	Averaging period and requirement
	50	24-hour (daily) mean. Not to be exceeded more than 35 times in a calendar year.
$PM_{2.5}$ (particulate matter less than 2.5 micrometres in diameter)	25	Annual mean over a calendar year. Not to be exceeded.

ENVIRONMENTAL PROTECTION ACT 1990 - CONTROL OF DUST AND PARTICULATES ASSOCIATED WITH CONSTRUCTION

2.1.5. Section 79 of the Environmental Protection Act 1990 gives the following definitions of statutory nuisance relevant to dust and particles:

"*Any dust, steam, smell or other effluvia arising from industrial, trade or business premises or smoke, fumes or gases emitted from premises so as to be prejudicial to health or a nuisance;*

Any accumulation or deposit which is prejudicial to health or a nuisance"

2.1.6. Following this, Section 80 says that where a statutory nuisance is shown to exist, the local authority must serve an abatement notice. Failure to comply with an abatement notice is an offence and if necessary, the local authority may abate the nuisance and recover expenses.

2.1.7. There are no statutory limit values for dust deposition above which 'nuisance' is deemed to exist. Nuisance is a subjective concept and its perception is highly dependent upon the existing conditions and the change which has occurred.

ENVIRONMENT ACT 1995

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

2.2. POLICY

UK AIR QUALITY STRATEGY

2.2.1. The Government's policy on air quality within the UK is set out in the Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland[4]. The AQS provides a framework for reducing air pollution in the UK with the aim of meeting the requirements of European Union legislation.

2.2.2. The AQS also sets standards and objectives for nine key air pollutants to protect health, vegetation and ecosystems. These are benzene (C_6H_6), 1,3 butadiene (C_4H_6), carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$), sulphur dioxide (SO_2), ozone (O_3), and polycyclic aromatic hydrocarbons (PAHs). The standards and objectives for the pollutants considered in this assessment are given in **Table 2-1**.

2.2.3. The air quality standards are levels recommended by the Expert Panel on Air Quality Standards (EPAQS) and the World Health Organisation (WHO) with regards to current scientific knowledge about the effects of each pollutant on health and the environment.

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

2.2.5. For the pollutants considered in this assessment, there are both long-term (annual mean) and short-term standards. In the case of NO_2, the short-term standard is for a 1-hour averaging period, whereas for PM_{10} it is for a 24-hour averaging period. These periods reflect the varying impacts on health of differing exposures to pollutants, for example temporary exposure on the pavement adjacent to a busy road, compared with the exposure of residential properties adjacent to a road.

2.2.6. The AQS contains a framework for considering the effects of a finer group of particles known as '$PM_{2.5}$' as there is increasing evidence that this size of particles can be more closely associated with observed adverse health effects than PM_{10}. Local Authorities are required to work towards reducing emissions/concentrations of particulate matter within their administrative area. However, there is no statutory objective given in the AQS for $PM_{2.5}$ at this time.

NATIONAL PLANNING POLICY FRAMEWORK

2.2.7. The Government's overall planning policies for England are described in the National Planning Policy Framework[5] , which was first published in March 2012 and subsequently updated in July 2018. The core underpinning principle of the Framework is the presumption in favour of sustainable development, defined as:

[4] Department for Environment, Food and Rural Affairs (Defra) and the Devolved Administrations (2007). The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2)

[5] Department for Communities and Local Government (2018). National Planning Policy Framework.

- "*Development that meets the needs of the present without compromising the ability of future generations to meet their own needs*".

2.2.8. One of the core objectives of the NPPF is that planning should *"contribute to protecting and enhancing our natural, built and historic; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution and mitigating and adapting to climate change…"*.

2.2.9. In relation to air quality, the following paragraphs in the document are relevant:

- Paragraph 54: *"Local Planning authorities should consider where otherwise unacceptable development could be made acceptable though the use of conditions or planning obligations. Planning Obligations should only be used where it is not possible to address unacceptable impacts through a planning condition."*
- Paragraph 102, Part d: *"Transport Issues should be considered from the earliest stages of plan-making and development proposals, so that…the environmental impacts of traffic and transport infrastructure can be identified, assessed and takin into account – including appropriate opportunities for avoiding and mitigating any adverse effects, and for new environmental gains…"*
- Paragraph 103: *"The planning system should actively manage patterns of growth in support of these objectives. Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help reduce congestion and emissions, and improve air quality and public health. However, opportunities to maximise sustainable transport solutions will vary between urban and rural area, and this should be taken into account in both plan-making and decision-making."*
- Paragraph 170, Part e: *"Planning policies and decisions should contribute to and enhance the natural and local environment by…preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans…"*
- Paragraph 180: *"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development…"*
- Paragraph 181: *"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan.";* and,
- Paragraph 183: *"The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should*

assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities."

THE MAYOR'S AIR QUALITY STRATEGY FOR LONDON

2.2.10. In 2010, the Greater London Authority (GLA) published the Mayor's Air Quality Strategy for London[6]. This strategy is focused on improving London's air quality. It outlines the current air quality trends across London and gives predictions of future levels of air pollution. The sources of pollution are outlined and a comprehensive set of policies and proposals are set out that will improve air quality in the London Boroughs.

2.2.11. The Strategy sets out a framework for delivering improvements to London's air quality and includes measures aimed at reducing emissions from transport, homes, offices and new developments, promoting smarter more sustainable travel, as well as raising awareness of air quality issues.

2.2.12. The Strategy includes a policy which states: *"New developments in London shall as a minimum be 'air quality neutral' through the adoption of best practice in the management and mitigation of emissions"*.

THE LONDON PLAN CONSOLIDATED WITH ALTERATIONS 2016

2.2.13. Policy 7.14 of the London Plan 2016[7] is specific to the improvement of air quality and states that development proposals should:

- *"Minimise increased exposure to existing poor air quality and make provision to address local problems of air quality (particularly within 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";*
- *"Promote sustainable design and construction in order 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";*
- *"Be at least 'air quality neutral' and not lead to further deterioration of existing poor air quality";*
- *"Ensure that where provision needs to be made to reduce emissions from a development, this is usually made on site"; and*
- *"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."*

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6 Mayor of London (2010). *Cleaning London's air, The Mayor's Air Quality Strategy*.

7 Mayor of London (March 2016) *The London Plan: Spatial Development Strategy for London Consolidated with Alterations since 2011*.

DRAFT NEW LONDON PLAN

2.2.14. A draft new London Plan[8], to shape the way London develops in the next 20-25 years, was published by the Mayor of London for consultation on December 2017. Consultation on the new Plan concluded in March 2018 with minor suggested changes published in 2018[9]. Policy S|1 Improving air quality is the relevant policy, and it states:

"London's air quality should be significantly improved and exposure to poor air quality, especially for vulnerable people, should be reduced:

1. *development proposals should not:*

a) *lead to further deterioration of existing poor air quality*

b) *create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits*

c) *reduce air quality benefits that result from the Mayor's or boroughs' activities to improve air quality*

d) *create unacceptable risk of high levels of exposure to poor air quality.*

2. *development proposals should use design solutions to prevent or minimise increased exposure to existing air pollution and make provision to address local problems of air quality. Particular care should be taken with developments that are in Air Quality Focus Areas or that are likely to be used by large numbers of people particularly vulnerable to poor air quality, such as children or older people.*

3. *masterplans and development briefs for large-scale development proposals subject to an Environmental Impact Assessment should propose methods of achieving an Air Quality Positive approach through the new development. All other developments should be at least Air Quality Neutral.*

4. *development proposals must demonstrate how they plan to comply with the Non-Road Mobile achinery Low Emission Zone and reduce emissions from the demolition and construction of buildings following best practice guidance.*

5. *development proposals should ensure that where emissions need to be reduced, this is done on-site. Where it can be demonstrated that on-site provision is impractical or inappropriate, off-site measures to improve local air quality may be acceptable, provided that equivalent air quality benefits can be demonstrated."*

[8] Mayor of London (2017). The London Plan. The Spatial Development Strategy for Great London. Draft for Public Consultation.

[9] Mayor of London (2018) Draft New London Plan Showing Minor Suggested Changes. 13 August 2018

CAMDEN LOCAL PLAN

2.2.15. The Local Plan[10] of the London Borough of Camden (LBC) presents the strategy of the Council's vision for the development of the borough between 2016 and 2031. Policy CC 4 Air Quality states that:

"The Council will ensure that the impact of development on air quality is mitigated and ensure that exposure to poor air quality is reduced in the borough.

The Council will take into account the impact of air quality when assessing development proposals, through the consideration of both the exposure of occupants to air pollution and the effect of the development on air quality. Consideration must be taken to the actions identified in the Council's Air Quality Action Plan.

Air Quality Assessments (AQAs) are required where development is likely to expose residents to high levels of air pollution. Where the AQA shows that a development would cause harm to air quality, the Council will not grant planning permission unless measures are adopted to mitigate the impact. Similarly, developments that introduce sensitive receptors (i.e. housing, schools) in locations of poor air quality will not be acceptable unless designed to mitigate the impact.

Development that involves significant demolition, construction or earthworks will also be required to assess the risk of dust and emissions impacts in an AQA and include appropriate mitigation measures to be secured in a Construction Management Plan."

2.3. GUIDANCE

London Local Air Quality Management Technical Guidance

2.3.1. The Mayor of London has published LAQM guidance for London Boroughs[11]. This guidance, referred to in this report as 'LLAQM.TG(16)', supplements national guidance issued by the Department for Environment, Food and Rural Affairs (Defra), which is referred to as 'LAQM.TG (16)'[12]. The guidance provides a consistent technical basis for local authorities to meet the requirements of the AQS. It is also relevant to the assessment of development proposals.

Land-Use Planning & Development Control: Planning for Air Quality

2.3.2. Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) have published guidance[13] that offers comprehensive advice on: when an air quality assessment may be required; what should be included in an assessment; how to determine the significance of any air

[10] London Borough of Camden (July 2017) Camden Local Plan

[11] Mayor of London (2016). *London Local Air Quality Management Technical Guidance* LLAQM.TG(16).

[12] Defra (2018). *Part IV of the Environment Act 1995 and Environment (Northern Ireland) Order 2002 Part III, Local Air Quality Management Technical Guidance LAQM.TG16*.

[13] Environmental Protection UK and Institute of Air Quality Management (Version 1.2 Updated January 2017). Land Use Planning & Development Control: Planning for Air Quality

quality impacts associated with a development; and, the possible mitigation measures that may be implemented to minimise these impacts.

Guidance on the Assessment of Dust from Demolition and Construction

2.3.3. This document[14] published by the IAQM was produced to provide guidance to developers, consultants and environmental health officers on how to assess the impacts arising from construction activities. The emphasis of the methodology is on classifying sites according to the risk of impacts (in terms of dust nuisance, PM_{10} impacts on public exposure and impact upon sensitive ecological receptors) and to identify mitigation measures appropriate to the level of risk identified.

National Planning Practice Guidance – Air Quality

2.3.4. This guidance[15] provides guiding principles on how the planning process can take into account the impact of new development on air quality, and explains how much detail air quality assessments need to include for proposed developments, and how impacts on air quality can be mitigated. It also provides information on how air quality is considered by Local Authorities in both the wider planning context of Local Plans and neighbourhood planning, and in individual cases where air quality is a consideration in a planning decision.

London Councils Guidance for Air Quality Assessments

2.3.5. The London Councils have published guidance[16] for undertaking air quality assessments in the London Boroughs, the majority of which have declared AQMAs. The guidance sets out suggested methods for undertaking such an assessment within the London area and provides a methodology to assist in determining the impacts of a development proposal on air quality. The main message of the document is, as above, that the factor of greatest importance will generally be the difference in air quality because of the proposed development.

Mayor of London's supplementary planning guidance for the control of dust and emissions during construction and demolition

2.3.6. This Supplementary Planning Guidance[17] (SPG) builds on the voluntary guidance published in 2006 by the London Councils to establish best practice in mitigating impacts on air quality during construction and demolition work. The SPG incorporates more detailed guidance and best practice, and seeks to address emissions from Non-Road Mobile Machinery (NRMM) with a Low Emission Zone, which was introduced in September 2015.

2.3.7. The SPG provides a methodology for assessing the potential impact of construction and demolition activities on air quality following the same procedure as set out in the IAQM guidance. It then

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[14] Institute of Air Quality Management (Version 1.1 Updated June 2016). Guidance on the Assessment of Dust from Demolition and Construction

[15] Department of Communities and Local Government (DCLG) (March 2014). National Planning Practice Guidance

[16] London Councils (January 2007): Air Quality and Planning Guidance – Revised version

[17] Mayor of London (July 2014): The control of dust and emissions during construction and demolition – Supplementary Planning Guidance.

identifies the relevant controls and mitigation measures that should be put in place to minimise any adverse impacts, which need to be set out, in draft, in an air quality assessment report submitted with the planning application, and then formalised post submission as an Air Quality and Dust Management Plan. Details of site air quality monitoring protocols are also provided with varying requirements depending on the size of the site and the potential risk of adverse impacts.

Greater London Authority: Sustainable Design and Construction Supplementary Planning Guidance

2.3.8. Section 4.3 of this Supplementary Planning Guidance (SPG) provides guidance on when a developer will be required to undertake an air quality assessment, looks at how design and transport measures can be used to minimise emissions to air, and sets out emissions standards for combustion plant.

2.3.9. The SPG also contains guidance on assessing the air quality neutrality of a Proposed Development to comply with the London Plan and the Mayor's Air Quality Strategy. Air Quality neutral benchmarks for both transport and buildings NO_x and PM_{10} emissions are provided within the SPG.

2.3.10. Developments that do not exceed these benchmarks (considered separately) are 'air quality neutral', whilst developments that exceed the benchmarks after appropriate on-site mitigation measures have been incorporated will be required to off-set any excess in emissions off site. This can be achieved by providing NO_x and PM abatement measures, such as: green planting/walls and screens, with special consideration given to planting that absorbs or supresses pollutants; upgrade or abatement work to combustion plant; retro-fitting abatement technology for vehicles and flues; and exposure reduction. These measures can be secured by condition or Section 106 contribution. Air quality monitoring is not eligible for funding as it is not considered to contribute to actual air quality improvements.

Air Quality Neutral Planning Support Guidance

2.3.11. The Air Quality Neutral Planning Support guidance[18] provides a methodology for assessing the air quality neutrality of proposed developments in London.

Camden Air Quality Planning Guidance

2.3.12. LBC has prepared the Camden Planning Guidance (CPG)[19] on air quality to support the policies in the Camden Local Plan 2017. This guidance is providing additional clarity on how local plan policies should be implemented. The CPG provides information in relation to the type of air quality assessment to be prepared to support planning applications.

[18] AQC and ENVIRON UK Ltd (2014). Air Quality Neutral Planning Support.

[19] London Borough of Camden (2018) Air Quality Camden Planning Guidance (Draft).

3. SCOPE & METHODOLOGY

3.1. SCOPE

3.1.1. The scope of the assessment has been determined in the following way:

- Consultation with the LBC Environmental Health Officer to agree the scope of the assessment and the methodology to be applied. This was undertaken between 13 and 15 November 2018;
- Review of LBC's latest LAQM reports[20];
- Review of air quality data for the area surrounding the Application Site including data published by LBC, Defra[21], the London Air Quality Network (LAQN)[22] and the London Atmospheric Emissions Inventory (LAEI)[23];
- Review of the results from a three-month NO_2 diffusion tube monitoring survey undertaken by WSP in 2017 (**Appendix B**);
- Review of the masterplan of the Proposed Development to establish the location of new sensitive receptors;
- Review of the traffic data provided by WSP; and
- Review of the emission data for the proposed onsite energy generation as supplied by WSP.

3.1.2. The reviews of the above information have also established the baseline conditions for the air quality assessment.

3.1.3. The scope of the assessment includes consideration of the potential air quality impacts resulting from:

- Dust and particulate matter generated by on-site activities during the construction phase;
- Increases in pollutant concentrations due to exhaust emissions arising from construction traffic and plant; and
- Potential exposure of future residents and users of the Proposed Development to poor air quality will also be considered.

3.1.4. The following aspects have been scoped-out:

- The impact of exhaust emissions arising from traffic generated by the Proposed Development once operational. The Proposed Development is car free albeit that 12 car parking spaces owned by Grand Union House and located at ground floor will be retained and the only vehicle movements are associated with the Proposed Development will be from servicing (18 light vans

[20] London Borough of Camden (May 2018) London Borough of Camden Annual Status Report 2017)

[21] Defra Local Air Quality Management (LAQM) Support Pages. Available at: http://laqm.defra.gov.uk/. Accessed on 13/11/2018

[22] London Air Quality Network. Available at: http://www.londonair.org.uk/LondonAir/Default.aspx. Accessed on 13/11//2018

[23] London Atmospheric Emissions Inventory (LAEI). Available at: https://data.london.gov.uk/dataset/london-atmospheric-emissions-inventory-2013. Accessed 21/08/2018

and 6 lorries per day). Based on joint EPUK and IAQM 'planning for air quality' guidance, the proposed number of vehicles is less than 100 light duty vehicles and 25 heavy duty vehicles per day as thresholds for indicating the need for air quality assessment within an AQMA. Therefore, any impacts from vehicle emissions on air quality are unlikely to be significant.

- The impact of emissions to air from the on-site boiler and energy generation as part of the Proposed Development. The WSP energy consultant has advised that that air source heat pumps (ASHP) will be used for the non-residential element and individual domestic ultra-low NOx boilers (approximately 255kW total capacity, with NO_X emission less than 40mg/kWh) for the residential units. Joint EPUK and IAQM guidance advises that ultra-low NOx boilers with less than 450kW capacity are unlikely to cause noticeable impacts;

3.2. METHODOLOGY

CONSTRUCTION PHASE

3.2.1. Dust comprises particles typically in the size range 1-75 micrometres (µm) in aerodynamic diameter and is created through the action of crushing and abrasive forces on materials. The larger dust particles fall out of the atmosphere quickly after initial release and therefore tend to be deposited near to the source of emission. Dust therefore, is unlikely to cause long-term or widespread changes to local air quality; however, its deposition on property and cars can cause 'soiling' and discolouration. This may result in complaints of nuisance through amenity loss or perceived damage caused, which is usually temporary.

3.2.2. The smaller particles of dust (less than 10µm in aerodynamic diameter) are known as particulate matter (PM_{10}) and represent only a small proportion of total dust released; this includes a finer fraction, known as $PM_{2.5}$ (with an aerodynamic diameter less than 2.5µm). As these particles are at the smaller end of the size range of dust particles they remain suspended in the atmosphere longer than the larger dust particles, and can therefore be transported by wind over a wider area. PM_{10} and $PM_{2.5}$ are small enough to be drawn into the lungs during breathing, which in sensitive members of the public could have a potential impact on health.

3.2.3. An assessment of the likely significant impacts on local air quality due to the generation and dispersion of dust and PM_{10} during the construction phase has been undertaken with reference to: The Mayor of London's SPG for the control of dust and emissions during construction and demolition; the available information for this phase of the Proposed Development provided by the Client and Project Team; and, professional judgement.

3.2.4. The Mayor of London's SPG requires a Dusk Risk Assessment to be undertaken following the methodology published by the IAQM, which assesses the risk of potential dust and PM_{10} impacts from the following four sources: demolition; earthworks; general construction activities and track-out. It accounts for the nature and scale of the activities undertaken for each source and the sensitivity of the area to an increase in dust and PM_{10} levels to assign a level of risk. Risks are described in terms of there being a low, medium or high risk of dust impacts. Once the level of risk has been ascertained, then site specific mitigation proportionate to the level of risk is identified, and the significance of residual effects determined. A summary of the IAQM assessment methodology is provided in **Appendix C**.

3.2.5. In addition, exhaust emissions from construction vehicles and plant may impact on local air quality along access routes and around the boundary of the Site. A qualitative assessment of their impact

on local air quality has been undertaken using available project information and professional judgement and by considering the following:

- The number and type of construction traffic and plant likely to be generated by this phase of the Proposed Development;
- The number and proximity of sensitive receptors to the Application Site and along the likely routes to be used by construction vehicles; and
- The likely duration of the construction phase and the nature of the construction activities undertaken.

OPERATIONAL PHASE

Exposure of New Building Occupants

3.2.6. To determine the future baseline pollutant concentrations at the Site, monitoring data and LAEI projections for annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ in 2013 have been reviewed to establish the potential exposure of future residents and users of the Proposed Development to poor air quality.

3.2.7. Defra's NO_2 'Fall-Off with Distance Calculator' (version 4.1)[24] has been used to estimate the ambient NO_2 concentration at the nearest façade of the new building on Kentish Town Road from an adjacent kerbside monitoring site.

Air Quality Neutral Assessment

3.2.8. To address the Mayor's Air Quality Neutral policy concerning new developments, and in line with the 2014 Sustainable Design and Construction SPG, NO_x and PM_{10} emissions for buildings and transport have been calculated based on the data given in **Table 3-2**.

[24] https://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html

Table 3-1 - Parameters Used in the Air Quality Neutral Assessment

Parameter	Information
Gross Internal Area (GIA) (used as a proxy for Gross Floor Area)	Flexible Retail and Restaurant/Café (Class A1/A3) –275 m^2 Flexible Retail, Restaurant, /Café and Leisure (Class A1, A3 and/or D2) – 263 m^2 Office (Class B1) – 5,254 m^2 Residential (Class C3) – 476 m^2
Number of residential units	6
Annual two-way vehicle trip generation associated with servicing	9,606
6 individual boilers for residential units	Total= 255 kw @ 39 mgNOx/kWh
Note: GIA provided by the Architect Andrew Phillips (AP). Traffic data and boiler emissions provided by WSP Transport and Building Services respectively.	

3.2.9. The results of the Air Quality Neutral Assessment are compared to the benchmarks set out by the Mayor of London's SPG on Sustainable Design and Construction. Developments that do not exceed these benchmarks will be considered to avoid any significant increase in NOx and PM_{10} emissions across London as a whole and therefore be classed as 'air quality neutral'. Where a scheme does not meet the 'air quality neutral' benchmarks, after mitigation measures for the Proposed Development have been implemented, developers will be required to off-set emissions.

3.2.10. Building Emissions Benchmark (BEB) and Transport Emissions Benchmark (TEB) categories have been calculated as per current guidance and are provided in **Table 3-3**.

Table 3-2 - Emissions Benchmarks (kg/year)

Benchmark Category	NO_X	PM_{10}
Transport Emissions	99.2	17.2
Building Emissions	186.8	-

3.3. ASSESSMENT CRITERIA

CONSTRUCTION PHASE

3.3.1. The IAQM assessment methodology recommends that significance criteria is only assigned to the identified risk of dust impacts occurring from a construction activity with appropriate mitigation measures in place. For almost all construction activities, the application of effective mitigation should prevent any significant effects occurring to sensitive receptors and therefore the residual effect will normally be negligible.

3.3.2. For the assessment of the impact of exhaust emissions from plant used on-site and construction vehicles accessing and leaving the Site on local concentrations of NO_2 and particulate matter, the

significance of residual effects have been determined using professional judgement and the principles outlined in the joint EPUK and IAQM guidance, which are described below.

OPERATIONAL PHASE

3.3.3. The joint EPUK and IAQM guidance for new development says that "*Where the air quality is such that an air quality objective at the building facade is not met, the effect on residents or occupants will be judged as significant, unless provision is made to reduce their exposure by some means. For people working at new developments in this situation, the same will not be true as occupational exposure standards are different, although any assessment may wish to draw attention to the undesirability of the exposure*".

3.3.4. In determining both the significance of new exposure to air pollution and the levels of mitigation required within the Proposed Development Site, consideration was given to the Air Pollution Exposure Criteria (APEC) published in the London Councils guidance for air quality assessments and shown in **Table 3-4**.

Table 3-3 - London Councils Air Pollution Exposure Criteria

APEC Level	Applicable Range Annual average NO_2	Applicable Range PM_{10}	Recommendation
A	>5% below national objective	Annual Mean >5% below national objective 24-hour mean >1 day less than the national objective	No air quality grounds for refusal; however, mitigation of any emissions should be considered.
B	Between 5% below or above national objective	Annual Mean Between 5% below or above national objective 24-hour mean Between 1 day above or below the national objective	May not be sufficient air quality grounds for refusal, however appropriate mitigation must be considered e.g., maximise distance from pollution source, proven ventilation systems, parking considerations, winter gardens, internal layout considered and internal pollutant emissions minimised.
C	>5% above national objective	Annual Mean >5% above national objective 24-hour mean >1 day more than the national objective	Refusal on air quality grounds should be anticipated, unless the Local Authority has a specific policy enabling such land use and ensure best endeavours to reduce exposure are incorporated. Worker exposure in commercial/industrial land uses should be considered further. Mitigation measures must be presented with air quality assessment, detailing anticipated outcomes of mitigation measures.

3.4. LIMITATIONS & ASSUMPTIONS

3.4.1. As suitable information for the construction phase of the Proposed Development was not available professional judgement has been used in the completion of this part of the assessment.

3.4.2. Uncertainty in estimates of NO_x emissions from road vehicles in future years. To address this, LAEI 2013 concentrations have been assumed for the opening year.

4. BASELINE CONDITIONS

4.1. LBC'S REVIEW & ASSESSMENT OF AIR QUALITY

4.1.1. The LBC has declared the whole borough an AQMA due to exceedances of the AQS objectives for ambient concentrations of NO_2 and PM_{10}. These exceedances are predominantly due to road transport emissions.

4.1.2. LBC's draft air quality action plan[25] gives measures to bring about reductions in concentrations of NO_2, PM_{10} and $PM_{2.5}$ within the borough, including:

- Monitoring of air quality;
- Reducing emissions of from buildings and new development (construction and operational phases);
- Reducing emissions from transport;
- Raising awareness of the causes of air pollution and what can be done to reduce exposure; and
- Lobbying and partnership working.

4.2. LOCAL EMISSION SOURCES

4.2.1. The Site is in an area where ambient NO_2, PM_{10} and $PM_{2.5}$ concentrations are strongly influenced by road transport emissions. Other local sources include combustion plant used to generate heat and power for buildings.

4.3. LOCAL AUTHORITY AIR QUALITY MONITORING DATA

4.3.1. LBC has historically monitored air pollution at four continuous monitoring stations and 16 NO_2 diffusion tube sites. In addition, LBC conducted a community air quality monitoring campaign between July 2017 and March 2018 at a further 42 locations across the borough. For this air quality assessment, historical monitoring data for NO_2 at sites within 1km of the Site have been considered. The relevant data are included in **Table 4-1**. There are no PM_{10} or $PM_{2.5}$ monitoring sites within 1km of the Site.

Table 4-1 - LBC Monitoring Annual Mean NO_2 Concentrations (µg/m^3)

Site Name	Site Type	2012	2013	2014	2015	2016	2017
Camden Road (CA23)	Roadside	**67.4**	**77.9**	**72.2**	**63.3**	**61.7**	**75.4**
Kentish Town Road (CA16)	Roadside	**59.0**	**65.3**	**57.8**	**63.6**	**58.7**	**74.9**
Brill Place (CA20)	Roadside	**50.0**	**49.4**	**52.3**	**48.9**	**47.5**	**57.3**

Source: LBC Annual Status Report for 2017. Values in **bold** exceed the objective (40 µg/m^3).

[25] London Borough of Camden (2015) Camden's Clean Air Action Plan 2016-2018.

4.3.2. The concentrations in **Table 4-1** show that NO_2 annual mean concentrations exceeded the objective (40µg/m^3) between 2012 and 2017. The highest NO_2 concentrations in the period occurred on Camden Road. No clear downward (improving) trend is supported by the data.

4.4. WSP MONITORING RESULTS

4.4.1. The estimated annual NO_2 mean concentration for each monitoring location is presented in **Table 4-2** and location of the monitoring locations shown in Figure 1.

Table 4-2 - WSP Diffusion Tube Survey Annual Mean NO_2 Concentrations

Site ID	Data Capture (%)	Estimated Annual Mean NO_2 Concentration* (µg/m^3)	Potential Breach of the NO_2 1-hour (hourly) AQS Objective?
GUH1	50%	**67.1**	Yes
GUH2	83%	**64.8**	Yes
GUH3	50%	**75.5**	Yes
GUH4	83%	**81.3**	Yes
GUH5	33%	**51.9 ****	No **
GUH6	17%	**68.7 ****	Yes **
GUH7	67%	**98.4**	Yes
GUH8	67%	**94.1**	Yes
Co-location	100%	**113.8**	Yes

* Values in **bold** indicate exceedance of the annual mean NO_2 objective
** Data capture was insufficient for annualisation, only averaged results have been presented.

4.4.2. The percentage data capture was less than 100% at all sites (excluding the co-location) due to diffusion tubes becoming detached or being tampered with. Lower percentage data capture adds uncertainty to the estimated annual mean concentrations and these results should be treated with some caution. Annualised concentrations are not reported for GUH5 and GUH6 where data capture was very low.

4.4.3. The results show that NO_2 concentrations exceed the objective at all the monitoring locations. Non-compliance with the 1-hour mean objective is also indicated at all sites except GUH5.

4.5. LAEI DATA

4.5.1. LAEI model data for 2013 has been reviewed. The LAEI model gives predictions of annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ at 20m by 20m grid points across the whole of London. Concentrations of PM10 and PM2.5 are compliant with objectives at all locations with relevant exposure. As illustrated in **Figure 2**, there are extensive areas in the vicinity of the Site exceeding the annual mean NO_2 objective with the highest concentrations along the main roads.

5. ASSESSMENT OF IMPACTS

5.1. CONSTRUCTION PHASE

DUST AND PM_{10} ARISING FROM ON-SITE ACTIVITIES

5.1.1. Construction activities that have the potential to generate and/or re-suspend dust and PM_{10}. include:

- Site clearance and preparation including demolition activities;
- Preparation of temporary access/egress to the Application Site and haulage routes;
- Earthworks;
- Materials handling, storage, stockpiling, spillage and disposal;
- Movement of vehicles and construction traffic within the Application Site (including excavators and dumper trucks);
- Use of crushing and screening equipment/plant;
- Exhaust emissions from site plant, especially when used at the extremes of their capacity and during mechanical breakdown;
- Construction of buildings, roads and areas of hardstanding alongside fabrication processes;
- Internal and external finishing and refurbishment; and
- Site landscaping after completion.

5.1.2. The majority of the releases are likely to occur during the 'working week'. However, for some potential release sources (e.g. exposed soil produced from significant earthwork activities) in the absence of dust control mitigation measures, dust generation has the potential to occur 24 hours per day over the period during which such activities are to take place.

ASSESSMENT OF POTENTIAL DUST EMISSION MAGNITUDE

5.1.3. The IAQM assessment methodology has been used to determine the potential dust emission magnitude for the following four different dust and $_{PM10}$ sources: demolition; earthworks; construction; and, trackout. The findings of the assessment are presented below.

Demolition

5.1.4. Total volume of buildings to be demolished on Site is expected to be less than 20,000m^3, with potentially dusty construction material, and with demolition activities occurring between 10 and 20m above ground level. Therefore, the potential dust emission magnitude has been classed as ‘small’ for demolition activities

Earthworks

5.1.5. The total area of the Site is less than 2,500m^2, the soil type is not dusty as it has a large grain size and the total amount of material that will be moved is estimated to be less than 20,000 tonnes. It is also estimated that less than 5 heavy earth moving vehicles will be active at any one time, and that the formation of bunds with a height of less than 4m is likely to occur. Therefore, the potential dust emission magnitude has been classed as ‘small’ for earthwork activities.

Construction

5.1.6. The total volume of buildings to be constructed on the Site is expected to be between the IAQM range of 25,000m^3 and 100,000m^3 with potentially dusty construction materials being used. In

addition, on site concrete batching will occur. Therefore, the potential dust emission magnitude has been classed as 'medium' for construction activities

Trackout

5.1.7. Based on our professional judgment of similar schemes, there will be less between 10 and 50 heavy duty vehicles (lorries greater than 3.5 tonne gross weight) outward movements in any one day travelling on surface materials with low potential for dust release. Due to the size of the site, it is also assumed that the length of unpaved roads within Application Site will be less than 50m. Therefore, the potential dust emission magnitude has been classed as 'small' for trackout.

5.1.8. **Table 5-1** provides a summary of the potential dust emission magnitude determined for each construction activity considered.

Table 5-1 - Potential Dust Emission Magnitude

Activity	Dust Emission Magnitude
Demolition	Small
Earthworks	Small
Construction Activities	Medium
Trackout	Medium

ASSESSMENT OF SENSITIVITY OF THE STUDY AREA

5.1.9. A wind rose generated using the meteorological data from Heathrow Airport 2017 is provided in **Appendix D**. This shows that the prevailing wind direction is from the south east. Therefore, receptors located to north and east of the Site are more likely to be affected by dust and particulate matter emitted and re-suspended during the construction phase.

5.1.10. Under low wind speed conditions, it is likely that most dust would be deposited in the area immediately surrounding the source. Most of the buildings surrounding the Site are residential flats/apartments, offices, retail, and educational facilities some of which are located on routes, such as Kentish Town Road, which construction traffic would use to access the Site.

5.1.11. There are no ecological receptors within 50m of the Site or within 50m of roads to be used by construction vehicles, up to 500m from the Site access, therefore ecological receptors have not been considered further in this assessment.

5.1.12. Taking the above into account and following the IAQM assessment methodology, the sensitivity of the area to changes in dust and PM_{10} has been derived for each of the construction activities considered. The results are shown in **Table 5-2**.

Table 5-2 - Sensitivity of the Study Area

Potential Impact	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High	High	High	High
Human Health	Medium	Medium	Medium	Medium

Risk of Impacts

5.1.13. The predicted dust emission magnitude has been combined with the defined sensitivity of the area to determine the risk of impacts during the construction phase, prior to mitigation. **Table 5-3** below provides a summary of the risk of dust impacts for the Proposed Development. The risk category identified for each construction activity has been used to determine the level of mitigation required.

Table 5-3 - Summary of Risk to Inform Site Specific Mitigation

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium	Low	Medium	Medium
Human Health	Low	Low	Medium	Low

CONSTRUCTION VEHICLES & PLANT

5.1.14. The greatest impact on air quality due to emissions from vehicles and plant associated with the construction phase will be in the areas immediately adjacent to the Site access. It is anticipated that construction traffic will access the Site via Kentish Town Road. Due to the size of the Site, it is likely that the construction traffic will make up a very small fraction of existing traffic flows on these roads.

5.1.15. Final details of the exact plant and equipment likely to be used during the construction phase will be determined by the appointed contractor, it is considered likely to comprise dump trucks, tracked excavators, diesel generators, asphalt spreaders, rollers, compressors and trucks. The number of plant and their location are likely to be variable over the construction period.

5.1.16. Based on the current local air quality in the area, the proximity of sensitive receptors to the roads likely to be used by construction vehicles, the impacts are therefore considered to range from slight adverse to negligible without the implementation of mitigation.

5.2. OPERATION PHASE

EXPOSURE OF NEW BUILDING OCCUPANTS

5.2.1. Monitored annual mean NO_2 concentrations in the immediate vicinity of the Site are given in **Table 5-4** (see **Figure 1** for locations).

Table 5-4 - Annual Mean NO_2 Concentrations in the Immediate Vicinity of the Application Site

Nearest Diffusion Tubes to Proposed Development	Annual Mean NO_2 ($\mu g/m^3$)	Distance from Kerb to Diffusion Tube (m)	Distance from Kerb to Façade of New Building (m)	Annual Mean Background Concentration ($\mu g/m^3$) *	Annual Mean NO_2 ($\mu g/m^3$) at Façade of New Building
GUH2	**64.8**	1.5	5.1	31.7	**55.9**
GUH3	**75.5**	-	-	-	**-**
GUH4	**81.3**	-	-	-	**-**

* Background concentration from Defra background map for 2016. Values in **bold** indicate exceedance of the annual mean NO_2 objective.

5.2.2. The concentrations in **Table 5-4** indicate substantial exceedances of the annual mean objective ($40\mu g/m^3$) with concentrations increasing between GUH2, GUH3 and GUH4 northwards along Kentish Town Road. As the annual mean concentrations exceed $40\mu g/m^3$, non-compliance with the 1-hour mean objective on the footway in this area is also likely. For GUH2 it has been possible to extrapolate the concentration back to the façade of the new residential building using Defra's NO_2 'Fall-Off with Distance Calculator' (version 4.1). The adjusted concentration is $55.9\mu g/m^3$ which indicates compliance with the 1-hour mean objective at the position of the new residential façade.

5.2.3. **Figure 2** illustrates annual NO_2 concentrations for 2013 in the vicinity of the Site as represented in the LAEI. The LAEI indicates ground level concentrations only. Concentrations at upper levels may be slightly lower as the height above road level emissions sources increases; however, in urban areas the decline in concentrations with height is not a simple assumption to make where adjacent premises may have building heating and energy plant exhaust outlets at one or more level above ground, and physically affect local pollutant dispersion.

5.2.4. The LAEI data (and monitoring data) show that pollutant concentrations increase along the façade of the new building (indicated by the Site boundary in **Figure 2**) northwards along Kentish Town Road from the junction with Camden Road. Annual mean PM_{10} and $PM_{2.5}$ concentrations are well below objective levels (27 to 30 $\mu g/m^3$ for PM_{10}, and 17 to 18 $\mu g/m^3$ for $PM_{2.5}$), whereas annual mean NO_2 concentrations exceed the objective, ranging between 60 and 67 $\mu g/m^3$ along the Kentish Town Road façade and between 47 and 50 $\mu g/m^3$ along the rear façade.

5.2.5. With reference to the London Councils pollution exposure criteria (**Table 3-4**), the ambient annual mean NO_2 concentrations at the new building facades are likely to fall into the APEC C category and as such appropriate mitigation will be required to protect new occupants according to relevant exposure. Concentrations of PM_{10} and $PM_{2.5}$ are likely to fall within the APEC A category so no specific mitigation should be required for these pollutants to protect the new occupants.

AIR QUALITY NEUTRAL ASSESSMENT

5.2.6. The results of the air quality neutral assessment are summarised in **Table 5-6**.

Table 5-5 - Summary of Air Quality Neutral Assessment

Category	Parameter	NO_X (kg/annum)	PM_{10} (kg/annum)
Building Emissions	Benchmark	186.8	-
	Proposed Development	87.1	-
	Category Difference	**-99.7**	-
Transport Emissions	Benchmark	99.2	17.2
	Proposed Development	24.0	4.2
	Category Difference	**-75.2**	**-13.0**

5.2.7. NO_X and PM_{10} emissions associated with the Proposed Development are below the Benchmarks. The Proposed Development is air quality neutral.

6. MITIGATION & RESIDUAL EFFECTS

6.1. CONSTRUCTION PHASE

6.1.1. Based on the assessment results, mitigation will be required and secured via a planning condition. Recommended mitigation measures are given below.

General Communication

- A stakeholder communications plan that includes community engagement before work commences on Site should be developed and implemented.
- The name and contact details of person(s) accountable for air quality and dust issues should be displayed on the Site boundary. This may be the environment manager/engineer or the Site manager. The head or regional office contact information should also be displayed.

General Dust Management

- A Dust Management Plan (DMP), which may include measures to control other emissions, in addition to the dust and PM_{10} mitigation measures given in this report, should be developed and implemented, and approved by the Local Authority. The DMP may include a requirement for monitoring of dust deposition, dust flux, real-time $_{PM10}$ continuous monitoring and/or visual inspections.

Site Management

- All dust and air quality complaints should be recorded and causes identified. Appropriate remedial action All dust and air quality complaints should be recorded and causes identified. Appropriate remedial action should be taken in a timely manner with a record kept of actions taken including of any additional measures put in-place to avoid reoccurrence.
- The complaints log should be made available to the local authority on request.
- Any exceptional incidents that cause dust and/or air emissions, either on- or offsite should be recorded, and then the action taken to resolve the situation recorded in the log book.

Monitoring

- Regular site inspections to monitor compliance with the DMP should be carried out, inspection results recorded, and an inspection log made available to the local authority when asked.
- The frequency of Site inspections should be increased when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
- Dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations should be agreed with the Local Authority. Where possible baseline monitoring should start at least three months before work commences on Site or, if it a large site, before work on a phase commences.

Preparing and maintaining the site

- Plan the Site layout so that machinery and dust causing activities are located away from receptors, as far as is practicable.
- Where practicable, erect solid screens or barriers around dusty activities or the Site boundary that are at least as high as any stockpiles on site.
- Where practicable, fully enclose 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 that have a potential to produce dust from Site as soon as possible, unless being re-used on Site. If they are being re-used on-site cover appropriately.
- Where practicable, cover, seed or fence stockpiles to prevent wind whipping.

Operating vehicle/machinery and sustainable travel

- Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone and the London NRMM standards, where applicable
- Ensure all vehicle operators 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 practicable.
- A maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas should be imposed (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).
- A Construction Management Plan should be produced to manage the sustainable delivery of goods and materials.
- A Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing) should be considered.

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 suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and 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

- Avoid bonfires and burning of waste materials.

Measures Specific to Demolition

- Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
- Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
- Avoid explosive blasting, using appropriate manual or mechanical alternatives.
- Bag and remove any biological debris or damp down such material before demolition.

Measures Specific to Earthworks

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
- Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
- Where practicable, only remove the cover in small areas during work and not all at once.
- Stockpile surface areas should be minimised (subject to health and safety and visual constraints regarding slope gradients and visual intrusion) to reduce area of surfaces exposed to wind pick-up.
- Where practicable, windbreak netting/screening should be positioned around material stockpiles and vehicle loading/unloading areas, as well as exposed excavation and material handling operations, to provide a physical barrier between the Site and the surroundings.
- Where practicable, stockpiles of soils and materials should be located as far as possible from sensitive properties, taking account of the prevailing wind direction.
- During dry or windy weather, material stockpiles and exposed surfaces should be dampened down using a water spray to minimise the potential for wind pick-up.

Measures Specific to Construction

- Avoid scabbling (roughening of concrete surfaces) if possible.)
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
- 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.
- All construction plant and equipment should be maintained in good working order and not left running when not in use.

Measures Specific to Trackout

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being in frequent use.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Record all inspections of haul routes and any subsequent action in a Site log book.
- Where practicable, hard surfaced haul routes should be installed, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- 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.

6.1.2. Detailed mitigation measures to control construction traffic should be discussed with LBC to establish the most suitable access and haul routes for the site traffic. The most effective mitigation will be achieved by ensuring that construction traffic does not pass along sensitive roads (residential roads, congested roads, via unsuitable junctions, etc.) where possible, and that vehicles are kept clean (e.g. using wheel washers, etc.) and sheeted when on public highways. Timing of large-scale vehicle movements to avoid peak hours on the local road network will also be beneficial.

RESIDUAL EFFECTS

6.1.3. The residual effects of dust and PM_{10} generated by construction activities following the application of the mitigation measures described above and good Site practice are likely to be not significant.

6.1.4. The residual effects of emissions to air from construction vehicles and plant on local air quality are likely to be not significant.

6.2. OPERATIONAL PHASE

MITIGATION

6.2.1. Based on the assessment, a ventilation strategy incorporating NO_x filtration should be provided to protect future residential occupants from high ambient NO_2 concentrations. Ventilation for commercial spaces should also be designed to minimise the risk of exposure of transient occupants to ambient 1-hour mean NO_2 concentrations in that are likely to be in breach of the objective. These mitigation measures should be secured via a planning condition.

RESIDUAL EFFECTS

6.2.2. The Proposed Development is predicted to cause negligible changes to annual mean NO_2 and PM_{10} and $PM_{2.5}$ concentrations.

6.2.3. The residual effects of emissions to air from the operation of the Proposed Development are not significant.

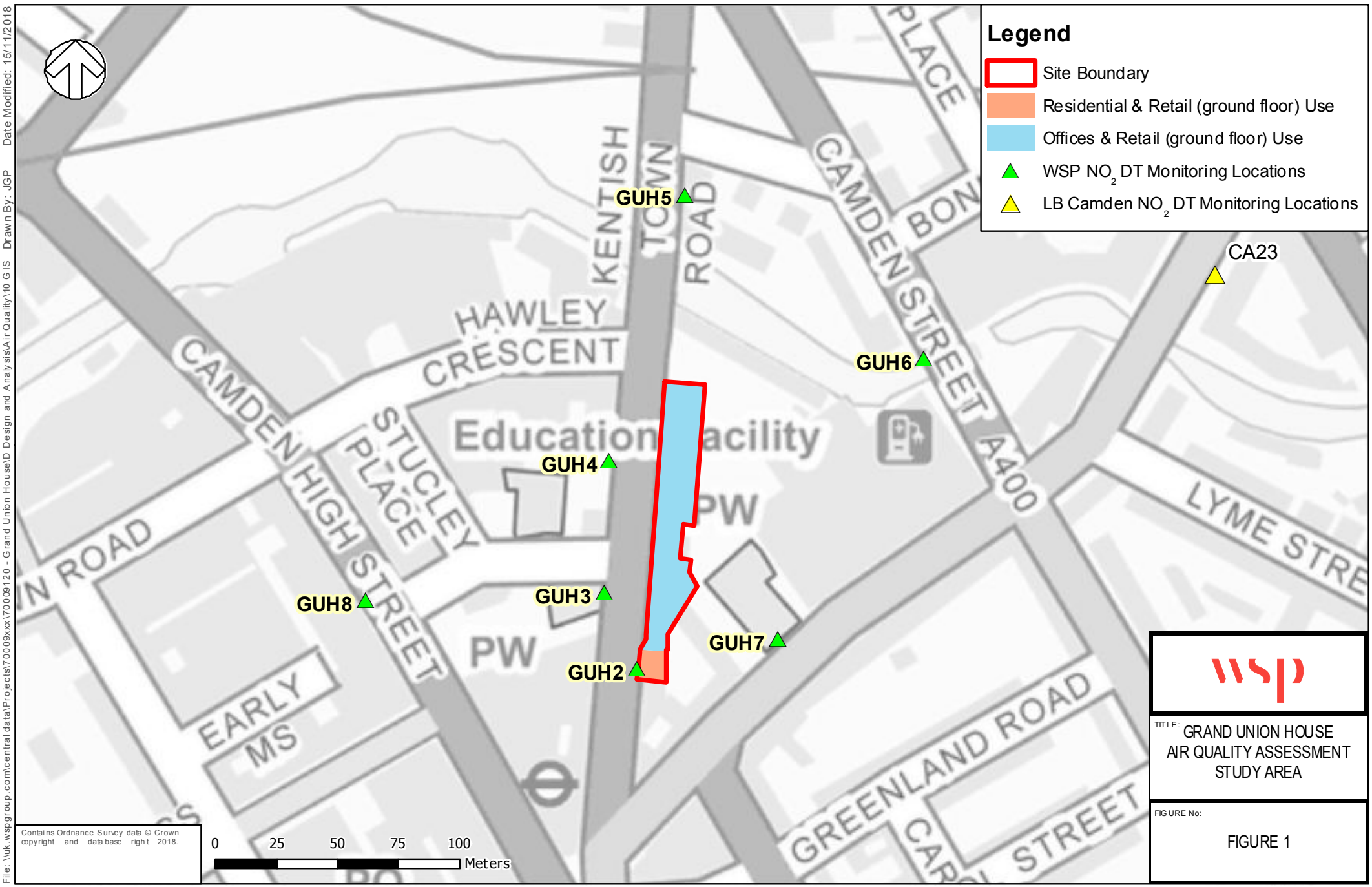
7. CONCLUSIONS

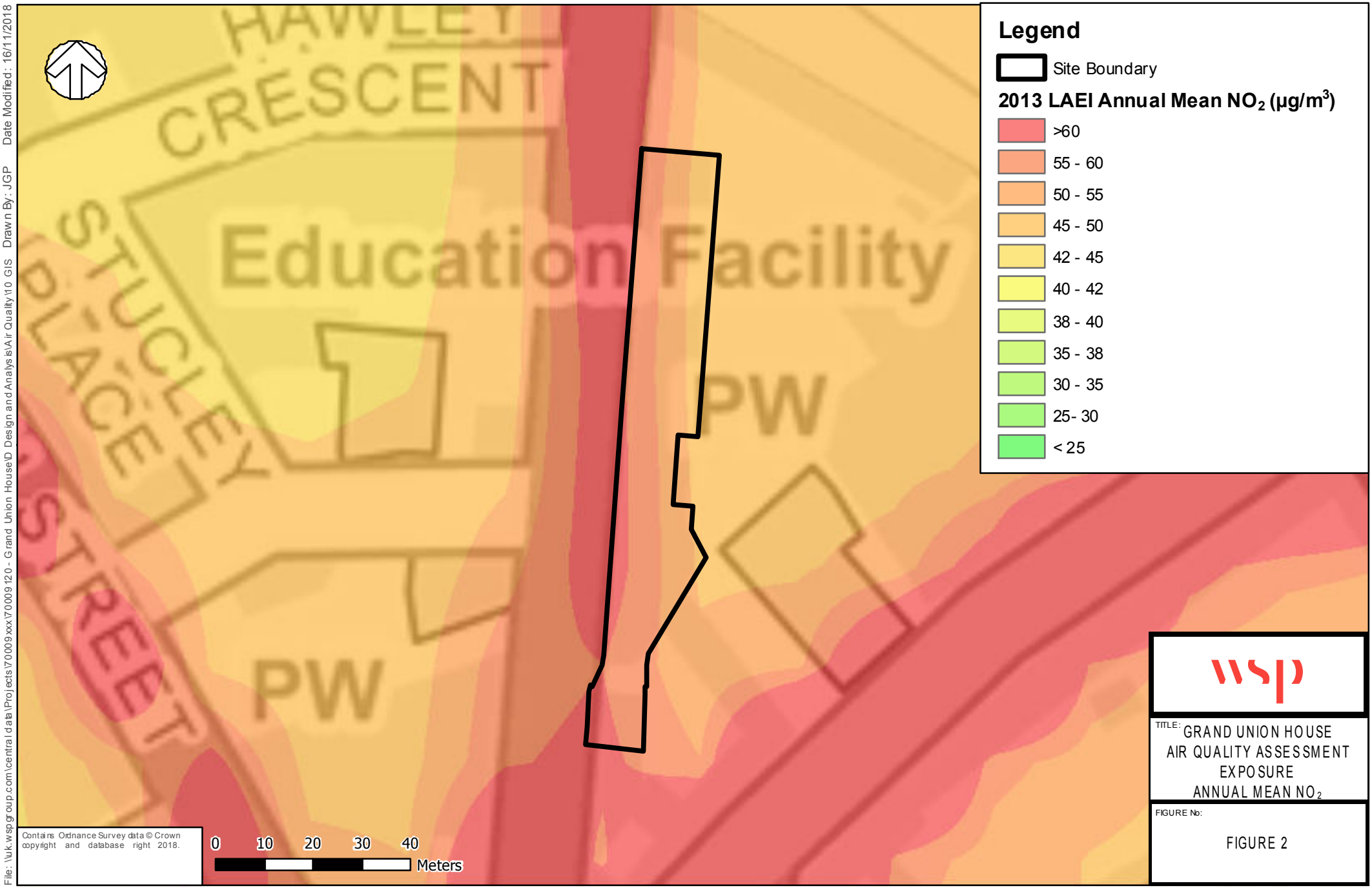
7.1.1. A qualitative assessment of the potential impacts on local air quality from construction activities has been carried out for this phase of the Proposed Development using the IAQM methodology. This identified that there is a medium to low risk for both dust soiling impacts and particulate matter concentrations due to construction activities. However, through good site practice and the implementation of suitable mitigation measures, the effect of dust and PM_{10} releases would be significantly reduced. The residual effect of dust and PM_{10} generated by construction activities on air quality are therefore not significant. The residual effect of emissions to air from construction vehicles and plant on local air quality is not significant.

7.1.2. An assessment of the exposure of the new occupants of the Proposed Development to potentially elevated pollutant concentrations has been undertaken in-line with published methodologies and technical guidance. The levels of pollutants are well above objectives and therefore specific mitigation measures are required to protect new users within the Proposed Development. Details of the ventilation strategy will be available at detailed design stage.

7.1.3. In accordance with the requirements of the Greater London Authority, the assessment shows that the Proposed Development is air quality neutral with regards to both building and transport emissions.

7.1.4. The Proposed Development complies with national and local policy for air quality.


Legend
Site Boundary
Residential & Retail (ground floor) Use
Offices & Retail (ground floor) Use
WSP NO2 DT Monitoring Locations
LB Camden NO2 DT Monitoring Locations
GUH5
GUH6
GUH4
GUH3
GUH8
GUH7
GUH2
CA23
KENTISH TOWN ROAD
HAWLEY CRESCENT
CAMDEN HIGH STREET
STUCLEY PLACE
CAMDEN STREET
A400
PLACE
LYME STRE
GREENLAND ROAD
EARLY MS
PW
Education Facility
0 25 50 75 100
Meters
Contains Ordnance Survey data © Crown copyright and database right 2018.
TITLE: GRAND UNION HOUSE AIR QUALITY ASSESSMENT STUDY AREA
FIGURE No:
FIGURE 1
File: \\uk.wspgroup.com\central data\Projects\70009xxx\70009120 - Grand Union House\D Design and Analysis\Air Quality\10 GIS Drawn By: JGP Date Modified: 15/11/2018


HAWLEY
CRESCENT
STUCLEY
PLACE
STREET
Education Facility
PW
PW
Legend
Site Boundary
2013 LAEI Annual Mean NO2 (µg/m3)
>60
55 - 60
50 - 55
45 - 50
42 - 45
40 - 42
38 - 40
35 - 38
30 - 35
25- 30
< 25
0
10
20
30
40
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Contains Ordnance Survey data © Crown copyright and database right 2018.
wsp
TITLE: GRAND UNION HOUSE
AIR QUALITY ASSESSMENT
EXPOSURE
ANNUAL MEAN NO2
FIGURE No:
FIGURE 2
File: \\uk.wspgroup.com\central data\Projects\70009xxx\70009120 - Grand Union House\D Design and Analysis\Air Quality\10 GIS Drawn By: JGP Date Modified: 16/11/2018

Appendix A

GLOSSARY

Term	Definition
AADT Annual Average Daily Traffic	A daily total traffic flow (24 hrs), expressed as a mean daily flow across all 365 days of the year.
Adjustment	Application of a correction factor to modelled results to account for uncertainties in the model
Accuracy	A measure of how well a set of data fits the true value.
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedances within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Ambient air	Outdoor air in the troposphere, excluding workplace air.
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year.
AQMA	Air Quality Management Area.
AURN	Automatic Urban and Rural (air quality monitoring) Network, managed by contractors on behalf of Defra
Conservative	Tending to over-predict the impact rather than under-predict.
Data capture	The percentage of all the possible measurements for a given period that were validly measured.
DEFRA	Department for Environment, Food and Rural Affairs.
DfT	Department for Transport.
Dust	Dust comprises particles typically in the size range 1-75 micrometres (µm) in aerodynamic diameter and is created through the action of crushing and abrasive forces on materials
Emission rate	The quantity of a pollutant released from a source over a given period of time.
Exceedance	A period of time where the concentrations of a pollutant is greater than the appropriate air quality standard.
Fugitive emissions	Emissions arising from the passage of vehicles that do not arise from the exhaust system.
HDV/HGV	Heavy Duty Vehicle/Heavy Goods Vehicle.

Term	Definition
LAQM	Local Air Quality Management.
Model adjustment	Following model verification, the process by which modelled results are amended. This corrects for systematic error.
NO_2	Nitrogen dioxide.
NOx	Nitrogen oxides.
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometres.
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5 micrometres.
Ratification (Monitoring)	Involves a critical review of all information relating to a data set, in order to amend or reject the data. When the data have been ratified they represent the final data to be used (see also validation).
Road link	A length of road which is considered to have the same flow of traffic along it. Usually, a link is the road from one junction to the next.
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 vehicles using the network. This arises when heavy duty vehicles (HDVs) leave the construction / demolition site with dusty materials, which may then spill onto the road, and/or when HDVs transfer dust and dirt onto the road having travelled over muddy ground on site.
$\mu g/m^3$	Micrograms per cubic metre. A measure of concentration in terms of mass per unit volume. A concentration of $1\mu g/m^3$ means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.
Uncertainty	A measure, associated with the result of a measurement, which characterizes the range of values within which the true value is expected to lie. Uncertainty is usually expressed as the range within which the true value is expected to lie with a 95% probability, where standard statistical and other procedures have been used to evaluate this figure. Uncertainty is more clearly defined than the closely related parameter 'accuracy', and has replaced it on recent European legislation.
Verification (modelling)	Comparison of modelled results versus any local monitoring data at relevant locations.

Appendix B

WSP MONITORING REPORT

Camden Mixed Developments Limited

GRAND UNION HOUSE

Air Quality Monitoring Report

70009120-703
DECEMBER 2017

INTERNAL

Camden Mixed Developments Limited

GRAND UNION HOUSE

Air Quality Monitoring Report

TYPE OF DOCUMENT (VERSION) INTERNAL

PROJECT NO. 70009120

OUR REF. NO. 70009120-703

DATE: DECEMBER 2017

Camden Mixed Developments Limited

GRAND UNION HOUSE

Air Quality Monitoring Report

WSP

4th Floor
6 Devonshire Square
London
EC2M 4YE

Phone: +44 113 395 6201

Fax: +44 20 7337 1701

WSP.com

QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks	Draft for comments	Final		
Date	17/11/2017	08/12/2017		
Prepared by	Yasmin Wright	Yasmin Wright		
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Checked by	Jorge Gomez Perales	Jorge Gomez Perales		
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Authorised by		Andy Talbot		
Signature		Talbot, Andy Digitally signed by Talbot, Andy DN: cn=Talbot, Andy, ou=London (Devonshire Square), email=Andy.Talbot@wsp.com Date: 2017.12.08 17:40:08 Z		
Project number	70022836	70022836		
Report number	V01	V02		
File reference	70009120 - Grand Union House\D Design and Analysis\Air Quality	70009120 - Grand Union House\D Design and Analysis\Air Quality		

CONTENTS

APPENDICES

1. INTRODUCTION

1.1.1. WSP has been appointed by Camden Mixed Developments Limited to undertake an air quality monitoring survey for the proposed redevelopment of Grand Union House, hereafter referred to as the 'Site', in the London Borough of Camden. The purpose is to indicate ambient annual mean nitrogen dioxide (NO_2) concentrations in the vicinity of the Site.

1.1.2. This report presents the results of the survey using passive NO_2 diffusion tubes, which were deployed over a three month period between 14th July and 13th October 2017.

1.1.3. A glossary of terms has been provided in **Appendix A.**

2. RELEVANT LEGISLATION AND GUIDANCE

2.1. UK AIR QUALITY STRATEGY

2.1.1. The Government's policy on air quality within the UK is set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (AQS) published in July 2007[1]. The AQS provides a framework for reducing air pollution in the UK with the aim of meeting the requirements of European Union legislation and international commitments.

2.1.2. The AQS also sets standards and objectives for nine key air pollutants to protect health, vegetation and ecosystems. These are benzene (C_6H_6), 1,3 butadiene (C_4H_6), carbon monoxide (CO), lead (Pb), NO_2, particulate matter (PM_{10} and $PM_{2.5}$), sulphur dioxide (SO_2), ozone (O_3), and polycyclic aromatic hydrocarbons (PAHs).

2.1.3. The air quality standards are levels recommended by the Expert Panel on Air Quality Standards (EPAQS) and the World Health Organisation (WHO) with regard to current scientific knowledge about the effects of each pollutant on health and the environment.

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

2.1.5. For some pollutants, (e.g. NO_2), there is both a long-term (annual mean) standard and a short-term standard. In the case of NO_2, the short-term standard is for a 1-hour averaging period. These periods reflect the varying impacts on health of differing exposures to pollutants, for example temporary exposure on the pavement adjacent to a busy road, compared with the exposure at residential properties adjacent to a road.

2.1.6. A summary of the current national air quality objectives for NO_2 is provided below in **Table 1**.

[1] Department for Environment, Food and Rural Affairs (Defra) and the Devolved Administrations (2007). The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2)

Table 1 - NO_2 Air Quality Objectives

Pollutant	Applies To	Objective		
		Concentration	Measured As	Number of Annual Exceedances Allowed
Nitrogen Dioxide (NO_2)	All UK	200µg/m^3	1 hour (hourly) mean	18
	All UK	40µg/m^3	Annual mean	-

µg/m^3 = micrograms per cubic metre.

2.2. AIR QUALITY REGULATIONS

2.2.1. Many of the objectives in the AQS have been made statutory in England with the Air Quality (England) Regulations 2000[2] and the Air Quality (England) (Amendment) Regulations 2002[3] for the purpose of Local Air Quality Management (LAQM).

2.2.2. These Regulations require that likely exceedances of the AQS objectives are assessed in relation to:

- *"…the quality of air at locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present…"*

2.2.3. The Air Quality Standards Regulations 2010[4] transpose the European Union Ambient Air Quality Directive (2008/50/EC)[5] into law in England. This Directive sets legally binding limit values for concentrations in outdoor air of major air pollutants that impact public health such as NO_2. The limit values for NO_2 are numerically the same as the AQS objectives (**Table 1**).

2.3. LOCAL AIR QUALITY MANAGEMENT REVIEW AND ASSESSMENT TECHNICAL GUIDANCE

2.3.1. The Greater London Authority (GLA) has prepared London Local Air Quality Management (LLAQM) Technical Guidance[6] – to support London boroughs in carrying out their duties under the

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

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

[4] The Air Quality Standards Regulations 2010 - Statutory Instrument 2010 No. 1001.

[5] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe.

[6] London Local Air Quality Management (LLAQM) Technical Guidance LLAQM.TG(16) (Greater London Authority, 2016)

Environment Act 1995 and connected regulations. This statutory guidance only applies to London's 32 boroughs (and the City of London).

2.3.2. The Department for Environment, Food and Rural Affairs (Defra) has published a technical guidance for use by local authorities in their review and assessment work. This guidance, referred to in this document as LAQM.TG(16)[7]. This guidance contains methodology on how best to undertake an air quality monitoring survey, how to process the data collected, and how annualise it if the monitoring survey is shorter than nine months.

[7] Local Air Quality Management Technical Guidance LAQM.TG(16) (DEFRA, April 2016)

3. METHODOLOGY

3.1. DIFFUSION TUBE MONITORING SURVEY

3.1.1. Eight NO_2 diffusion tube monitoring sites were selected around the Application Site. An additional set of tubes were co-located with the continuous monitor on Euston Road. The monitoring locations are listed in **Table 2** and shown in **Figure 1**.

Table 2 - NO_2 Diffusion Tube Monitoring Locations

Site ID	OS Grid Reference		Height (m)	Site Type
	X (m)	Y (m)		
GUH1	528957	183786	2	Kerbside
GUH2	528939	183969	2	Kerbside
GUH3	528923	183999	2	Kerbside
GUH4	528925	184053	2	Kerbside
GUH5	528956	184162	2	Kerbside
GUH6	529054	184095	2	Kerbside
GUH7	528994	183980	2	Kerbside
GUH8	528825	183996	2	Kerbside
Co-location	529884	182639	2	Kerbside

3.1.2. NO_2 diffusion tubes were supplied by Gradko, a UKAS accredited laboratory. The tube preparation used was 20% triethanolamine ('TEA') in water. The tubes were deployed in duplicates at each monitoring location and exposed for approximately one month before being replaced. Exposed tubes were exchanged with fresh tubes and sent to Gradko for analysis. The monitoring timetable is given in **Table 3**.

Table 3 - Monitoring Timetable

Monitoring Period	Start Date	End Date	Total Exposure (Days)
Month 1	14/07/2017	11/08/2017	28
Month 2	11/08/2017	08/09/2017	28
Month 3	08/09/2017	13/10/2017	35

3.2. PROCESSING OF MONITORING RESULTS

Annualisation and Bias Adjustment

3.2.1. LAQM.TG(16) recommends that diffusion tube data collected over periods of less than nine months are 'annualised' using data from well-established automatic monitoring stations. This allows the annual mean NO_2 concentration to be estimated for each diffusion tube site to enable comparison with the annual mean objective.

3.2.2. The annualisation calculation requires the raw NO_2 diffusion tube results to be compared with data from between two to four continuous automatic monitoring stations within a 50 mile radius, with data capture of at least 85%. Ideally, the stations should be representative of urban background, suburban or rural environments. Details of the automatic monitoring stations used for annualisation are given in **Table 4**.

Table 4 - Automatic Monitoring Stations Used for Annualisation

Local Authority- Site Name	OS Grid Reference		Approximate Distance to Scheme (miles)	Site Type
	X (m)	Y (m)		
Camden - Bloomsbury	530123	182014	1.4	Urban Background
Islington - Arsenal	531325	186032	1.9	Urban Background
Haringey - Priory Park South	529977	188903	3.1	Urban Background

3.2.3. 2016 monitoring data from these monitoring stations (**Table 3**) were used to derive an annualisation factor of 1.41 (**Appendix B**).

3.2.4. To account for the tendency of diffusion tubes to over- or under- estimate NO_2 concentrations compared to reference chemiluminescence method, as employed at the automatic monitoring stations, further adjustment is made to account for tube 'bias'. For this study a bias adjustment factor of 0.92 has been applied, which has been taken from Defra's national bias adjustment factor spreadsheet[8].

Assessment of NO_2 Concentrations at Locations with Relevant Exposure

3.2.5. Ideally, monitoring locations should be representative of relevant exposure. However, it is not always possible to place monitoring equipment exactly in the location with relevant exposure, such

[8] The Diffusion Tube Bias Adjustment Factors Spreadsheet (Defra, March 2016). Available at: https://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html.

as on the nearest residential façade. Where this is not possible, LAQM.TG(16) recommends that *"the NO_2 concentration at the nearest location relevant for exposure should be estimated, using the NO_2 fall-off with distance calculator available on the LAQM Support website"*[9]. This calculator extrapolates the measured concentration to the nearest façade with relevant exposure.

3.2.6. Where there are residential properties on the opposite side of the road to the monitoring locations, kerbside NO_2 concentrations have been assumed to be the same.

3.2.7. The processed concentration data are comparable with the AQS objective for annual mean NO_2, which is 40µg/m^3 (**Table 1**).

3.2.8. It is not possible to determine NO_2 hourly mean concentrations from diffusion tube monitoring, however LAQM.TG(16) provides guidance on the relationship between the annual mean and hourly mean NO_2 concentrations :

- *"For diffusion tube monitoring, it can be considered that exceedances of the NO_2 1-hour objective may occur at roadside sites if the annual mean is above 60µg/m^3."*

[9] NO_2 fall off distance calculator version 4.1 (Defra, April 2016) Available at: https://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html

4. MONITORING SURVEY RESULTS

4.1. ANNUAL MEAN NO_2 CONCENTRATIONS AT MONITORING SITES

4.1.1. The estimated annual NO_2 mean concentration for each monitoring location, after bias adjustment and annualisation, is presented in **Table 5**. The raw diffusion tube data are summarised in **Appendix C**.

Table 5 - Annual Mean NO_2 Concentrations Estimated for 2016

Site ID	Data Capture (%)	Estimated Annual Mean NO_2 Concentration ($\mu g/m^3$)*	Potential Breach of the NO_2 1-hour (hourly) AQS Objective?	Site Type
GUH1	50%	**67.1**	Yes	Kerbside
GUH2	83%	**64.8**	Yes	Kerbside
GUH3	50%	**75.5**	Yes	Kerbside
GUH4	83%	**81.3**	Yes	Kerbside
GUH5	33%	**51.9****	**	Kerbside
GUH6	17%	**68.7****	**	Kerbside
GUH7	67%	**98.4**	Yes	Kerbside
GUH8	67%	**94.1**	Yes	Kerbside
Co-location	100%	**113.8**	Yes	Kerbside

* Values in **bold** indicate exceedance of the annual mean NO_2 AQS objective

** Data capture was insufficient for annualisation, averaged results have been presented

4.1.2. The percentage data capture was less than 100% at all sites (excluding the co-location) due to diffusion tubes being stolen. The low percentage data capture adds uncertainty to the estimated annual mean NO_2 concentration reported at these sites and these results should be treated with caution. Data capture was so low at sites GUH5 and GUH6 that the results have not been annualised.

4.1.3. Diffusion tubes were not located at roof level of Grand Union House as there was nowhere to attach the tubes safely.

4.1.4. The results show that NO_2 concentrations exceed the AQS objective at all the monitoring locations. Non-compliance with the 1-hour mean AQS objective is also indicated at all sites except GUH5.

4.2. ASSESSMENT OF NO_2 CONCENTRATIONS AT LOCATIONS WITH RELEVANT EXPOSURE

4.2.1. It was not possible to attach diffusion tubes to the façades of existing buildings. Therefore, the Defra's NO_2 Fall-Off with Distance Calculator (version 4.1) has been used to estimate ambient NO_2 concentrations at the nearest façade to each diffusion tube location along Kentish Town Road, A400 (**Table 6**).

Table 6 - Estimated Annual Mean NO_2 Concentrations at Nearest Façade

Nearest Diffusion Tubes to Proposed Development	Distance from Kerb to Diffusion Tube (m)	Distance from Kerb to Property (m)	Annual Mean Background Concentration (µg/m^3)*	Annual Mean NO_2 Concentration at Monitoring Site (µg/m^3)**	Annual Mean NO_2 Concentration at Nearest Façade (µg/m^3)**
GUH2	1.5	5.1	31.7	**64.8**	**55.9**
GUH3	0.5	5.1	31.7	**75.5**	**56.9**
GUH4	1.4	3.1	31.7	**81.3**	**72.8**

* Background concentration data from Defra background maps for 2016;

** Values in **bold** indicate exceedance of the annual mean NO_2 AQS objective

4.2.2. The annual mean NO_2 concentrations at the building façades substantially exceed the AQS objective. The NO_2 concentration at the nearest façade to GUH4 is above 60µg/m^3; therefore, non-compliance with the 1-hour mean AQS objective at this location is likely.

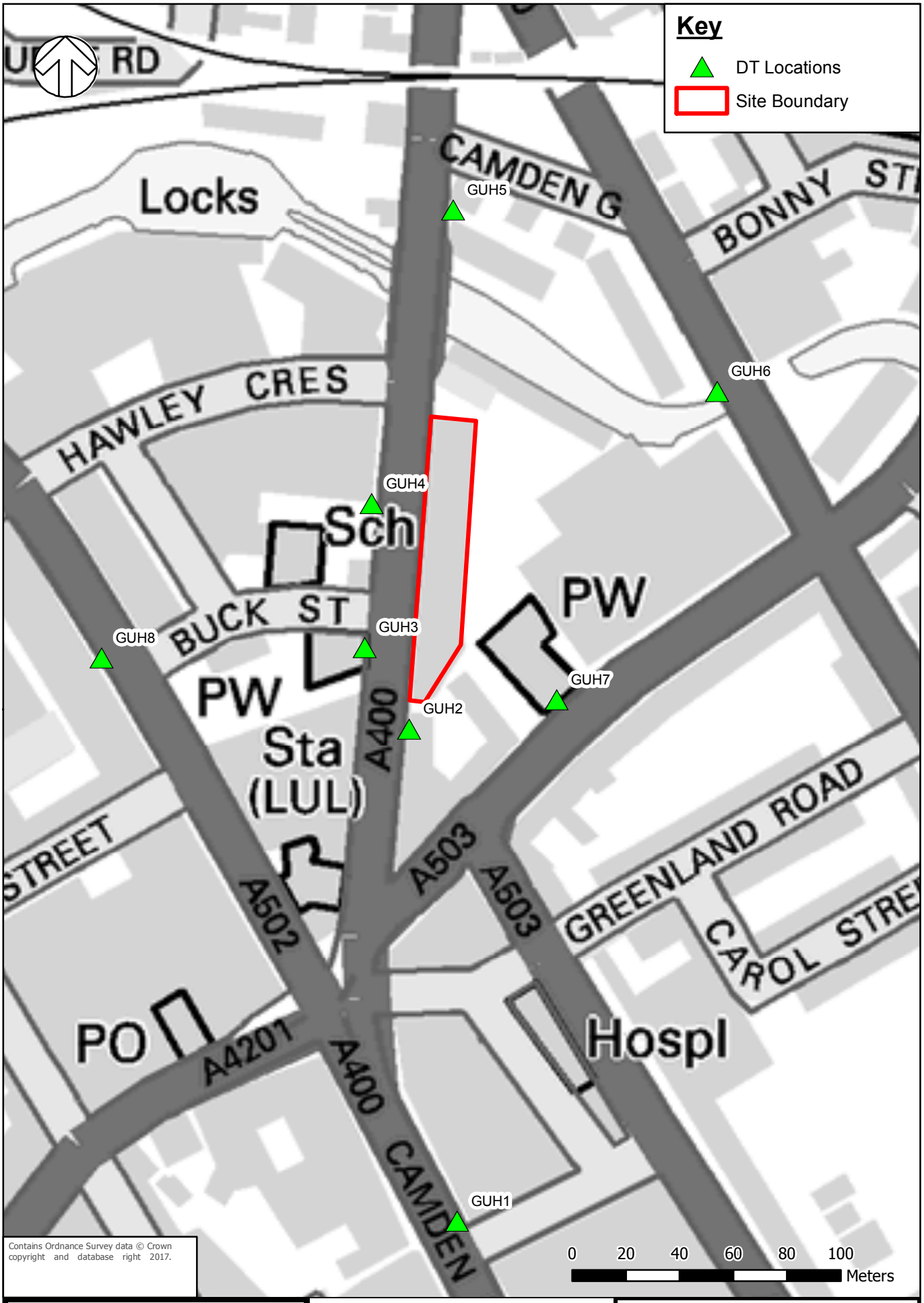
5. CONCLUSIONS AND RECOMMENDATIONS

5.1.1. A three months diffusion tube survey was carried out in the vicinity of the Application Site. The results show that annual mean NO_2 concentrations substantially exceed the AQS objective (40µg/m^3) at roadside façade locations. Non-compliance with the 1-hour mean AQS objective is also likely.

5.1.2. Based on the results presented in this report, mitigation measures are recommended as part of a ventilation strategy to protect the occupants of the Proposed Development. Mechanical ventilation with NO_x filtration should be considered.

6. FIGURES

Drawn By: Yasmin Wright Date Modified: 17/11/2017



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70009120 -
GRAND UNION HOUSE,
CAMDEN

FIGURE No:

FIGURE 1

Appendix A

GLOSSARY

Term	Definition
Adjustment	Application of a correction factor to modeled results to account for uncertainties in the model
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedances within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Annual mean	The average (mean) of the concentrations measured for each pollutant for one calendar year (January-December).
Data capture	The percentage of all the possible measurements for a given period that were validly measured.
Defra	Department for Environment, Food and Rural Affairs.
Exceedance	A period of time where the concentrations of a pollutant is greater than the appropriate air quality standard.
LAQM	Local Air Quality Management.
NO_2	Nitrogen dioxide.
NO_x	Nitrogen oxides.
$\mu g/m^3$ (micrograms per cubic metre)	A measure of concentration in terms of mass per unit volume. A concentration of $1\mu g/m^3$ means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.
UKAS	United Kingdom Accreditation Service

Appendix B

DERIVATION OF ANNUALISATION FACTOR

Local Authority Automatic Air Quality Monitoring Station	Annual Mean NO_2 for 2016		Period Mean NO_2 for 14th July to 13th October 2017		Ratio
	Concentration ($\mu g/m^3$)	Data Capture	Concentration ($\mu g/m^3$)	Data Capture	
Camden - Bloomsbury	41.9	98%	35.7	96.9%	1.17
Islington - Arsenal	33.1	97%	20.2	92.9%	1.64
Haringey - Priory Park South	25.8	99%	18.1	98%	1.43
Annualisation factor (average of annual mean/period mean values)					**1.41**

Local Authority Automatic Air Quality Monitoring Station	Annual Mean NO_2 for 2016		Period Mean NO_2 for 14th July to 8th September 2017		Ratio
	Concentration ($\mu g/m^3$)	Data Capture	Concentration ($\mu g/m^3$)	Data Capture	
Camden - Bloomsbury	41.9	98%	34.4	95.2%	1.21
Islington - Arsenal	33.1	97%	19.1	97.6%	1.73
Haringey - Priory Park South	25.8	99%	16.5	97%	1.57
Annualisation factor (average of annual mean/period mean values)					**1.50**

Local Authority Automatic Air Quality Monitoring Station	Annual Mean NO_2 for 2016		Period Mean NO_2 for 11th August to 13th October 2017		Ratio
	Concentration ($\mu g/m^3$)	Data Capture	Concentration ($\mu g/m^3$)	Data Capture	
Camden -	41.9	98%	37.7	96.0%	1.11

Local Authority Automatic Air Quality Monitoring Station	Annual Mean NO_2 for 2016		Period Mean NO_2 for 11th August to 13th October 2017		Ratio
	Concentration ($\mu g/m^3$)	Data Capture	Concentration ($\mu g/m^3$)	Data Capture	
Bloomsbury					
Islington - Arsenal	33.1	97%	20.8	90.8%	1.59
Haringey - Priory Park South	25.8	99%	20.2	97%	1.28
Annualisation factor (average of annual mean/period mean values)					**1.33**

Appendix C

RAW MONITORING RESULTS

Raw NO_2 Monitoring Results Prior to Annualisation and Bias Adjustment

Location	Month of Monitoring	Duplicate/ Triplicates	Raw NO_2 Concentration ($\mu g/m^3$)
GUH1	1	A	‡
		B	‡
	2	A	55.57
		B	53.92
	3	A	55.40
		B	‡
GUH2	1	A	50.49
		B	51.19
	2	A	57.18
		B	‡
	3	A	48.49
		B	54.37
GUH3	1	A	53.37
		B	‡
	2	A	54.78
		B	56.81
	3	A	‡
		B	‡
GUH4	1	A	59.32
		B	56.87
	2	A	71.63
		B	‡
	3	A	70.58

Location	Month of Monitoring	Duplicate/ Triplicates	Raw NO_2 Concentration ($\mu g/m^3$)
		B	70.35
GUH5	1	A	51.19
		B	‡
	2	A	52.55
		B	‡
	3	A	‡
		B	‡
GUH6	1	A	68.70
		B	‡
	2	A	‡
		B	‡
	3	A	‡
		B	‡
GUH7	1	A	67.56
		B	61.06
	2	A	79.42
		B	76.44
	3	A	‡
		B	‡
GUH8	1	A	70.84
		B	60.03
	2	A	61.74
		B	79.68
	3	A	‡

Location	Month of Monitoring	Duplicate/ Triplicates	Raw NO_2 Concentration ($\mu g/m^3$)
		B	‡
Co-location	1	A	88.70
		B	86.30
		C	82.41
	2	A	92.60
		B	92.28
		C	98.17
	3	A	82.85
		B	85.02
		C	80.33

‡ - denotes missing data

4th Floor
6 Devonshire Square
London
EC2M 4YE

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Appendix C

IAQM CONSTRUCTION ASSESSMENT METHODOLOGY

STEP 1 – SCREENING THE NEED FOR A DETAILED ASSESSMENT

An assessment will normally be required where there are:

- 'Human receptors' within 350m of the site boundary; or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s); and/or
- 'Ecological receptors' within 50m of the site boundary; or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is "negligible".

STEP 2A – DEFINE THE POTENTIAL DUST EMISSION MAGNITUDE

The following are examples of how the potential dust emission magnitude for different activities can be defined. (Note that not all the criteria need to be met for a particular class). Other criteria may be used if justified in the assessment.

Table 2A: Examples of Human Receptor Sensitivity to Construction Phase Impacts

Dust Emission Magnitude	Activity
Large	Demolition >50,000m^3 building demolished, dusty material (e.g. concrete), on-site crushing/screening, demolition >20m above ground level
	Earthworks >10,000m^2 site area, dusty soil type (e.g. clay), >10 earth moving vehicles active simultaneously, >8m high bunds formed, >100,000 tonnes material moved
	Construction >100,000m^3 building volume, on site concrete batching, sandblasting
	Trackout >50 HDVs out / day, dusty surface material (e.g. clay), >100m unpaved roads
Medium	Demolition 20,000 - 50,000m^3 building demolished, dusty material (e.g. concrete) 10-20m above ground level
	Earthworks 2,500 - 10,000m^2 site area, moderately dusty soil (e.g. silt), 5-10 earth moving vehicles active simultaneously, 4m - 8m high bunds, 20,000 -100,000 tonnes material moved
	Construction 25,000 - 100,000m^3 building volume, dusty material e.g. concrete, on site concrete batching
	Trackout

Dust Emission Magnitude	Activity
	10 - 50 HDVs out / day, moderately dusty surface material (e.g. clay), 50 -100m unpaved roads
Small	Demolition <20,000m^3 building demolished, non-dusty material (e.g metal cladding), <10m above ground level, work during wetter months
	Earthworks <2,500m^2 site area, soil with large grain size (e.g. sand), <5 earth moving vehicles active simultaneously, <4m high bunds, <20,000 tonnes material moved, earthworks during wetter months
	Construction <25,000m^3, non-dusty material (e.g. metal cladding or timber)
	Trackout <10 HDVs out / day, non-dusty soil, < 50m unpaved roads

STEP 2B – DEFINE THE SENSITIVITY OF THE AREA

The tables below present the IAQM assessment methodology to determine the sensitivity of the area to dust soiling, human health and ecological impacts respectively. The IAQM guidance provides guidance to allow the sensitivity of individual receptors to dust soiling and health effects to assist in the assessment of the overall sensitivity of the study area.

Table 2Ba: Sensitivity of the Area to Dust Soiling Effects

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<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

Table 2Bb: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentration ($\mu g/m^3$)	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Table 2Bc: Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from the Sources (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

STEP 2C – DEFINE THE RISK OF IMPACTS

The dust emissions magnitude determined at Step 2A should be combined with the sensitivity of the area determined at Step 2B to determine the risk of impacts without mitigation applied. For those cases where the risk category is 'negligible' no mitigation measures beyond those required by legislation will be required.

Table 2C: Risk of Dust Impacts

Sensitivity of surrounding area	Dust Emission Magnitude		
	Large	Medium	Small
Demolition			
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible
Earthworks and Construction			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible
Trackout			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

STEP 3 –SITE SPECIFIC MITIGATION

Having determined the risk categories for each of the four activities it is possible to determine the site-specific measures to be adopted. These measures will be related to whether the site is considered to be a low, medium or high risk site. The IAQM guidance details the mitigation measures required for high, medium and low risk sites as determined in Step 2C.

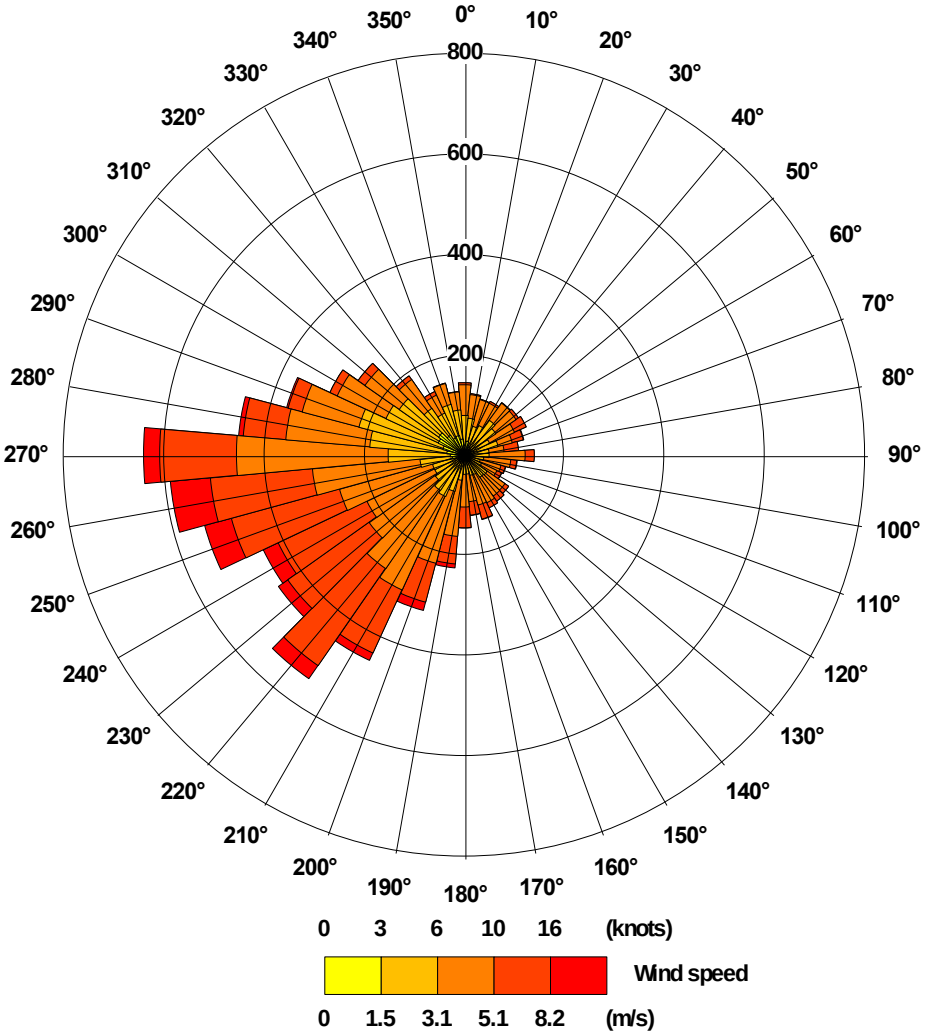
STEP 4 – DETERMINE SIGNIFICANT EFFECTS

Once the risk of dust impacts has been determined in Step 2C and the appropriate dust mitigation measures identified in Step 3, the final step is to determine whether there are significant effects arising from the construction phase. For almost all construction activities, the application of effective mitigation should prevent any significant effects occurring to sensitive receptors and therefore the residual effect will normally be negligible.

Appendix D

WIND ROSE

WIND ROSE FOR HEATHROW AIRPORT 2017



4th Floor
6 Devonshire Square
London
EC2M 4YE

wsp.com