Air Quality Assessment

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REDROW

WSP

265 BURLINGTON ROAD NEW MALDEN

Redrow Homes Limited

AIR QUALITY ASSESSMENT

265 Burlington Road, New Malden

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EXECUTIVE SUMMARY

WSP has been commissioned by Redrow Homes Limited to undertake an air quality assessment to support the planning application for the proposed development at 265 Burlington Road in New Malden. The application comprises 456 residential units across two buildings and associated infrastructure.

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 proposed. The methodology followed in this study was discussed and agreed with the Environmental Health Officer at the London Borough of Merton.

The assessment of construction phase impacts associated with fugitive dust and fine particulate matter (PM_{10} and $PM_{2.5}$) and vehicle and plant emissions has been undertaken in line with the relevant Mayor of London's Supplementary Planning Guidance. This identified that there is a Medium Risk of dust soiling impacts and a Low Risk of increases in particulate matter concentrations due to construction activities. However, through good site practice and the implementation of suitable mitigation measures, the effect of dust and particulate matter releases, as well as construction vehicle and plant emissions, would be significantly reduced. The residual effects of the construction phase on air quality are negligible.

The assessment of the potential air quality impacts associated with traffic generated by the operational phase of the proposed development has been completed in line with published methodologies and technical guidance. The pollutants considered in this part of the assessment were nitrogen dioxide (NO_2), PM_{10} and $PM_{2.5}$. Air quality impacts associated with emissions to air from the proposed energy centre were also assessed.

An assessment of the potential for future residents of the proposed development to be exposed to poor air quality, given the site's location in an Air Quality Management Area, has also been undertaken.

The results show that the proposed development would cause negligible impacts on concentrations of NO_2, PM_{10} and $PM_{2.5}$ at all sensitive receptors in accordance with the relevant assessment significance criteria.

Concentrations of all pollutants were below the relevant UK Air Quality Strategy objectives on the Application Site, and therefore future residents will not be exposed to poor air quality.

Based on the assessment results, it is considered that the development proposals comply with national, regional and local policy for air quality.

1. INTRODUCTION

1.1.1. WSP has been commissioned by Redrow Homes Limited to carry out an assessment of the potential air quality impacts arising from the proposed development at 265 Burlington Road, New Malden, hereafter referred to as the 'Proposed Development' or 'Application Site'.

1.1.2. The Application Site lies within the administrative boundary of the London Borough of Merton (LBoM) and is situated to the east of the district centre. It is bordered to the north by Raynes Park High School, to the east by Burlington Road, to the south by existing commercial units, and to the west by a food store car park. The Application Site covers an area in the region of 1.22ha of land currently comprising a car park and former commercial buildings.

1.1.3. Demolition of the existing buildings and erection of two blocks of development ranging in height between seven and 15 storeys and comprising 456 new homes, of which 114 will be one beds, 289 will be two beds and 53 will be three beds. 499sqm of B1(a) office space will be accommodated at ground floor level along with 220 car parking spaces, 830 cycle parking spaces, a realigned junction onto Burlington Road, hard and soft landscaping and associated residential facilities. The application also includes minor changes to the layout and configuration of the retained Tesco car park.

1.1.4. An energy centre, comprising a gas fired Combined Heat and Power (CHP) unit and four boilers, is included in the proposals.

1.1.5. This report presents the findings of an assessment of the potential air quality impacts of the Proposed Development during 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 described.

1.1.6. This report also considers the potential exposure of future residents of the Proposed Development to local pollution concentrations given the Application Site is located in an Air Quality Management Area (AQMA).

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

2. LEGISLATION, POLICY & GUIDANCE

2.1. AIR QUALITY LEGISLATION & POLICY

2.1.1. A summary of the relevant air quality legislation and policy is provided below.

UK AIR QUALITY STRATEGY

2.1.2. 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)[1]. The AQS provides a framework for reducing air pollution in the UK with the aim of meeting the requirements of European Union legislation.

2.1.3. 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 Appendix B.

2.1.4. 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.

2.1.5. The air quality objectives are 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.

2.1.6. 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.

2.1.7. 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.

[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)

AIR QUALITY REGULATIONS

2.1.8. 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).

2.1.9. 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…"

2.1.10. The Air Quality Standards Regulations 2010[4] 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 limit values for NO_2 and PM_{10} are the same concentration levels as the relevant. AQS objectives and the limit value for $PM_{2.5}$ is a concentration of 25µg/m^3.

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

2.1.11. 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'; and

'Any accumulation or deposit which is prejudicial to health or a nuisance'.

2.1.12. 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.

2.1.13. 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

2.1.14. 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

[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

improvements in air quality and show how it intends to work towards achieving air quality standards in the future.

2.2. PLANNING POLICY

2.2.1. A summary of the national, regional and local planning policy relevant to the Proposed Development and air quality is provided below.

NATIONAL PLANNING POLICY

National Planning Policy Framework

2.2.2. The Government's overall planning policies for England are described in the National Planning Policy Framework[5]. The core underpinning principle of the Framework is the presumption in favour of sustainable development, defined as:

- *'… meeting the needs of the present without compromising the ability of future generations to meet their own needs*

2.2.3. One of the three overarching objectives of the NPPF is that planning should 'to contribute to protecting and enhancing our natural, built and historic environment; 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, including moving to a low carbon economy.'

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

- Paragraph 54, which states '*Local planning authorities should consider whether otherwise unacceptable development could be made acceptable through 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 103, which states '*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 to reduce congestion and emissions, and improve air quality and public health.*;
- Paragraph 170, which states '*Planning policies and decisions should contribute to and enhance the natural and local environment by: …e) 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, which states '*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*

[5] Ministry of Housing, Communities and Local Government (2018). National Planning Policy Framework.

the potential sensitivity of the site or the wider area to impacts that could arise from the development.'

- Paragraph 181, which states '*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*.';
- Paragraph 183, which states '*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.*'

REGIONAL PLANNING POLICY

The Mayor's Air Quality Strategy for London

2.2.5. In 2010 the GLA/Mayor of London published the Mayor's Air Quality Strategy for London[6]. This strategy is focused on improving London's air quality. It also explains the current air quality experienced across London and gives predictions of future levels of 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.

2.2.6. 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.

2.2.7. 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: Spatial Development Strategy for Greater London (consolidated with alterations since 2011)

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

[6] Mayor of London: Cleaning London's air, The Mayor's Air Quality Strategy (December 2010)

[7] Mayor of London (March 2016) The London Plan: Spatial Development Strategy for Greater London Consolidated with alterations since 2011.

- *'Minimise increased exposure to existing poor air quality and make provision to address local problems of air quality';*
- *'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.'*

LOCAL PLANNING POLICY

London Borough of Merton Core Strategy

2.2.9. In the LBM's Core Strategy 2011-2026[8] there are no air quality specific policies, however Strategic Objective 1 states:

> *'To make Merton a municipal leader in improving the environment, taking the lead in tackling climate change, reducing pollution, developing a low carbon economy, consuming fewer resources and using them more effectively. We will achieve this by:*
>
> *a. Reducing carbon emissions from new development;*
>
> *b. Supporting development of sustainable energy infrastructure to produce energy more efficiently;*
>
> *c. Applying the waste hierarchy and by exploiting the opportunities to utilise energy from waste;*
>
> *d. Promoting the retrofit of greater improved energy performance to existing buildings and greater connections with renewable and decentralised energy;*
>
> *e. Reducing reliance on private motorised transport and promoting sustainable public transport, cycling and walking.'*

2.3. GUIDANCE

2.3.1. A summary of the publications referred to in the undertaking of this assessment is provided below.

LONDON LOCAL AIR QUALITY MANAGEMENT TECHNICAL GUIDANCE

2.3.2. The Mayor of London has published guidance for use by the London Boroughs in their review and assessment work[9]. This guidance, referred to in this document as LLAQM.TG(16), has been used where appropriate in the assessment presented herein.

[8] Merton Council, Local Development Framework, Core Planning Strategy, Adopted in July 2011.

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

LOCAL AIR QUALITY MANAGEMENT REVIEW AND ASSESSMENT TECHNICAL GUIDANCE

2.3.3. The Department for Environment, Food and Rural Affairs (Defra) has published technical guidance for use by local authorities outside of their London Boroughs in their review and assessment work[10]. This guidance, referred to in this document as LAQM.TG16, has been used with respect to the methodology used in the assessment of operational phase effects because LLAQM.TG(16) does not include suitable guidance on the approach that should be taken.

LAND-USE PLANNING & DEVELOPMENT CONTROL: PLANNING FOR AIR QUALITY

2.3.4. Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) have published guidance[11] 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 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

2.3.5. This document[12] 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

2.3.6. Paragraph 181 of this guidance[13] says that *'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*

[10] DEFRA (2018) Part IV The Environment Act 1995 and Environment (Northern Ireland) Order 2002 Part III, Local Air Quality Management Technical Guidance LAQM.TG16

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

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

[13] Department of Communities and Local Government (DCLG) (July 2018). National Planning Practice Guidance

any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan.'

LONDON COUNCILS GUIDANCE FOR AIR QUALITY ASSESSMENTS

2.3.7. The London Councils have published guidance[14] 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 as a result of the proposed development.

MAYOR OF LONDON'S SUPPLEMENTARY PLANNING GUIDANCE FOR THE CONTROL OF DUST AND EMISSIONS DURING CONSTRUCTION AND DEMOLITION

2.3.8. This Supplementary Planning Guidance[15] (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) through the use of a Low Emission Zone, which was introduced in September 2015.

2.3.9. 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 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

2.3.10. Section 4.3 of this 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.

2.3.11. The SPG also contains guidance on assessing the air quality neutrality of a Proposed Development in order 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.

2.3.12. Developments that do not exceed these benchmarks (considered separately) will be considered to be '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

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

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

site. This can be achieved by providing NO_x and PM abatement measures in the vicinity of the development, 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

2.3.13. The Air Quality Neutral Planning Support guidance[16] provides a methodology for assessing the air quality neutrality of proposed developments in London.

ENVIRONMENT AGENCY: RISK ASSESSMENTS FOR SPECIFIC ACTIVITIES: ENVIRONMENTAL PERMITS

2.3.14. The Air Emissions section[17] of this Environment Agency Guidance has been referred to in the assessment of emissions to air from the proposed energy centre.

DESIGN MANUAL FOR ROADS AND BRIDGES

2.3.15. The Design Manual for Roads and Bridges (DMRB)[18] was produced by the Highways Agency (now Highways England) to provide guidance on the assessment of air quality impacts associated with road infrastructure projects.

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

[17] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit (March 2016)

[18] Highways Agency (2007) *Design Manual for Roads and Bridges Volume 11 Section 3 HA 207/07*

3. SCOPE & METHODOLOGY

3.1. SCOPE

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

- Consultation with the Environmental Health Officer (EHO) at the LBoM to agree the scope of the assessment and the methodology to be applied;
- Review of the LBoM's latest review and assessment report[19] and air quality data for the area surrounding the Application Site, including data from Defra[20], the Environment Agency (EA)[21] and the London Air website[22];
- Desk study to confirm the locations of nearby existing receptors that may be sensitive to changes in local air quality, and a review of the masterplan for the Proposed Development to establish the location of new sensitive receptors;
- Review of the traffic data provided for the assessment by Mott MacDonald; and
- Review of the emission data for the proposed energy centre as supplied by the Project's M&E consultants (Hodkinson Consultancy).

3.1.2. The scope of the assessment includes consideration of the potential impacts on local air quality resulting from:

- Dust and particulate matter generated by on-site activities during the construction phase;
- Increases in pollutant concentrations as a result of exhaust emissions arising from construction traffic and plant;
- Increases in pollutant concentrations as a result of exhaust emissions arising from traffic generated by the Proposed Development once operational; and
- Increases in pollutant concentrations as a result of emissions to air from the energy centre included within the Proposed Development.

3.1.3. In addition, the potential exposure of future residents of the Proposed Development to poor air quality will also be considered.

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

[19] London Borough of Merton (2018) Annual Status Report for 2017

[20] DEFRA Local Air Quality Management (LAQM) Support Pages. Available at: http://laqm.defra.gov.uk/ Accessed on 22nd November 2018

[21] https://data.gov.uk/dataset/cfd94301-a2f2-48a2-9915-e477ca6d8b7e/pollution-inventory 22nd November 2018

[22] London Air Website. Available at: http://www.londonair.org.uk/LondonAir/Default.aspx. 22nd November 2018

particles fall out of the atmosphere quickly after initial release and therefore tend to be deposited in close proximity 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 for a longer period of time 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 takes into account the nature and scale of the activities undertaken for each source and the sensitivity of the area to an increase in dust and $_{PM10}$ 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 to impacts on local air quality due to on-site construction activities, exhaust emissions from construction vehicles and plant may have an impact on local air quality adjacent to the routes used by these vehicles to access the Application Site and in the vicinity of the Application Site itself. As information on the number of vehicles and plant associated with the construction phase was not available at the time of writing, a qualitative assessment of their impact on local air quality has been undertaken using 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 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

3.2.6. Of the pollutants included in the AQS, concentrations of NO_2 and particulate matter (PM_{10} and $PM_{2.5}$) have been considered in this assessment as road traffic is a major source of these pollutants and their concentrations tend to be close to, or in exceedance of, the objectives in urban locations.

3.2.7. For the prediction of impacts due to emissions arising from road traffic during the operation of the Proposed Development, the dispersion model ADMS Roads (version 4.1.1.0) has been used. This model uses detailed information regarding traffic flows on the local road network, surface roughness, and local meteorological conditions to predict pollutant concentrations at specific receptor locations, as determined by the user.

3.2.8. Meteorological data, such as wind speed and direction, is used by the model to determine pollutant transportation and levels of dilution by the wind. Meteorological data used in the model was obtained from the Met Office observing station at London Heathrow Airport for 2017. This station is considered to provide representative data for the assessment.

3.2.9. A summary of the traffic data and pollutant emission factors used in the assessment can be found in Appendix D. It includes details of the Annual Average Daily Traffic (AADT) flows, vehicle speeds (km/h) and the percentage of Heavy Duty Vehicles (HDVs) for the local road network in all assessment years considered. Traffic speeds were reduced at junctions in line with guidance provided in LAQM.TG16, and using professional judgement.

3.2.10. For the assessment, three scenarios were modelled, as follows:

- 2017 – Model Verification and Baseline;
- 2021 – Without Development; and
- 2021 – With Development.

3.2.11. 2017 is the most recent year for which monitoring data and meteorological data are available to enable verification of the model results, and so this year has also been used as the baseline year for this assessment. 2021 is the anticipated opening year of the Proposed Development.

3.2.12. The traffic flows for the 'without development' scenarios include anticipated growth but do not include any contribution to road traffic from the Proposed Development itself. The traffic flows for the 'with development' scenarios include contributions to road traffic from the Proposed Development itself and anticipated growth on the local road network.

Vehicle Emission Factors

3.2.13. Vehicle emission factors for use in the assessment have been obtained using the Emission Factor Toolkit (EFT) version 8.0.1 (published in December 2017) available on the Defra website. The EFT allows for the calculation of emission factors arising from road traffic for all years between 2015 and 2030. For the predictions of future year emissions, the toolkit takes into account factors such as anticipated advances in vehicle technology and changes in vehicle fleet composition, such that vehicle emissions are assumed to reduce over time. Emission factors for the relevant assessment years were therefore utilised in the assessment. This approach was agreed with the EHO at the LBoM.

Selection of Background Concentrations

3.2.14. Background pollutant concentrations used in the assessment have been taken from the national maps provided on the Defra website[23], where background concentrations of those pollutants included within the AQS have been mapped at a grid resolution of 1x1km for the whole of the UK. Estimated concentrations are available for all years between 2015 and 2030. The maps assume that background concentrations will improve (i.e. reduce) over time, in line with the predicted reduction in vehicle emissions and emissions from other sources.

3.2.15. It should be noted that for NO_2, PM_{10} and $PM_{2.5}$, the background maps present both the 'total' estimated background concentrations and the individual contributions from a range of emission sources (for example, motorways, aircraft, domestic heating etc.). When detailed modelling of an individual sector is required as part of an air quality assessment, the respective contribution can be subtracted from the overall background estimate to avoid the potential for 'double-counting'. For this assessment, as not all of the road links within the respective grid squares have been modelled, the total background concentrations have been used. There is therefore likely to be an element of double-counting within the modelling results.

3.2.16. Further details on the background concentrations are provided in Section Four of this report.

MODEL VERIFICATION AND PROCESSING OF RESULTS

3.2.17. The ADMS Roads dispersion model has been widely validated for this type of assessment and is considered to be fit for purpose. Model validation undertaken by the software developer will not have included validation in the vicinity of the Development.

3.2.18. To determine the performance of the model at a local level, a comparison of modelled results with the results of monitoring carried out within the study area was undertaken. This process of verification aims to minimise modelling uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results, and was carried out following the methodology specified in Chapter 7, Section 4, of LAQM.TG16.

3.2.19. Details of the verification factor calculations are presented in Appendix E. A factor of 2.2 was obtained during the verification process, which indicated that the model was under-predicting. This factor was applied to the model road-NO_x outputs prior to conversion to annual mean NO_2 concentrations utilising the NO_x to NO_2 calculator (version 6.1, released November 2017) provided by Defra[24].

3.2.20. As local roadside monitoring data are not available for PM_{10} or $PM_{2.5}$, the modelled road-PM_{10} and road-$PM_{2.5}$ components have been adjusted by the verification factor obtained for NO_x before adding to the appropriate background concentration. The number of days with PM_{10} concentrations greater than 50µg/m^3 was then estimated using the relationship with the annual mean concentration described in LLAQM.TG(16).

[23] https://uk-air.defra.gov.uk/data/laqm-background-home

[24] DEFRA NOx to NO2 Calculator. Available at: http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxsector.

3.2.21. LAQM.TG16 advises that exceedances of the 1 hour mean NO_2 objective are unlikely to occur where annual mean concentrations are below 60µg/m^3, and it provides guidance on the approach that should be taken if either measured or predicted annual mean NO_2 concentrations are 60µg/m^3 or above.

3.2.22. Once processed, the predicted concentrations were compared against the relevant AQS objective levels for NO_2, PM_{10} and $PM_{2.5}$ set out in Appendix B.

Assessment of Impacts due to Emissions Generated by the Proposed Energy Centre

3.2.23. It is anticipated that the energy centre will include one 233kWth Veolia V-0150AU-070-NG-50-3WY gas CHP unit and four 254/762V Wessex ModuMax mk3 boilers. These will be located in a centralised plant room within Block A, with all emissions released via flues discharging above the roof of the building.

3.2.24. For the prediction of impacts due to emissions arising from the operation of the proposed CHP unit and boilers, the air pollutant dispersion model ADMS 5.2 (version 5.2.1.0) has been used. This model uses detailed information regarding the pollutant releases, local building effects and local meteorological conditions to predict pollution concentrations at specific locations selected by the user.

3.2.25. A summary of the flue parameters and emissions to air from the energy centre plant utilised within the model is provided in **Table 1**. It should be noted that as emissions from the boilers will be combined into a common flue, the values represent the total of all four units.

Table 1 - Emission Parameters for the Proposed Energy Centre Plant

Parameter	CHP	Boilers
Stack Location(s)	522655.2, 168492.0	522655.6, 168493.5
Stack Height (m)	44.5	44.5
Stack diameter (m)	0.20	0.75
Release temperature (ºC)	100	82
Release velocity (m/s)	5.12	3.47
NO_x emission rate (g/s)	0.0059	0.1184

3.2.26. The same meteorological data used in the assessment of traffic impacts, was used in the assessment of emissions from the proposed energy centre.

3.2.27. The emission rates shown in **Table 1** were adjusted to represent the anticipated energy demand of the Proposed Development, as provided by the Energy Consultants for the project. This ensured a reasonable representation of predicted emissions over the assessment period. For the modelling of 1-hour mean NO_2 concentrations, the emission rates were not adjusted to ensure all meteorological conditions were considered appropriately and the results therefore represent a robust analysis.

3.2.28. Both nearby buildings and complex topography can have a significant effect on the dispersion characteristics of the plumes from the stacks being assessed. ADMS 5.2 has algorithms which take

account of these impacts. Buildings can cause the plume to come to ground much closer to the stack than otherwise expected, causing higher pollutant concentrations. Plumes can also impact on hillsides under certain weather conditions, or within a basin or hollow which may result in pollutants being trapped for low level discharges.

3.2.29. All buildings associated with the Application Site were included within the model. Review of the local area indicated that there were no other existing structures of sufficient height to affect dispersion from the proposed flues.

3.2.30. The topography of the surrounding area is essentially flat and at the same elevation across the entire area considered in the modelling. Therefore, terrain data have not been included in the model. The surface roughness used in the modelling was 1.0m.

3.2.31. The energy centre contribution to annual mean NO_x concentrations was predicted, along with the 99.8th percentile of hourly mean concentrations. The predicted NO_x contributions were then converted to NO_2 assuming 70% for long-term emissions and 35% for short-term emissions.

Significant Energy Centre Contributions

3.2.32. The EA's Air Emissions risk assessment guidance sets out the levels at which process contributions (contributions to concentrations from energy centre emissions) can be screened out as being insignificant; Process Contributions (PC) can be considered insignificant if:

- The long term PC is <1% of the long term environmental standard (for NO_2 <0.4µg/m^3);
- The short term PC is <10% of the short term environmental standard (for NO_2 <20µg/m^3).

3.2.33. Where the PC exceeds these thresholds and are potentially significant, it is necessary to compare the Predicted Environmental Concentration (PEC) against the relevant statutory and guideline air quality standards, by combining the PC with appropriate background data.

Combining the ADMS Roads and ADMS 5.2 Results

3.2.34. The total NO_2 concentrations (i.e. PEC) at each receptor were calculated as follows:

Long term standards: PEC = PC + Background Concentration

Short term standards: $PEC_{short\ term} = PC_{short\ term} + (2 \times Background_{long\ term})$.

3.2.35. Where the 'Background Concentration' is the annual mean NO_2 concentration determined from the ADMS Roads modelling presented above.

3.2.36. The ADMS 5.2 modelled 99.8th percentile of hourly mean NO_2 concentrations has been added to twice the background concentration plus road traffic contribution and then compared to the short-term objective level of 200µg/m^3 at the relevant sensitive receptor locations.

3.2.37. The concentrations have been compared against the relevant AQS objective levels as set out in Appendix B.

Selection of Sensitive Receptors

3.2.38. Sensitive locations are places where the public or sensitive ecological habitats may be exposed to pollutants resulting from activities associated with the Proposed Development. These will include locations sensitive to an increase in dust deposition and PM_{10} exposure as a result of on-site construction activities, and locations sensitive to exposure to gaseous pollutants emitted from the

proposed energy centre and from the exhausts of construction and operational traffic associated with the Proposed Development

CONSTRUCTION PHASE

3.2.39. The IAQM assessment is undertaken 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). It is within these distances that the impacts of dust soiling and increased particulate matter in the ambient air will have the greatest impact on local air quality at sensitive receptors.

OPERATIONAL PHASE

3.2.40. In terms of locations that are sensitive to pollutants emitted from engine exhausts and energy centre flues, these will include places where members of the public are likely to be regularly present over the period of time prescribed in the AQS. For instance, on a footpath where exposure will be transient (for the duration of passage along that path) comparison with a short-term standard (i.e. 15 minute mean or 1 hour mean) may be relevant. At a school or adjacent to a private dwelling, where exposure may be for longer periods, comparison with a long-term standard (such as 24 hour mean or annual mean) may be more appropriate. Box 1.1 of LLAQM.TG(16) provides examples of the locations where the air quality objectives should/should not apply.

3.2.41. To complete the assessment of operational phase impacts, a number of 'receptors' representative of locations of relevant public exposure were identified at which pollution concentrations were predicted. Receptors have been located adjacent to the roads that are likely to experience the greatest change in traffic flows or composition, and therefore NO_2 and particulate matter concentrations, as a result of the Proposed Development. Locations that are the most likely to experience a change in NO_2 concentrations as a result of emissions from the energy centre have also been considered in this assessment.

3.2.42. To complete the exposure assessment, pollution concentrations were also predicted at a number of locations within the Application Site. The receptors have been positioned at ground and top floor heights at a number of positions representing worst-case exposure on each block.

3.2.43. In terms of ecological receptors, paragraphs 3.12 and 3.13 in guidance published by Highways England[25] (referred to as the DMRB guidance in this report) define the type of Designated Sites that require consideration and when, which depends on whether or not they lie within 200m of an 'affected road' as determined by specific changes to the traffic flow and composition on a road due to a proposal.

[25] Highways Agency (2007) Design Manual for Roads and Bridges Volume 11 Section 3 HA 207/07

3.2.44. A review of the MAGIC website[26] did not indicate any Designated Sites within the vicinity of roads considered within the assessment. As such, impacts at ecological receptors were not considered further in the context of the project.

3.2.45. The locations of the assessment receptors are shown on **Figure 1** and listed in **Table 2** below. These include both existing sensitive locations and new receptor locations on the Application Site.

Table 2 - Receptor Locations Used in the Assessment

Receptor	Description / Address	Grid Reference		Height above Ground Level (m)
		X	Y	
1	Residential - Claremont Avenue	522676.0	168304.5	1.5
2	Residential - Burlington Road	522648.1	168287.2	1.5
3	Residential - Burlington Road	522611.7	168264.1	1.5
4	Residential - Burlington Road	522495.5	168214.7	1.5
5	Residential - Burlington Road	522466.8	168208.2	1.5
6	Residential - Burlington Road	522422.8	168198.8	1.5
7	Residential - Malden Way	522232.2	168054.5	1.5
8	Residential - Malden Way	522175.9	167993.7	1.5
9	Residential - Malden Way	522090.8	167908.6	1.5
10	Residential - Aboyne Drive	522289.1	169057.2	1.5
11	Residential - Bodnant Gardens	522436.0	168896.2	1.5
12	Residential - Seaforth Avenue	522783.6	168476.5	1.5
13	Residential - Seaforth Avenue	522779.2	168423.7	1.5

[26] Multi-Agency Geographic Information for the Countryside (MAGIC) website available at: https://magic.defra.gov.uk/

14	Residential - West Barnes Lane	522758.3	168447.9	1.5
15	Residential - West Barnes Lane	522786.2	168668.1	1.5
16	Residential - West Barnes Lane	522767.5	168712.0	1.5
17	Residential - West Barnes Lane	522780.9	168762.8	1.5
18	Residential - Bushey Road	523027.6	168958.8	1.5
19	Residential - Bushey Road	523074.0	168992.1	1.5
20	Residential - Bushey Road	523128.1	169013.5	1.5
21	Residential - Bushey Road	523226.7	169024.8	1.5
22	Residential - Bushey Road	523180.4	169076.5	1.5
23	Residential - Bushey Court	522923.6	168940.4	1.5
24	Residential - Bushey Court	523076.4	169044.4	1.5
25	West Wimbledon Primary School	522793.2	168880.5	1.5
26	Raynes Park High School	522545.3	168648.4	1.5
27	Raynes Park High School	522743.2	168632.0	1.5
28	Raynes Park High School	522720.2	168521.5	1.5
29	Raynes Park High School	522603.2	168548.5	1.5
30	Sacred Heart Catholic Primary School	522517.7	168298.6	1.5
31	Sacred Heart Catholic Primary School	522487.5	168256.6	1.5
32	Proposed Development 1	522724.6	168467.5	1.5
33	Proposed Development 2	522715.0	168441.7	1.5
34	Proposed Development 3	522710.7	168424.4	1.5

35	Proposed Development 4	522705.2	168415.5	1.5
36	Proposed Development 5	522687.9	168392.8	1.5
37	Proposed Development 6	522675.0	168373.7	1.5
38	Proposed Development 7	522658.8	168366.7	1.5
39	Proposed Development 8	522704.3	168474.1	1.5
40	Proposed Development 9	522694.5	168447.0	1.5
41	Proposed Development 10	522663.7	168446.0	1.5
42	Proposed Development 11	522672.5	168403.3	1.5
43	Proposed Development 12	522639.7	168415.5	1.5
44	Proposed Development 13	522671.2	168480.0	1.5
45	Proposed Development 14	522666.7	168500.5	1.5
46	Proposed Development 1	522724.6	168467.5	25.6
47	Proposed Development 2	522715.0	168441.7	22.6
48	Proposed Development 3	522710.7	168424.4	22.6
49	Proposed Development 4	522705.2	168415.5	22.6
50	Proposed Development 5	522687.9	168392.8	31.8
51	Proposed Development 6	522675.0	168373.7	31.8
52	Proposed Development 7	522658.8	168366.7	31.8
53	Proposed Development 8	522704.3	168474.1	25.6
54	Proposed Development 9	522694.5	168447.0	22.6
55	Proposed Development 10	522663.7	168446.0	22.6

56	Proposed Development 11	522672.5	168403.3	31.8
57	Proposed Development 12	522639.7	168415.5	45.6
58	Proposed Development 13	522671.2	168480.0	34.9
59	Proposed Development 14	522666.7	168500.5	41.0

3.3. SIGNIFICANCE CRITERIA

CONSTRUCTION PHASE

3.3.1. The IAQM assessment methodology recommends that significance criteria are 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 EPUK/IAQM guidance, which are described below.

OPERATIONAL PHASE

3.3.3. The approach provided in the EPUK/IAQM guidance has been used within this assessment to assist in describing the air quality effects of additional emissions from traffic generated by the Proposed Development once operational.

3.3.4. This guidance recommends that the degree of an impact is described by expressing the magnitude of incremental change in pollution concentration as a proportion of the relevant assessment level and examining this change in the context of the new total concentration and its relationship with the assessment criterion, as summarised in **Table 3**.

Table 3 - Impact Descriptors for Individual Receptors

Long term average concentration at receptors in assessment year	**% Change in Concentration Relative to Air Quality Assessment Level (AQAL)**			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial

110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

Notes

AQAL = Air Quality Assessment Level, which for this assessment related to the UK Air Quality Strategy objectives.

Where the %change in concentrations is <0.5%, the change is described as 'Negligible' regardless of the concentration.

When defining the concentration as a percentage of the AQAL, 'without scheme' concentration should be used where there is a decrease in pollutant concentration and the 'with scheme;' concentration where there is an increase.

Where concentrations increase, the impact is described as adverse, and where it decreases as beneficial.

3.3.5. The EPUK/IAQM guidance notes that the criteria in **Table 3** should be used to describe impacts at individual receptors and should be considered as a starting point to make a judgement on significance of effects, as other influences may need to be accounted for. The EPUK/IAQM guidance states that the assessment of overall significance should be based on professional judgement, taking into account several factors, including:

- The existing and future air quality in the absence of the Proposed Development;
- The extent of current and future population exposure to the impacts; and
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

3.3.6. The EPUK/IAQM guidance states that for most road transport related emissions, long-term average concentrations are the most useful for evaluating the impacts. The guidance does not include criteria for determining the significance of the effect on hourly mean NO_2 concentrations or daily mean PM_{10} concentrations. The significance of effects of hourly mean NO_2 and daily mean PM_{10} concentrations arising from the operational phase have therefore been determined qualitatively using professional judgement and the principles described above.

3.3.7. The EPUK/IAQM guidance 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.'

3.3.8. In addition to these criteria, the flow chart method for determining the significance of the predicted air quality impacts of a proposed development and published in the London Councils guidance for air quality assessments has been used. A summary of the flow chart for determining significance is shown below in **Table 4**.

Table 4 - Summary of the London Councils flow chart method for assessing the significance of air quality impacts

Effect of Development	Outcome
Will development interfere with or prevent implementation of measures in the AQAP	Air Quality is an overriding consideration.
Is development likely to cause a worsening of air quality or introduce new exposure into the AQMA?	Air Quality is a highly significant consideration.
Would the development contribute to air quality exceedances or lead to the designation of a new AQMA?	Air Quality is a highly significant consideration.
Is the development likely to increase emissions of or increase/introduce new exposure to $_{PM10}$	Air Quality is a significant consideration.
None of the above.	Air Quality is not a significant consideration but mitigation measures may still need to be considered.

3.3.9. 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 5**.

Table 5 - 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.

MAYOR OF LONDON'S AIR QUALITY NEUTRAL POLICY

3.3.10. The air quality neutral assessment has been undertaken using the Gross Floor Area (GFA) of the Development, along with anticipated vehicle trip rates and energy centre emissions once operational, to calculate the NO_x and PM_{10} emissions from the building and transport elements of the Proposed Development. The relevant figures for the Proposed Development calculated from information provided by the Project Team are presented in **Table 6**.

Table 6 - Parameters used in the Air Quality Neutral Assessment

Land Use Class	Parameter
Residential (C3)	446 units / 40,361m^2
Commercial (A1)	499m^2

3.3.11. The results were compared to the benchmarks set out in the SPG, which are shown in **Table 7** for the Proposed Development. It should be noted that as natural gas will be the only fuel utilised on site, the Building Emission Benchmarks (BEBs) for PM_{10} were not calculated.

Table 7 - Emission Benchmarks (kg/yr)

Land Use Class	Benchmark Category	NO_x Benchmark	PM_{10} Benchmark
Residential (C3)	BEB	18,001	-
	Transport Emission Benchmark (TEB)	693	119
Commercial (A1)	BEB	11	-
	TEB	124	21

3.3.12. The total NO_x BEB was calculated as 18,012kg/yr.

3.3.13. The total NO_x TEB was calculated as 817kg/yr and the total PM_{10} TEB was calculated as 140kg/yr

3.4. LIMITATIONS & ASSUMPTIONS

3.4.1. As suitable information for the construction phase of the Proposed Development was only partly available, professional judgement has been used in the completion of this part of the assessment.

3.4.2. There are uncertainties associated with both measured and predicted concentrations. The model (ADMS Roads) used in this assessment relies on input data (including predicted traffic flows), which also have uncertainties associated with them. The model itself simplifies complex physical systems into a range of algorithms. In addition, local micro-climatic conditions may affect the concentrations of pollutants that the ADMS Roads model will not take into account.

3.4.3. In order to reduce the uncertainty associated with predicted concentrations, model verification has been carried out following guidance set out in LAQM.TG16. As the model has been verified against local monitoring data and adjusted accordingly, there can be reasonable confidence in the predicted concentrations.

4. BASELINE CONDITIONS

4.1. LBOM'S REVIEW & ASSESSMENT OF AIR QUALITY

4.1.1. The LBoM has designated one AQMA within their administrative area as a consequence of their Review and Assessment work. The Application Site lies within this AQMA designated due to exceedances of the AQS objectives for NO_2 and PM_{10}.

4.1.2. The LBoM has identified road traffic as the primary pollutant source within the AQMA.

4.2. LOCAL EMISSION SOURCES

4.2.1. There are a number of roads near to the Application Site that are likely to influence the local air quality, with the most significant being Burlington Road (bordering the Site to the east), the A3 to the west of the Site and the A298 to the north of the Site.

4.2.2. The EA's pollution register indicates that there are no large scale/ Part A1[27] authorised industrial processes located within the vicinity of the Site that are likely to have a significant influence on air quality at the site. Furthermore, a review of information relating to the public register available on the LBoM's website confirms that there are no smaller scale Part A2[28] or B[29] processes located within the immediate vicinity of the Site.

4.3. BACKGROUND AIR QUALITY DATA

4.3.1. **Table 8** summarises the background pollutant concentrations of NO_2, PM_{10} and $PM_{2.5}$ for 2017 and 2021 that were utilised in the assessment. All of the annual mean background concentrations are well below the relevant objectives.

Table 8 - Background Concentrations (µg/m^3)

Year	Grid Square (centre on O.S. Grid Reference)	NO_2 (µg/m^3)	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)
2017	522500, 168500	23.43	16.15	10.38
2021		19.36	15.70	9.94

[27] Large scale industrial processes (such as power stations, chemical plants) that have the greatest potential to release pollutants into the environment (to air, land and water). Part A1 processes are regulated by the Environment Agency.

[28] Medium sized industries (such as brick manufacturers) that are regulated by the Local Authority as they have the potential to release pollutant emissions to air, land and water.

[29] Part B processes include those that are unlikely to release significant emissions to land and water and are therefore only regulated for emissions to air (e.g. paint spraying, dry cleaners). They are regulated by the local authority.

4.4. LOCAL AUTHORITY AIR QUALITY MONITORING DATA

4.4.1. Concentrations of NO_2 measured in the vicinity of the Application Site by the LBoM are provided in **Table 9**.

Table 9 - Local Annual Mean NO_2 Concentrations (µg/m^3)

Site ID	Distance Proposed Development	2013	2014	2015	2016	2017
5 (Burlington Road)	110m to the west	42	33	28	32[a]	42
*1 (*A298)	700m to the northeast	n/a	n/a	n/a	n/a	52
6 (Grand Drive)	720m to the southeast	42	32	n/a	34	45
*4 (*B279)	850m to northeast	38	43	32	39[b]	37

[a] Means annualised as capture was less than 75%; [b] Mean adjusted to the point of relevant exposure

4.4.2. As shown in **Table 9**, the annual mean NO_2 AQS objective has been exceeded once or twice over the last 5 years at all local monitoring sites. This would be expected based on the AQMA designation.

4.4.3. Given that annual mean NO_2 concentrations are all below 60µg/m^3, based on guidance published by Defra it can therefore be assumed that hourly mean NO_2 concentrations are also compliant in the area.

4.4.4. Monitoring of PM_{10} and $PM_{2.5}$ is not undertaken in the vicinity of the site.

4.5. SUMMARY

4.5.1. The Application Site is located in an area where the main influence on air quality is emissions from road traffic.

4.5.2. The LBoM has declared an AQMA throughout the Borough due to exceedences of the AQS objectives for NO_2 and PM_{10}. Exhaust emissions associated with traffic travelling to and from the Proposed Development, as well as releases from the energy centre, may cause adverse impacts within the AQMA. This has been considered within the assessment.

4.5.3. Recent results from monitoring sites located within the vicinity of the Application Site indicate that NO_2 concentrations have exceeded the respective AQS objective in some years. There is therefore the potential for exceedences at the Application Site itself. This has been considered throughout the assessment.

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);
- Construction of buildings and areas of hardstanding;
- 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', which is taken to be:

- Monday to Friday: 09:00hrs to 18:00hrs; and,
- Saturday, Sundays and Bank Holidays: Closed.

5.1.3. 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

5.1.4. The IAQM assessment methodology has been used to determine the potential dust emission magnitude for the following four different dust and PM_{10} sources: demolition; earthworks; construction; and, trackout. The findings of the assessment are presented below.

Demolition

5.1.5. Total volume of buildings to be demolished on site is between 20,000m^3 and 50,000m^3, with potentially dusty construction material, and with demolition activities occurring at heights of between 10 and 20m above ground level. Therefore, the potential dust emission magnitude is considered to be medium for demolition activities.

Earthworks

5.1.6. The total area of the Application Site is more than 10,000m^2. However, the total material of material that will be moved is estimated to be between 20,000 and 100,000 tonnes. It is also estimated that there will be less than 5 heavy earth moving vehicles active at any one time, and that the formation of bunds with a height of less than 4m is likely to occur. Therefore, adopting a conservative approach, the potential dust emission magnitude is considered to be large for earthwork activities

Construction

5.1.7. It is anticipated that the total volume of buildings to be constructed on the Application Site will be more than 100,000m^3 with potentially dusty construction materials being used. In addition, on site

concrete batching will occur. Therefore, the potential dust emission magnitude is considered to be large for construction activities.

Trackout

5.1.8. Information on the number of HDVs associated with this phase of the Proposed Development is not available and therefore professional judgement has been used. It has been assumed that given the size of the development area there are likely to be between 10 and 50 HDV outward movements in any one day, travelling over moderately dusty surface material, and the unpaved road length in the Application Site is likely to be less than 50m. Therefore, adopting a conservative approach, the potential dust emission magnitude of is medium for trackout.

5.1.9. **Table 10** provides a summary of the potential dust emission magnitude determined for each construction activity considered.

Table 10 - Potential Dust Emission Magnitude

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

ASSESSMENT OF SENSITIVITY OF THE STUDY AREA

5.1.10. A windrose generated using the meteorological data used for the dispersion modelling of operational phase impacts is provided in Appendix F. This shows that the prevailing wind direction is from the west-south-west. Therefore, receptors located to east-north-east of the Application Site are more likely to be affected by dust and particulate matter emitted and re-suspended during the construction phase.

5.1.11. Under low wind speed conditions, it is likely that the majority of dust would be deposited in the area immediately surrounding the source. The Mayor of London's guidance advises that construction dust and particulate effects will be most relevant within a 350m radius of a construction site. The key receptors within 350m include residential properties to the east, commercial units to the south and west, a car park to the west, Raynes Park High School to the north and the Sacred Heart Primary School to the south-west. There are also residential properties located along Burlington Road that may be sensitive to potential trackout impacts.

5.1.12. There are no ecological designated sites located within 50m of the Application Site boundary or the road network within 500m of the Application Site. Therefore, there is no requirement to consider ecological receptors any further.

5.1.13. 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 11**.

Table 11 - Sensitivity of the Study Area

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

Risk of Impacts

5.1.14. 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 12** 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 12 - Summary Dust Risk Table to Define Site Specific Mitigation

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

CONSTRUCTION VEHICLES & PLANT

5.1.15. 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 Burlington Road. Due to the size of the Site, it is considered likely that the construction traffic will be low in comparison to the existing traffic flows on this road.

5.1.16. Final details of the exact plant and equipment likely to be used on Site 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 within the Site are likely to be variable over the construction period.

5.1.17. 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, and the likely numbers of construction vehicles and plant that will be used, the impacts are therefore considered to be of negligible to minor negative significance, prior to mitigation.

5.2. OPERATION PHASE

5.2.1. Full results of the dispersion modelling are presented in Appendix G and a summary is provided overleaf.

ANNUAL MEAN NO_2 CONCENTRATIONS

5.2.2. The AQS objective for annual mean NO_2 concentrations is 40µg/m^3. The results of the assessment show that in the 2017 baseline scenario, concentrations exceed the annual mean objective at four receptors and are below the objective at the remaining 27 receptors. The highest predicted concentration is 52.49µg/m^3 at Receptor 7 - Malden Way. These results support the findings of nearby monitoring undertaken by the LBoM, which show that concentrations are currently above the AQS objective within the AQMA.

5.2.3. By 2021, the opening year of the Proposed Development, concentrations exceed the annual mean objective at two receptors and are below the objective at 29 receptors, both with and without the development. The highest concentrations are again predicted at Receptor 7 - Malden Way, where they are 43.37µg/m^3 'without development' and 43.49µg/m^3 'with development'. The greatest increase in concentrations due to the Proposed Development is 0.30µg/m^3 at Receptor 3 - Burlington Road.

5.2.4. The predicted changes in annual mean NO_2 concentrations at all receptors are <1% of the AQAL as a result of the Proposed Developments' energy centre and road traffic exhaust emissions combined. The impacts are therefore classed as not significant in accordance with the EA criteria.

5.2.5. As a result of road vehicle exhaust and energy centre emissions combined, the predicted changes in annual mean NO_2 concentrations at 26 receptors are <0.5% of the AQAL and the impacts are therefore classed as negligible. For all remaining receptors, the changes are equivalent to 0.5 - 1% of the AQAL and total concentrations are <94% of the AQAL; therefore, in line with the EPUK/IAQM guidance, the impacts at these locations are also described as negligible.

HOURLY MEAN NO_2 CONCENTRATIONS

5.2.6. The annual mean NO_2 concentrations predicted by the model were below the AQS objective of 200µg/m^3 at all receptor locations.

5.2.7. The predicted changes in 1-hour mean NO_2 concentrations at all receptors are <20% of the AQAL as a result of energy centre emissions. The impacts are therefore classed as not significant in accordance with the EA criteria.

5.2.8. The impact of the Proposed Development on hourly mean NO_2 concentrations at existing sensitive receptors is considered to be negligible.

ANNUAL MEAN PM_{10} CONCENTRATIONS

5.2.9. The AQS objective for annual mean PM_{10} concentrations is 40µg/m^3. The results of the assessment show that in the 2017 baseline scenario, concentrations at all of the receptors considered are predicted to easily meet the objective. The highest predicted concentration is 22.77µg/m^3 at Receptor 7 - Malden Way. These results agree with the conclusions of the Review and Assessment work undertaken by the LBoM, which concluded that no AQMAs needed to be designated for this pollutant.

5.2.10. Predicted concentrations of PM_{10} are well below the annual mean objective at all receptors in each of the modelled scenarios. In 2021, the highest concentrations are predicted at Receptor 7 - Malden Way, where a concentration of 22.06µg/m^3 is predicted in the 2021 'without development' scenario and a concentration of 22.10µg/m^3 in the 'with development' scenario. The predicted changes in annual mean PM_{10} concentrations are all <0.5% of the relevant AQS objective; based on the

EPUK/IAQM guidance, the impact of the increased emissions associated with the Proposed Development on annual mean PM_{10} concentrations is considered to be negligible.

DAILY MEAN PM_{10} CONCENTRATIONS

5.2.11. The AQS objective for daily mean PM_{10} concentrations is 50µg/m^3 to be exceeded no more than 35 times a year. The results of the dispersion modelling indicate that the objective is not exceeded on any occasion at any receptor location.

5.2.12. The increased emissions associated with the Proposed Development result in no changes to the number of days experiencing concentrations greater than 50µg/m^3; the impact on daily mean PM_{10} concentrations is thus also considered to be negligible.

ANNUAL MEAN $PM_{2.5}$ CONCENTRATIONS

5.2.13. Predicted annual mean concentrations of $PM_{2.5}$ are all well below AQS objective of 25µg/m^3 in all modelled scenarios.

5.2.14. In 2021, the highest predicted concentration in the 'with development' scenario is 13.60µg/m^3, which is predicted at Receptor 7 - Malden Way. All changes in $PM_{2.5}$ as a result of increased traffic associated with the Proposed Development are <0.5% of the relevant AQS objective and therefore, based on the EPUK/IAQM guidance, the Proposed Development is considered to have a negligible impact on annual mean $PM_{2.5}$ concentrations.

EXPOSURE OF FUTURE RESIDENTS

5.2.15. Predicted concentrations of NO_2, PM_{10} and $PM_{2.5}$ are all below the relevant AQS objectives at all proposed receptors located on the Application Site.

5.2.16. The highest predicted annual mean NO_2 concentration is 27.82µg/m^3, whilst the predicted annual mean PM_{10} concentration is 17.52µg/m^3, with 1 day exceeding 50µg/m^3. The highest predicted $PM_{2.5}$ concentration is 10.99µg/m^3.

5.2.17. All predicted concentrations are classified as APEC - A in accordance with the relevant guidance. As such, mitigation to prevent exposure of future residents to poor air quality is not required within the Proposed Development.

AIR QUALITY NEUTRAL ASSESSMENT

5.2.18. Building emissions were found to be compliant with the NO_x BEB of 18,012kg/yr, and transport emissions were found to be deficient in respect of the NO_x TEB of 817kg/yr and the PM_{10} TEB of 140kg/yr. A summary of the findings of this assessment are presented in **Table 13**.

Table 13 - Summary of Air Quality Neutral Assessments

Category	NO_x (kg/annum)	PM_{10} (kg/annum)
Building Emissions	193	-
Transport Emissions	865	149

5.2.19. Taking into account the combined building and transport emissions benchmarks, the Proposed Development is better than ‘air quality neutral’.

6. MITIGATION & RESIDUAL EFFECTS

6.1. CONSTRUCTION PHASE

MITIGATION

6.1.1. Based on the assessment results, mitigation will be required. 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 PM_{10} continuous monitoring and/or visual inspections.

Site Management

- 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

- Daily on-site and off-site inspections should be undertaken, where receptors (including roads) are nearby to monitor dust. The inspection results should be recorded and made available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.
- 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, if required. If possible baseline monitoring should start at least three months before work commences on site.

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 Construction Logistics Plan should be produced to manage the sustainable delivery of goods and materials.

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

- 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

- 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 Application 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

- 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.
- 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 the LBoM 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 (through the use of 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 is considered to be negligible.

6.1.4. The residual effects of emissions to air from construction vehicles and plant on local air quality is considered to be negligible.

6.2. OPERATIONAL PHASE

MITIGATION

6.2.1. The change in pollutant concentrations attributable to traffic and energy centre emissions associated with the operational phase of the Proposed Development (i.e. impacts on local air quality) are negligible (themselves not warranting the need for mitigation).

6.2.2. Predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations were classified as APEC - A at all receptors on the Proposed Development. As such, mitigation in the form of mechanical ventilation or air filtration is not considered necessary.

RESIDUAL EFFECTS

6.2.3. The residual effects of the Proposed Development on air quality are negligible for NO_2, PM_{10} and $PM_{2.5}$ according to the EPUK /IAQM assessment criteria.

6.2.4. At the majority of locations concentrations are predicted to meet the statutory objectives both with and without the Proposed Development. The Proposed Development does not cause any new exceedances.

6.2.5. Future users of the Proposed Development would not be exposed to NO_2, PM_{10} or $PM_{2.5}$ concentrations that exceed the AQS objectives.

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 Risk of dust soiling impacts and a Low Risk of increases in 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 effects of dust and PM_{10} generated by construction activities on air quality are therefore considered to be insignificant. The residual effects of emissions to air from construction vehicles and plant on local air quality will be negligible.

7.1.2. In addition, a quantitative assessment of the potential impacts during the operational phase was undertaken using ADMS Roads and ADMS 5.2 to predict the changes in NO_2, PM_{10} and $PM_{2.5}$ concentrations that would occur due to traffic generated by the Proposed Development and emissions from the proposed energy centre.

7.1.3. The results show that the Proposed Development would cause negligible residual effects on NO_2, PM_{10} and $PM_{2.5}$ concentrations at all of the sensitive receptor locations.

7.1.4. The results also indicate that NO_2, PM_{10} and $PM_{2.5}$ concentrations were classified as APEC - A at all proposed receptor locations on the Development. As such, mitigation in the form of mechanical ventilation or filtration is not considered necessary.

7.1.5. Finally, it is considered that the Proposed Development complies with national, regional and local policy for air quality.

Figure 1 – Location of Assessment Receptors - Existing Receptors

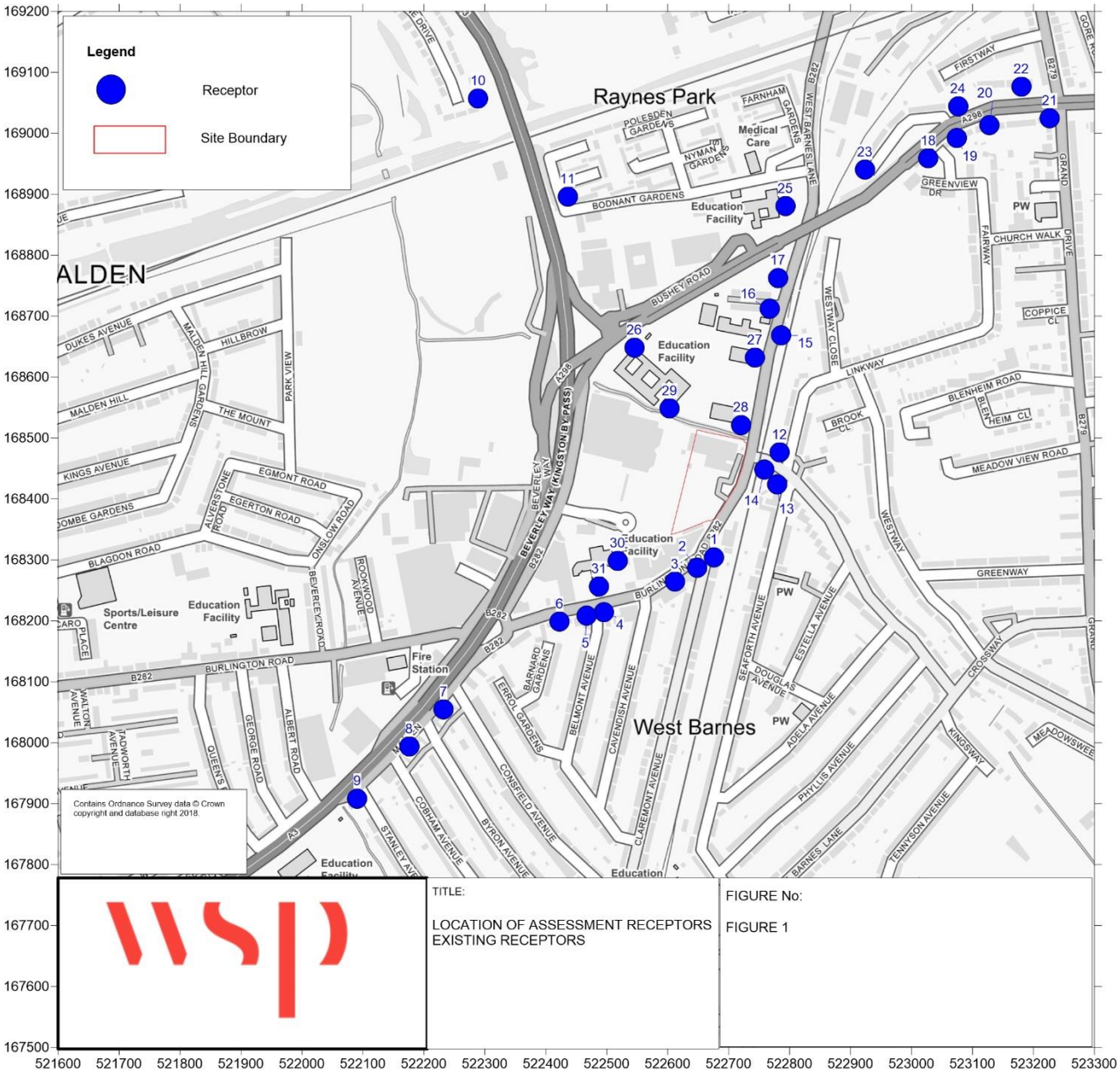
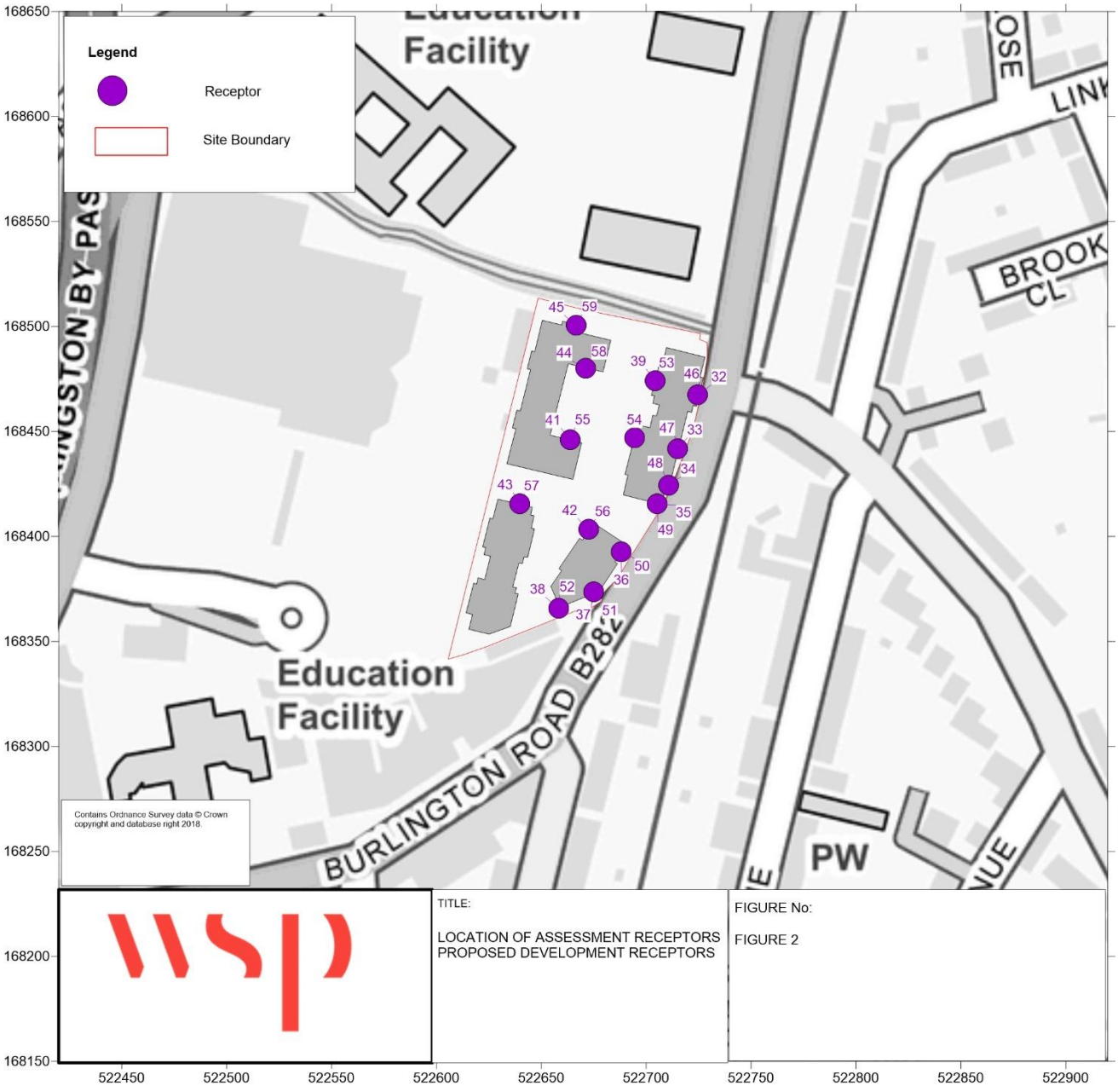


Figure 2 – Location of Assessment Receptors - Proposed Development Receptors



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 modeled 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.
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.
HDV/HGV	Heavy Duty Vehicle/Heavy Goods Vehicle.
IAQM	Institute of Air Quality Management.
LAQM	Local Air Quality Management.
LBoM	London Borough of Merton.

Term	Definition
Model adjustment	Following model verification, the process by which modelled results are amended. This corrects for systematic error.
NO_2	Nitrogen dioxide.
NO_x	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.
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.
$\mu g/m^3$ (microgrammes per cubic metre)	A measure of concentration in terms of mass per unit volume. A concentration of $1ug/m^3$ 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.
Validation (modelling)	Refers to the general comparison of modelled results against monitoring data carried out by model developers.
Verification (modelling)	Comparison of modelled results versus any local monitoring data at relevant locations.

Appendix B

RELEVANT UK AIR QUALITY STRATEGY OBJECTIVES

National Air Quality Objectives and European Directive Limit Values for the protection of human health

Pollutant	Applies to	Objective	Measured as	Date to be achieved by and maintained thereafter	European Obligations	Date to be achieved by and maintained thereafter
Nitrogen dioxide (NO_2)	UK	200µg/m^3 not to be exceeded more than 18 times a year	1 hour mean	31.12.2005	200µg/m^3 not to be exceeded more than 18 times a year	01.01.2010
	UK	40µg/m^3	annual mean	31.12.2005	40µg/m^3	01.01.2010
Particulate Matter (PM_{10}) (gravimetric)[A]	UK (except Scotland)	40µg/m^3	annual mean	31.12.2004	40µg/m^3	01.01.2005
	UK (except Scotland)	50µg/m^3 not to be exceeded more than 35 times a year	24 hour mean	31.12.2004	50µg/m^3 not to be exceeded more than 35 times a year	01.01.2005
Particulate Matter ($PM_{2.5}$)	UK (except Scotland)	25µg/m^3	annual mean	2020	Target value 25µg/m^3	2010

[A] Measured using the European gravimetric transfer sampler or equivalent

µg/m^3 = microgram per cubic metre

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 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

TRAFFIC & EMISSIONS DATA

2017 BASELINE

Road Link	Speed (kph)	AADT	% HDV	NO_x Emission Factors (g/km/s)	PM_{10} Emission Factors (g/km/s)	$PM_{2.5}$ Emission Factors (g/km/s)
Beverley Way, northbound	35	15,755	2.34	0.0834	0.0070	0.0042
Beverley Way, southbound, junction	10	15,855	2.44	0.1434	0.0078	0.0050
Beverley Way, southbound	35	15,855	2.44	0.0843	0.0070	0.0043
Malden Way, northbound	35	9,687	2.66	0.0522	0.0043	0.0026
Malden Way, northbound, junction	10	9,687	2.66	0.0895	0.0048	0.0031
Malden Way, southbound	35	14,578	2.45	0.0776	0.0065	0.0039
Burlington Road, junction	10	17,905	2.16	0.1577	0.0087	0.0056
Burlington Road	40	17,905	2.16	0.0881	0.0078	0.0047
West Barnes Lane	30	13,461	2.28	0.0763	0.0060	0.0037
Bushey Park Road, eastbound	35	10,304	3.44	0.0579	0.0047	0.0029
Bushey Park Road, westbound	30	10,304	3.44	0.0625	0.0048	0.0029
Bushey Park Road	60	20,607	3.44	0.0911	0.0091	0.0054
Bushey Park Road, west of Grand Drive, eastbound	45	10,304	3.44	0.0511	0.0046	0.0028
Bushey Park Road, west of Grand Drive, eastbound, junction	5	10,304	3.44	0.1287	0.0052	0.0033
Bushey Park Road, west of Grand Drive, westbound, junction	10	10,304	3.44	0.1022	0.0052	0.0033
Bushey Park Road, west of Grand Drive, westbound	45	10,304	3.44	0.0511	0.0046	0.0028
Kingston Bypass, south of Malden Way	60	81,767	2.66	0.3507	0.0353	0.0211

Kingston Bypass	60	81,767	2.66	0.3507	0.0353	0.0211
Kingston Bypass, north of Beverley Way	60	81,767	2.66	0.3507	0.0353	0.0211
Shannon Corner	25	30,433	2.44	0.1894	0.0139	0.0086

2021 WITHOUT DEVELOPMENT

Road Link	Speed (kph)	AADT	% HDV	NO_x Emission Factors (g/km/s)	PM_{10} Emission Factors (g/km/s)	$PM_{2.5}$ Emission Factors (g/km/s)
Beverley Way, northbound	35	16,508	2.34	0.0646	0.0067	0.0039
Beverley Way, southbound, junction	10	16,620	2.44	0.1097	0.0072	0.0043
Beverley Way, southbound	35	16,620	2.44	0.0653	0.0068	0.0039
Malden Way, northbound	35	10,188	2.66	0.0404	0.0042	0.0024
Malden Way, northbound, junction	10	10,188	2.66	0.0684	0.0044	0.0027
Malden Way, southbound	35	15,279	2.45	0.0601	0.0062	0.0036
Burlington Road, junction	10	18,872	2.16	0.1220	0.0081	0.0049
Burlington Road	40	18,872	2.16	0.0691	0.0076	0.0044
West Barnes Lane	30	14,256	2.28	0.0597	0.0058	0.0034
Bushey Park Road, eastbound	35	10,668	3.44	0.0435	0.0045	0.0026
Bushey Park Road, westbound	30	10,668	3.44	0.0468	0.0045	0.0026
Bushey Park Road	60	21,337	3.44	0.0691	0.0087	0.0050
Bushey Park Road, west of Grand Drive, eastbound	45	10,668	3.44	0.0386	0.0044	0.0025
Bushey Park Road, west of Grand Drive, eastbound, junction	5	10,668	3.44	0.1014	0.0048	0.0029
Bushey Park Road, west of Grand Drive, westbound, junction	10	10,668	3.44	0.0756	0.0048	0.0029
Bushey Park Road, west of Grand Drive, westbound	45	10,668	3.44	0.0386	0.0044	0.0025
Kingston Bypass, south of Malden Way	60	84,673	2.66	0.2690	0.0339	0.0193

Kingston Bypass	60	84,673	2.66	0.2690	0.0339	0.0193
Kingston Bypass, north of Beverley Way	60	84,673	2.66	0.2690	0.0339	0.0193
Shannon Corner	25	31,900	2.44	0.1458	0.0132	0.0077

2021 WITH DEVELOPMENT

Road Link	Speed (kph)	AADT	% HDV	NO_x Emission Factors (g/km/s)	PM_{10} Emission Factors (g/km/s)	$PM_{2.5}$ Emission Factors (g/km/s)
Beverley Way, northbound	35	16,652	2.34	0.0652	0.0068	0.0039
Beverley Way, southbound, junction	10	16,741	2.44	0.1105	0.0073	0.0044
Beverley Way, southbound	35	16,741	2.44	0.0658	0.0068	0.0039
Malden Way, northbound	35	10,361	2.66	0.0411	0.0042	0.0024
Malden Way, northbound, junction	10	10,361	2.66	0.0695	0.0045	0.0027
Malden Way, southbound	35	15,507	2.45	0.0610	0.0063	0.0036
Burlington Road, junction	10	19,584	2.16	0.1265	0.0084	0.0051
Burlington Road	40	19,584	2.16	0.0717	0.0079	0.0045
West Barnes Lane	30	14,243	2.28	0.0596	0.0058	0.0034
Bushey Park Road, eastbound	35	10,703	3.44	0.0436	0.0045	0.0026
Bushey Park Road, westbound	30	10,703	3.44	0.0470	0.0045	0.0026
Bushey Park Road	60	21,405	3.44	0.0693	0.0087	0.0050
Bushey Park Road, west of Grand Drive, eastbound	45	10,703	3.44	0.0387	0.0044	0.0025
Bushey Park Road, west of Grand Drive, eastbound, junction	5	10,703	3.44	0.1018	0.0048	0.0029
Bushey Park Road, west of Grand Drive, westbound, junction	10	10,703	3.44	0.0759	0.0048	0.0029
Bushey Park Road, west of Grand Drive, westbound	45	10,703	3.44	0.0387	0.0044	0.0025
Kingston Bypass, south of Malden Way	60	84,932	2.66	0.2698	0.0340	0.0193

Kingston Bypass	60	84,673	2.66	0.2690	0.0339	0.0193
Kingston Bypass, north of Beverley Way	60	84,938	2.66	0.2699	0.0340	0.0193
Shannon Corner	25	32,248	2.44	0.1474	0.0133	0.0078

Appendix E

MODEL VERIFICATION

The comparison of modelled concentrations with local monitored concentrations is a process termed 'verification'. Model verification investigates the discrepancies between modelled and measured concentrations, which can arise due to the presence of inaccuracies and/or uncertainties in model input data, modelling and monitoring data assumptions. The following are examples of potential causes of such discrepancy:

a) Estimates of background pollutant concentrations;

b) Meteorological data uncertainties;

c) Traffic data uncertainties;

d) Model input parameters, such as 'roughness length'; and

e) Overall limitations of the dispersion model.

NITROGEN DIOXIDE

Most nitrogen dioxide is produced in the atmosphere by the reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of the primary pollutant emissions of nitrogen oxides (NO_x = NO + NO_2), in line with the guidance provided within LAQM.TG16.

The model has been run to predict the 2017 annual mean road-NO_x contribution at two diffusion tubes within the modelled road network. The model outputs of road-NO_x have been compared with the 'measured' road-NO_x, which was determined from the NO_2 concentrations measured using diffusion tubes at the monitoring locations, utilising the NO_x from NO_2 calculator provided by Defra and the NO_2 background concentration (from the Defra background map). As discussed in the methodology section, the most recent suitable data available for model verification purposes is 2017 data.

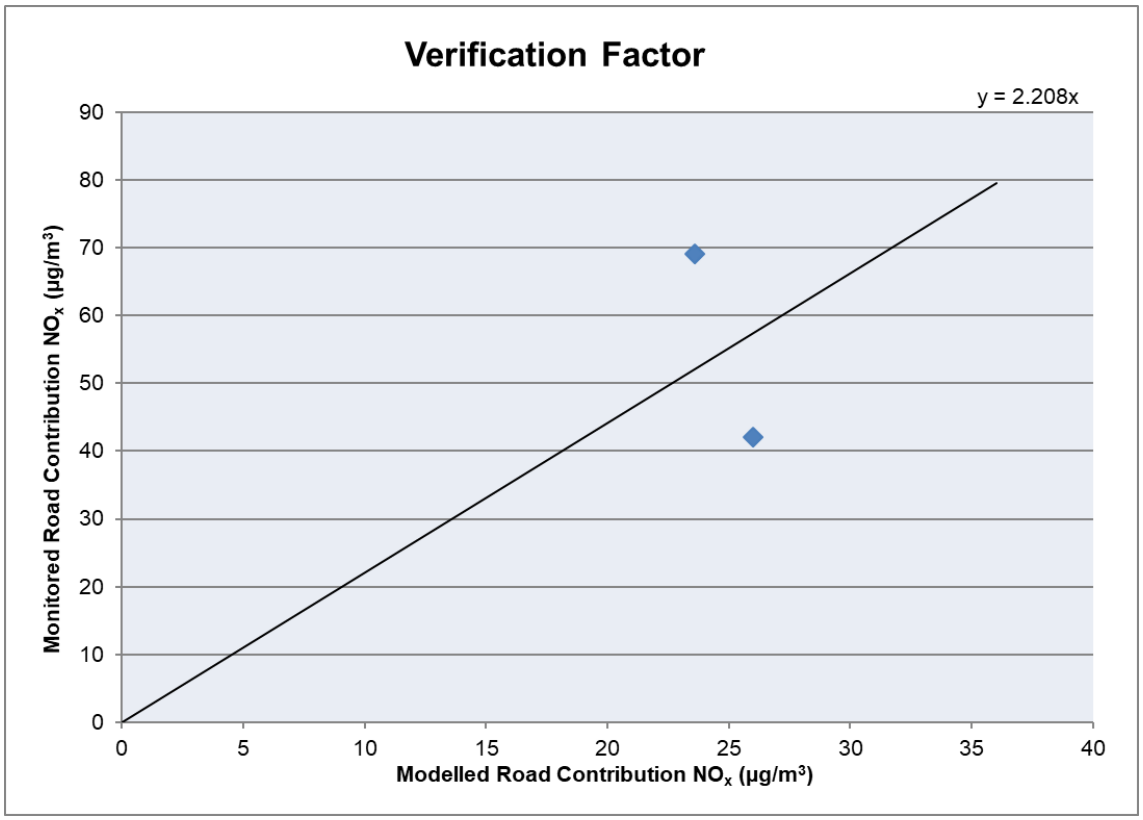
The table and figure below present the data used in the verification.

Table E1 – Data used in model verification

Monitoring Site	Measured Annual Mean NO_2 Concentration ($\mu g/m^3$)	Background NO_2 ($\mu g/m^3$)	Measured Road-NO_x ($\mu g/m^3$) (from NO_x:NO_2 calculator)	Modelled Road-NO_x ($\mu g/m^3$)	Ratio
1	52.0	23.43	69.12	23.61	2.93
5 (BA)	42.0	23.43	42.03	26.02	1.62

The road-NO_x adjustment factor was determined as the slope of the best fit line between the 'measured' road contribution and the model derived road contribution, forced through zero (Figure E1). This factor was then applied to the modelled road-NO_x concentration for each monitoring site to provide adjusted modelled road-NO_x concentrations. The total nitrogen dioxide concentrations were then determined by inputting the adjusted modelled road-NO_x concentrations and the background NO_2 concentration into the NO_x to NO_2 calculator.

Figure E1: Comparison of Measured Road-NO_x with Unadjusted Modelled Road-NO_x



PM_{10} AND $PM_{2.5}$

There are no local PM_{10} or $PM_{2.5}$ monitoring data against which the model could be verified. Consequently, the verification factor determined above for adjusting the road-NO_x contribution has been applied to the predicted road-PM_{10} and road-$PM_{2.5}$ contributions, consistent with guidance set out in LAQM.TG16.

MODEL UNCERTAINTY

An evaluation of model performance has been undertaken to establish confidence in model results. LAQM.TG16 identifies a number of statistical procedures that are appropriate to evaluate model performance and assess the uncertainty. These include:

a) Root mean square error (RMSE);

b) Fractional bias (FB); and

c) Correlation coefficient (CC).

These parameters estimate how the model results agree or diverge from the observations. These calculations can be carried out prior to, and after adjustment, or based on different options for adjustment, and can provide useful information on model improvement. A brief for explanation of each statistic is provided in Table E2, and further details can be found in Box 7.17 of LAQM.TG16.

Table E2 – Methods for describing model uncertainty

Statistical Parameter	Comments	Ideal value
RMSE	RMSE is used to define the average error or uncertainty of the model. The units of RMSE are the same as the quantities compared. If the RMSE values are higher than 25% of the objective being assessed, it is recommended that the model inputs and verification should be revisited in order to make improvements. For example, if the model predictions are for the annual mean NO_2 objective of 40µg/m^3, if an RMSE of 10µg/m^3 or above is determined for a model it is advised to revisit the model parameters and model verification. Ideally an RMSE within 10% of the air quality objective would be derived, which equates to 4µg/m^3 for the annual mean NO_2 objective.	0.01
Fractional Bias	It is used to identify if the model shows a systematic tendency to over or under predict. FB values vary between +2 and -2 and has an ideal value of zero. Negative values suggest a model over-prediction and positive values suggest a model under-prediction.	0.00
Correlation Coefficient	It is used to measure the linear relationship between predicted and observed data. A value of zero means no relationship and a value of 1 means absolute relationship. This statistic can be particularly useful when comparing a large number of model and observed data points.	1.00

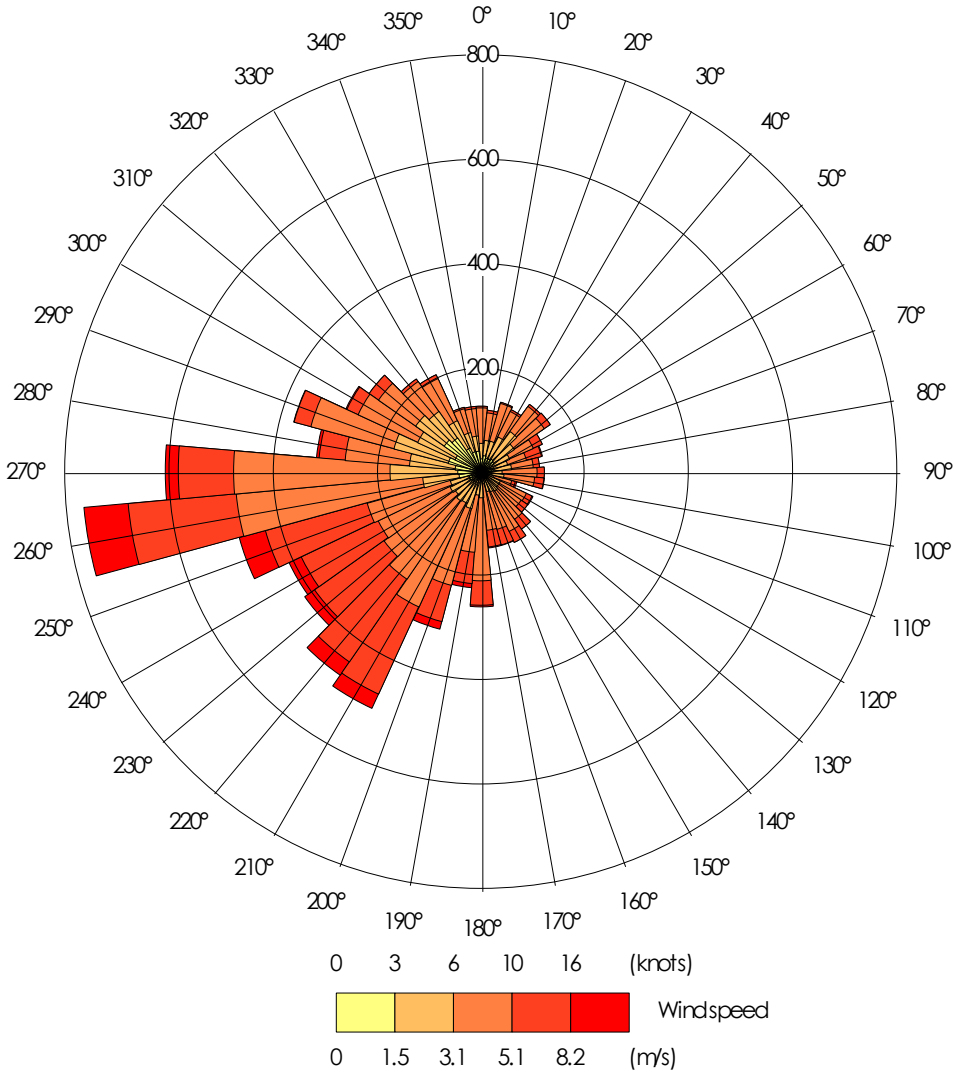
To assess the uncertainty of a model, the RMSE is the simplest parameter to calculate providing an estimate of the average error of the model in the same units as the modelled predictions. It is also often easier to interpret the RMSE than the other statistical parameters and therefore it has been calculated in this assessment to understand the model uncertainty.

The RMSE value calculated after verification was 6.0µg/m^3.

Appendix F

WIND ROSE

WIND ROSE FOR HEATHROW AIRPORT 2017



Appendix G

MODEL RESULTS

ANNUAL MEAN NO_2 CONCENTRATIONS ($\mu g/m^3$) - EXISTING RECEPTORS

ID	Receptor Location	Annual Mean NO_2 Concentrations ($\mu g/m^3$)					
		2017 Baseline	2021 Baseline	2021 With Dev	Change ($\mu g/m^3$)	% Change Relative to Objective	Impact
1	Residential - Claremont Avenue	33.2	27.3	27.5	0.2	0.5	Negligible
2	Residential - Burlington Road	36.5	30.0	30.3	0.3	0.7	Negligible
3	Residential - Burlington Road	37.6	31.0	31.3	0.3	0.8	Negligible
4	Residential - Burlington Road	36.6	30.1	30.3	0.2	0.5	Negligible
5	Residential - Burlington Road	37.5	30.8	31.0	0.2	0.5	Negligible
6	Residential - Burlington Road	40.7	33.4	33.7	0.2	0.6	Negligible
7	Residential - Malden Way	52.5	43.4	43.5	0.1	0.3	Negligible
8	Residential - Malden Way	51.3	42.3	42.5	0.1	0.3	Negligible
9	Residential - Malden Way	47.0	38.7	38.8	0.1	0.2	Negligible
10	Residential - Aboyne Drive	29.4	24.1	24.1	0.0	0.1	Negligible
11	Residential - Bodnant Gardens	38.5	31.5	31.5	0.0	0.1	Negligible
12	Residential - Seaforth Avenue	29.4	24.1	24.2	0.0	0.1	Negligible
13	Residential - Seaforth Avenue	28.8	23.7	23.7	0.0	0.1	Negligible
14	Residential - West Barnes Lane	31.2	25.6	25.7	0.0	0.1	Negligible
15	Residential - West Barnes Lane	36.1	29.7	29.7	0.0	0.1	Negligible
16	Residential - West Barnes Lane	31.7	26.0	26.0	0.0	0.1	Negligible

17	Residential - West Barnes Lane	32.8	26.8	26.9	0.0	0.1	Negligible
18	Residential - Bushey Road	34.1	27.8	27.8	0.0	0.1	Negligible
19	Residential - Bushey Road	33.2	27.2	27.2	0.0	0.1	Negligible
20	Residential - Bushey Road	35.3	28.9	28.9	0.0	0.1	Negligible
21	Residential - Bushey Road	36.2	29.6	29.6	0.0	0.1	Negligible
22	Residential - Bushey Road	33.9	27.8	27.8	0.0	0.1	Negligible
23	Residential - Bushey Court	29.5	24.2	24.2	0.0	0.0	Negligible
24	Residential - Bushey Court	31.6	25.9	25.9	0.0	0.1	Negligible
25	West Wimbledon Primary School	29.7	24.4	24.4	0.0	0.0	Negligible
26	Raynes Park High School	36.9	30.1	30.1	0.0	0.1	Negligible
27	Raynes Park High School	30.6	25.1	25.1	0.0	0.1	Negligible
28	Raynes Park High School	30.0	24.6	24.7	0.1	0.1	Negligible
29	Raynes Park High School	30.5	25.0	25.0	0.0	0.1	Negligible
30	Sacred Heart Catholic Primary School	32.4	26.5	26.6	0.1	0.2	Negligible
31	Sacred Heart Catholic Primary School	35.1	28.8	29.0	0.1	0.4	Negligible

Results rounded to 1.d.p

ANNUAL MEAN NO_2 CONCENTRATIONS (µg/m^3) - PROPOSED DEVELOPMENT RECEPTORS

ID	Annual Mean NO_2 Concentrations (µg/m^3)	
	2021 With Dev	APEC Category
32	27.5	APEC - A
33	26.9	APEC - A
34	27.8	APEC - A
35	27.6	APEC - A
36	26.9	APEC - A
37	26.9	APEC - A
38	25.5	APEC - A
39	24.5	APEC - A
40	24.5	APEC - A
41	24.0	APEC - A
42	24.7	APEC - A
43	24.2	APEC - A
44	24.0	APEC - A
45	24.0	APEC - A
46	21.4	APEC - A
47	21.7	APEC - A
48	21.7	APEC - A
49	21.7	APEC - A
50	21.0	APEC - A
51	21.0	APEC - A
52	21.1	APEC - A
53	21.5	APEC - A
54	21.8	APEC - A
55	22.0	APEC - A
56	21.1	APEC - A
57	20.3	APEC - A

58	21.0	APEC - A
59	20.6	APEC - A

1-HOUR MEAN NO_2 CONCENTRATIONS (µg/m^3) - ALL RECEPTORS

ID	Receptor Location	1-hour Mean NO_2 Concentrations (µg/m^3)				
		2021 Background	2021 Traffic Contribution	2021 Energy Centre Contribution	Total	% Objective
1	Residential - Claremont Avenue	38.7	0.2	1.4	40.3	20.1
2	Residential - Burlington Road	38.7	0.3	1.2	40.2	20.1
3	Residential - Burlington Road	38.7	0.3	1.1	40.1	20.0
4	Residential - Burlington Road	38.7	0.2	1.0	40.0	20.0
5	Residential - Burlington Road	38.7	0.2	1.0	39.9	20.0
6	Residential - Burlington Road	38.7	0.2	0.9	39.9	19.9
7	Residential - Malden Way	38.7	0.1	0.5	39.4	19.7
8	Residential - Malden Way	38.7	0.1	0.4	39.3	19.6
9	Residential - Malden Way	38.7	0.1	0.4	39.2	19.6
10	Residential - Aboyne Drive	38.7	0.0	0.5	39.2	19.6
11	Residential - Bodnant Gardens	38.7	0.0	0.7	39.5	19.7
12	Residential - Seaforth Avenue	38.7	0.0	1.8	40.6	20.3
13	Residential - Seaforth Avenue	38.7	0.0	1.8	40.5	20.3
14	Residential - West Barnes Lane	38.7	0.0	1.9	40.6	20.3
15	Residential - West Barnes Lane	38.7	0.0	1.4	40.1	20.1
16	Residential - West Barnes Lane	38.7	0.0	1.2	40.0	20.0
17	Residential - West Barnes Lane	38.7	0.0	1.0	39.7	19.9
18	Residential - Bushey Road	38.7	0.0	0.5	39.3	19.6

19	Residential - Bushey Road	38.7	0.0	0.5	39.2	19.6
20	Residential - Bushey Road	38.7	0.0	0.4	39.2	19.6
21	Residential - Bushey Road	38.7	0.0	0.4	39.1	19.6
22	Residential - Bushey Road	38.7	0.0	0.4	39.1	19.6
23	Residential - Bushey Court	38.7	0.0	0.6	39.3	19.7
24	Residential - Bushey Court	38.7	0.0	0.4	39.2	19.6
25	West Wimbledon Primary School	38.7	0.0	0.7	39.4	19.7
26	Raynes Park High School	38.7	0.0	1.5	40.2	20.1
27	Raynes Park High School	38.7	0.0	1.5	40.2	20.1
28	Raynes Park High School	38.7	0.0	3.7	42.5	21.2
29	Raynes Park High School	38.7	0.0	3.4	42.1	21.1
30	Sacred Heart Catholic Primary School	38.7	0.1	1.3	40.1	20.0
31	Sacred Heart Catholic Primary School	38.7	0.1	1.1	40.0	20.0
32	Proposed Development 1	38.7	0.0	3.2	41.9	21.0
33	Proposed Development 2	38.7	0.0	3.1	41.8	20.9
34	Proposed Development 3	38.7	0.0	3.1	41.8	20.9
35	Proposed Development 4	38.7	0.1	3.1	41.9	20.9
36	Proposed Development 5	38.7	0.1	2.6	41.5	20.7
37	Proposed Development 6	38.7	0.1	2.6	41.5	20.7
38	Proposed Development 7	38.7	0.1	1.6	40.4	20.2
39	Proposed Development 8	38.7	0.0	3.4	42.1	21.1
40	Proposed Development 9	38.7	0.0	3.1	41.9	20.9
41	Proposed Development 10	38.7	0.0	3.6	42.4	21.2
42	Proposed Development 11	38.7	0.1	2.6	41.4	20.7
43	Proposed Development 12	38.7	0.0	2.8	41.6	20.8
44	Proposed Development 13	38.7	0.0	4.1	42.8	21.4
45	Proposed Development 14	38.7	0.0	4.0	42.8	21.4
46	Proposed Development 1	38.7	0.0	3.4	42.1	21.0

47	Proposed Development 2	38.7	0.0	3.1	41.8	20.9
48	Proposed Development 3	38.7	0.0	3.3	42.0	21.0
49	Proposed Development 4	38.7	0.0	3.5	42.3	21.1
50	Proposed Development 5	38.7	0.0	5.5	44.2	22.1
51	Proposed Development 6	38.7	0.0	4.7	43.4	21.7
52	Proposed Development 7	38.7	0.0	3.6	42.4	21.2
53	Proposed Development 8	38.7	0.0	3.4	42.1	21.0
54	Proposed Development 9	38.7	0.0	3.1	41.9	20.9
55	Proposed Development 10	38.7	0.0	3.6	42.3	21.2
56	Proposed Development 11	38.7	0.0	3.8	42.6	21.3
57	Proposed Development 12	38.7	0.0	15.8	54.6	27.3
58	Proposed Development 13	38.7	0.0	4.1	42.8	21.4
59	Proposed Development 14	38.7	0.0	4.1	42.8	21.4

Results rounded to 1.d.p

ANNUAL MEAN PM_{10} CONCENTRATIONS (µg/m^3) - EXISTING RECEPTORS

ID	Receptor Location	Annual Mean PM_{10} Concentrations (µg/m^3)					
		2017 Baseline	2021 Baseline	2021 With Dev	Change (µg/m^3)	% Change Relative to Objective	Impact
1	Residential - Claremont Avenue	18.0	17.5	17.6	0.0	0.1	Negligible
2	Residential - Burlington Road	18.7	18.2	18.2	0.1	0.2	Negligible
3	Residential - Burlington Road	18.9	18.4	18.5	0.1	0.2	Negligible
4	Residential - Burlington Road	18.7	18.2	18.2	0.0	0.1	Negligible
5	Residential - Burlington Road	18.9	18.3	18.4	0.0	0.1	Negligible
6	Residential - Burlington Road	19.5	18.9	19.0	0.1	0.1	Negligible

7	Residential - Malden Way	22.8	22.1	22.1	0.0	0.1	Negligible
8	Residential - Malden Way	22.5	21.8	21.8	0.0	0.1	Negligible
9	Residential - Malden Way	21.5	20.9	20.9	0.0	0.1	Negligible
10	Residential - Aboyne Drive	17.4	16.9	16.9	0.0	0.0	Negligible
11	Residential - Bodnant Gardens	19.5	18.9	18.9	0.0	0.0	Negligible
12	Residential - Seaforth Avenue	17.2	16.7	16.7	0.0	0.0	Negligible
13	Residential - Seaforth Avenue	17.1	16.6	16.6	0.0	0.0	Negligible
14	Residential - West Barnes Lane	17.5	17.0	17.0	0.0	0.0	Negligible
15	Residential - West Barnes Lane	18.4	17.9	17.9	0.0	0.0	Negligible
16	Residential - West Barnes Lane	17.6	17.1	17.1	0.0	0.0	Negligible
17	Residential - West Barnes Lane	17.8	17.3	17.3	0.0	0.0	Negligible
18	Residential - Bushey Road	18.2	17.6	17.6	0.0	0.0	Negligible
19	Residential - Bushey Road	17.9	17.3	17.4	0.0	0.0	Negligible
20	Residential - Bushey Road	17.8	17.2	17.2	0.0	0.0	Negligible
21	Residential - Bushey Road	17.6	17.0	17.0	0.0	0.0	Negligible
22	Residential - Bushey Road	17.3	16.8	16.8	0.0	0.0	Negligible
23	Residential - Bushey Court	17.3	16.8	16.8	0.0	0.0	Negligible
24	Residential - Bushey Court	17.4	16.8	16.8	0.0	0.0	Negligible

25	West Wimbledon Primary School	17.3	16.8	16.8	0.0	0.0	Negligible
26	Raynes Park High School	18.8	18.2	18.2	0.0	0.0	Negligible
27	Raynes Park High School	17.4	16.9	16.9	0.0	0.0	Negligible
28	Raynes Park High School	17.3	16.9	16.9	0.0	0.0	Negligible
29	Raynes Park High School	17.5	17.0	17.0	0.0	0.0	Negligible
30	Sacred Heart Catholic Primary School	17.9	17.4	17.4	0.0	0.0	Negligible
31	Sacred Heart Catholic Primary School	18.4	17.9	17.9	0.0	0.1	Negligible

Results rounded to 1.d.p

ANNUAL MEAN PM_{10} CONCENTRATIONS (µg/m^3) - PROPOSED DEVELOPMENT RECEPTORS

ID	Annual Mean PM_{10} Concentrations (µg/m^3)	
	2021 With Dev	APEC Category
32	17.4	APEC - A
33	17.3	APEC - A
34	17.5	APEC - A
35	17.5	APEC - A
36	17.4	APEC - A
37	17.4	APEC - A
38	17.1	APEC - A
39	16.8	APEC - A
40	16.8	APEC - A
41	16.7	APEC - A
42	16.9	APEC - A

43	16.8	APEC - A
44	16.7	APEC - A
45	16.7	APEC - A
46	16.2	APEC - A
47	16.2	APEC - A
48	16.2	APEC - A
49	16.2	APEC - A
50	16.1	APEC - A
51	16.1	APEC - A
52	16.1	APEC - A
53	16.2	APEC - A
54	16.2	APEC - A
55	16.3	APEC - A
56	16.1	APEC - A
57	15.9	APEC - A
58	16.0	APEC - A
59	16.0	APEC - A

DAILY MEAN PM_{10} (NO. OF DAYS OF EXCEEDANCE) - EXISTING RECEPTORS

ID	Receptor Location	Days with PM_{10} Concentrations >50µg/m^3			
		2021 Baseline	2021 With Dev	Change (days)	Impact
1	Residential - Claremont Avenue	1	1	0	Negligible
2	Residential - Burlington Road	2	2	0	Negligible
3	Residential - Burlington Road	2	2	0	Negligible

4	Residential - Burlington Road	2	2	0	Negligible
5	Residential - Burlington Road	2	2	0	Negligible
6	Residential - Burlington Road	2	2	0	Negligible
7	Residential - Malden Way	6	6	0	Negligible
8	Residential - Malden Way	6	6	0	Negligible
9	Residential - Malden Way	5	5	0	Negligible
10	Residential - Aboyne Drive	1	1	0	Negligible
11	Residential - Bodnant Gardens	2	2	0	Negligible
12	Residential - Seaforth Avenue	1	1	0	Negligible
13	Residential - Seaforth Avenue	1	1	0	Negligible
14	Residential - West Barnes Lane	1	1	0	Negligible
15	Residential - West Barnes Lane	1	1	0	Negligible
16	Residential - West Barnes Lane	1	1	0	Negligible
17	Residential - West Barnes Lane	1	1	0	Negligible
18	Residential - Bushey Road	1	1	0	Negligible
19	Residential - Bushey Road	1	1	0	Negligible
20	Residential - Bushey Road	1	1	0	Negligible
21	Residential - Bushey Road	1	1	0	Negligible
22	Residential - Bushey Road	1	1	0	Negligible
23	Residential - Bushey Court	1	1	0	Negligible
24	Residential - Bushey Court	1	1	0	Negligible
25	West Wimbledon Primary School	1	1	0	Negligible
26	Raynes Park High School	2	2	0	Negligible
27	Raynes Park High School	1	1	0	Negligible
28	Raynes Park High School	1	1	0	Negligible
29	Raynes Park High School	1	1	0	Negligible
30	Sacred Heart Catholic Primary School	1	1	0	Negligible
31	Sacred Heart Catholic Primary School	1	1	0	Negligible

DAILY MEAN PM_{10} (NO. OF DAYS OF EXCEEDANCE) - PROPOSED DEVELOPMENT RECEPTORS

ID	Days with PM_{10} Concentrations >50µg/m^3	
	2021 With Dev	APEC Category
32	1	APEC - A
33	1	APEC - A
34	1	APEC - A
35	1	APEC - A
36	1	APEC - A
37	1	APEC - A
38	1	APEC - A
39	1	APEC - A
40	1	APEC - A
41	1	APEC - A
42	1	APEC - A
43	1	APEC - A
44	1	APEC - A
45	1	APEC - A
46	0	APEC - A
47	0	APEC - A
48	0	APEC - A
49	0	APEC - A
50	0	APEC - A
51	0	APEC - A
52	0	APEC - A
53	0	APEC - A
54	0	APEC - A
55	0	APEC - A
56	0	APEC - A
57	0	APEC - A

58	0	APEC - A
59	0	APEC - A

ANNUAL MEAN $PM_{2.5}$ CONCENTRATIONS (µg/m^3) - EXISTING RECEPTORS

ID	Receptor Location	Annual Mean $PM_{2.5}$ Concentrations (µg/m^3)					
		2017 Baseline	2021 Baseline	2021 With Dev	Change (µg/m^3)	% Change Relative to Objective	Impact
1	Residential - Claremont Avenue	11.5	11.0	11.0	0.0	0.1	Negligible
2	Residential - Burlington Road	11.9	11.4	11.4	0.0	0.2	Negligible
3	Residential - Burlington Road	12.1	11.5	11.5	0.0	0.2	Negligible
4	Residential - Burlington Road	11.9	11.4	11.4	0.0	0.1	Negligible
5	Residential - Burlington Road	12.0	11.5	11.5	0.0	0.1	Negligible
6	Residential - Burlington Road	12.4	11.8	11.8	0.0	0.1	Negligible
7	Residential - Malden Way	14.4	13.6	13.6	0.0	0.1	Negligible
8	Residential - Malden Way	14.2	13.4	13.5	0.0	0.1	Negligible
9	Residential - Malden Way	13.6	12.9	12.9	0.0	0.1	Negligible
10	Residential - Aboyne Drive	11.1	10.6	10.6	0.0	0.0	Negligible
11	Residential - Bodnant Gardens	12.4	11.7	11.8	0.0	0.0	Negligible
12	Residential - Seaforth Avenue	11.0	10.5	10.5	0.0	0.0	Negligible
13	Residential - Seaforth Avenue	11.0	10.5	10.5	0.0	0.0	Negligible
14	Residential - West Barnes Lane	11.2	10.7	10.7	0.0	0.0	Negligible

15	Residential - West Barnes Lane	11.8	11.2	11.2	0.0	0.0	Negligible
16	Residential - West Barnes Lane	11.3	10.7	10.8	0.0	0.0	Negligible
17	Residential - West Barnes Lane	11.4	10.9	10.9	0.0	0.0	Negligible
18	Residential - Bushey Road	11.6	11.0	11.0	0.0	0.0	Negligible
19	Residential - Bushey Road	11.4	10.9	10.9	0.0	0.0	Negligible
20	Residential - Bushey Road	11.4	10.8	10.8	0.0	0.0	Negligible
21	Residential - Bushey Road	11.3	10.7	10.7	0.0	0.0	Negligible
22	Residential - Bushey Road	11.1	10.6	10.6	0.0	0.0	Negligible
23	Residential - Bushey Court	11.1	10.6	10.6	0.0	0.0	Negligible
24	Residential - Bushey Court	11.1	10.6	10.6	0.0	0.0	Negligible
25	West Wimbledon Primary School	11.1	10.6	10.6	0.0	0.0	Negligible
26	Raynes Park High School	12.0	11.4	11.4	0.0	0.0	Negligible
27	Raynes Park High School	11.2	10.6	10.6	0.0	0.0	Negligible
28	Raynes Park High School	11.1	10.6	10.6	0.0	0.0	Negligible
29	Raynes Park High School	11.2	10.7	10.7	0.0	0.0	Negligible
30	Sacred Heart Catholic Primary School	11.4	10.9	10.9	0.0	0.0	Negligible
31	Sacred Heart Catholic Primary School	11.8	11.2	11.2	0.0	0.1	Negligible

Results rounded to 1.d.p

ANNUAL MEAN $PM_{2.5}$ CONCENTRATIONS ($\mu g/m^3$) - PROPOSED DEVELOPMENT RECEPTORS

ID	Annual Mean $PM_{2.5}$ Concentrations ($\mu g/m^3$)	
	2021 With Dev	APEC Category
32	10.9	APEC - A
33	10.9	APEC - A
34	11.0	APEC - A
35	11.0	APEC - A
36	10.9	APEC - A
37	10.9	APEC - A
38	10.7	APEC - A
39	10.6	APEC - A
40	10.6	APEC - A
41	10.5	APEC - A
42	10.6	APEC - A
43	10.6	APEC - A
44	10.5	APEC - A
45	10.5	APEC - A
46	10.2	APEC - A
47	10.2	APEC - A
48	10.2	APEC - A
49	10.2	APEC - A
50	10.2	APEC - A
51	10.2	APEC - A
52	10.2	APEC - A
53	10.2	APEC - A
54	10.3	APEC - A
55	10.3	APEC - A
56	10.2	APEC - A
57	10.1	APEC - A

58	10.1	APEC - A
59	10.1	APEC - A

REDROW