SAFEWAY STORES LIMITED & BDW TRADING LIMITED

PROPOSED RESIDENTIAL/RETAIL DEVELOPMENT: MORRISONS, CHALK FARM ROAD, CAMDEN

AIR QUALITY ASSESSMENT

REPORT REFERENCE NO. 160630-13
PROJECT NO. 160630
JUNE 2016

MORRISONS, CHALK FARM ROAD, CAMDEN

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1 INTRODUCTION

1.1 Ardent Consulting Engineers has been commissioned to undertake a detailed air quality and odour assessment based on the potential impacts the proposed residential and retail redevelopment of the Camden Morrisons site in the Chalk Farm area of London, NW1 8AA.

1.2 The proposed development comprises the demolition of the existing buildings and a planning application for the comprehensive redevelopment of the site to provide a residential-led mixed use scheme comprising the following:

1.3 Demolition of existing buildings (Class A1 foodstore and Sui Generis petrol filling station) and associated highways and site works including removal of existing surface level car parking and retaining walls along with road junction alterations.

1.4 Redevelopment of petrol filling station site to include the erection of a new building of up to six storeys and up to 11,243 sq m GEA floorspace to accommodate a petrol filling station (Sui Generis), flexible Class A1, A3 and A4 floorspace, Class B1 floorspace and a winter garden; associated cycle parking; public green space; public toilets and other associated works and highways works. For a temporary period of up to thirty months part of the ground and all of the 1st floor of the building will be used for a Class A1 foodstore with associated car parking.

1.5 Redevelopment of the main supermarket site to include the erection of buildings (Blocks A to F, including Blocks E1 and E2) of up to 14 storeys accommodating up to 573 homes and up to 60,568 sq m GEA of residential floorspace together with up to 28,333 sq m GEA non-residential floorspace within Class A1 (foodstore), flexible Class A1 and A3, Class B1a and B1c, Class D2 community centre, Sui Generis use at roof level of 'Block B' for food and plant growing/production facility (including small scale brewing and distilling) with associated ancillary office, storage, education, training, café and restaurant activities; together with associated new streets and squares; hard and soft landscaping and play space; lifts; public cycle parking and cycle hire facility; and other associated works, including highways works.

1.6 In addition to this, the assessment has assessed the potential impact on local air quality from demolition and construction activities at the site for both phases.

1.7 The impact of emissions from the CHP and road traffic will be assessed using the ADMS-Roads air dispersion model. This model has been devised by Cambridge Environmental Research Consultants (CERC) and is described as a comprehensive tool for investigating air pollution problems due to small networks of roads that may be in combination with industrial sources.

1.8 The impacts of vehicle emissions on the proposed development have been assessed using the techniques detailed within Volume 11, Section 3 of the

Design Manual for Roads and Bridges (DMRB)[1] and the Local Air Quality Management Technical Guidance (LAQM.TG09)[2]. Horizontal Guidance Note H1 - Annex (f)[3] has been used to assess the impact of emissions from the CHP.

1.9 With regards the CHP, the modelled impacts are considered worst case should the CHP be replaced with an Air Source Heat Pump (ASHP).

[1] Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1 – HA207/07, Highways Agency, May 2007

[2] Part IV of the Environment Act 1995, Local Air Quality Management Technical Guidance (TG09), Defra, February 2009

[3] Horizontal Guidance Note H1 - Environmental risk assessment for permits, Environment Agency, April 2010

2 LEGISLATION AND POLICY CONTEXT

International Legislation and Policy

European Union Ambient Air Quality and Clean Air for Europe, 2008 Directive 2008/50/EC[4] of the European Parliament came into force on 11 June 2008. The directive includes the following elements:

- The merging of most of existing legislation (Framework Directive 96/62/EC, 1-3 daughter Directives 1999/30/EC, 2000/69/EC, 2002/3/EC, and Decision on Exchange of Information 97/101/EC) into a single directive (except for the fourth daughter directive) with no change to existing air quality objectives;

- New air quality objectives for $PM_{2.5}$ (fine particles) including the limit value and exposure related objectives - exposure concentration obligation and exposure reduction target;

- The possibility to discount natural sources of pollution when assessing compliance against limit values; and

- The possibility for time extensions of three years (PM_{10}) or up to five years (NO_2, benzene) for complying with limit values, based on conditions and the assessment by the European Commission.

2.2 The Directive contains a series of limit values for the protection of human health and critical levels for the protection of vegetation.

2.3 Compliance with the European Union (EU) Limit Values is mandatory. However, Member States can apply for a time extension for compliance, subject to approval of an action plan by the European Commission. The UK Government applied in autumn 2011 for a time extension for compliance with the NO_2 limit values until 2015 for a number of areas throughout England. However, the UK Government has withdrawn its application for those zones where compliance is not expected until after 2015, which includes central London.

2.4 In December 2015, the Department for Environment Food and Rural Affairs (Defra) on behalf of the UK Government produced plans to improve air quality in the UK in order to meet the EU targets in the shortest possible time. An overview document has been produced[5], together with detailed plans for 31 zones where air quality is not predicted to meet the objective in 2013. The plan for the Greater London Urban Area[6] sets out a range of measures to reduce NO_2 concentrations and indicates that with these measures air quality in the area will be compliant by 2025. The adequacy of these plans to bring about the necessary improvements in air quality to meet the relevant objectives within the

[5] Defra, December 2015. Improving air quality in the UK, Tackling nitrogen dioxide in our towns and cities, UK overview document. Defra.

[6] Defra, December 2015. Air Quality Plan for the achievement of EU air quality limit value for nitrogen dioxide (NO_2) in Greater London urban area (UK0001). Defra.

shortest time possible has recently been successfully challenged within the High Court. As a result Defra has published a new draft plan for consultation[7]. The plan focuses on reducing emissions from road traffic vehicles through such measures as the introduction of low emission zones.

National Legislation and Policy

Environment Act, 1995

2.5 The Environment Act 1995[8] requires the UK Government and the devolved administrations to produce a national air quality strategy containing standards, objectives and measures for improving ambient air quality and to keep these policies under review.

2.6 The UK Government and the devolved administrations published the latest Air Quality Strategy for England, Scotland, Wales and Northern Ireland on 17 July 2007[9]. The Strategy provides an over-arching strategic framework for air quality management in the UK by way of the following:

- Setting out a way forward for work and planning on air quality issues;
- Setting out the air quality standards and objectives to be achieved;
- Introducing a new policy framework for tackling fine particles; and
- Identifying potential new national policy measures which modelling indicates could give further health benefits and move closer towards meeting the Strategy's objectives.

2.7 With regard to this assessment, the Air Quality Strategy contains national air quality standards and objectives established by the Government to protect human health. The objectives for nitrogen dioxide and particulates (PM_{10} and $PM_{2.5}$) have been set, along with seven other pollutants (benzene, 1,3-butadiene, carbon monoxide, lead, PAHs, sulphur dioxide and ozone). Those which are limit values required by EU Daughter Directives on Air Quality have been transposed into UK law through the Air Quality Standards Regulations 2010 which came into force on 11th June 2010. Table 2.1 provides the UK Air Quality Objectives for NO_2, PM_{10} and $PM_{2.5}$.

2.8 Objectives for $PM_{2.5}$ were also introduced by the UK Government and the Devolved Administrations in 2010. However, the Air Quality Strategy has adopted an 'exposure reduction' approach for $PM_{2.5}$ in order to seek a more efficient way of achieving further reductions in the health effects of air pollution by providing a driver to improve air quality everywhere in the UK rather than just in a small number of localised hotspot areas. As such, no further consideration has been given to $PM_{2.5}$ within this assessment.

[7] Defra, 2017. Improving air quality in the UK: tackling nitrogen dioxide in our towns and cities Draft UK Air Quality Plan for tackling nitrogen dioxide. Defra.
[8] Environment Act, 1995, The Stationery Office Limited.
[9] Department for Environment, Food and Rural Affairs, 2007. Air Quality Strategy for England, Scotland, Wales and Northern Ireland. HMSO.

Table 2.1: UK Air Quality Objectives for Nitrogen Dioxide and Particulate Matter

Pollutant	Objective	Concentration measured as
Particles (PM_{10})	50µg/m^3 not to be exceeded more than 35 times a year	24 hour mean
	40µg/m^3	Annual mean
Particles ($PM_{2.5}$)	25µg/m^3 (except Scotland)	Annual Mean
Nitrogen Dioxide (NO_2)	200µg/m^3 not to be exceeded more than 18 times a year	1 hour mean
	40µg/m^3	Annual mean

National Planning Policy Framework, 2012

2.9 On a national level, air quality can be a material consideration in planning decisions. The NPPF for England[10], released on 27 March 2012, is considered a key part of the Governments reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth. The NPPF replaces the Planning Policy Statement 23 (PPS23) Planning and Pollution Control[11].

2.10 The NPPF states that the "planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability".

2.11 It goes on to state that "planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan".

Planning Practice Guidance

2.12 The NPPF is supported by a series of PPG[12]. The PPG in relation to air quality provides guiding principles on how planning can take account of the impact of new development on air quality.

2.13 The PPG sets out the information that may be required in an air quality assessment, making clear that "…*assessments should be proportional to the nature and scale of development proposed and the level of concern about air quality*." It also provides guidance on options for mitigating air quality impacts, as well as examples of the types of measures to be considered. It makes clear that "…*mitigation options where necessary, will depend on the proposed development and should be proportionate to the likely impact.*"

[10] Department for Communities and Local Government, 2012. National Planning Policy Framework, London. HMSO.
[11] Office of the Deputy Prime Minister, 2004. Planning Policy Statement 23: Planning and Pollution Control.
[12] http://planningguidance.planningportal.gov.uk/blog/guidance/air-quality/

Regional Policy

The London Plan Spatial Development Strategy for London Consolidated with Alterations since 2011, 2016

2.14 In March 2016, the updated London Plan was published by the GLA[13]. The London Plan provides an overall strategic plan for London, setting out an integrated economic, environmental, transport and social framework for the development of London over the next 20–25 years. The Plan brings together the geographic and locational aspects of the Mayor's other strategies, including a range of environmental issues such as climate change (adaptation and mitigation), air quality, noise and waste.

2.15 Policy '7.14 - Improving Air Quality' relates specifically to improving air quality and states the following:

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

It goes on to state the following with regards to planning decisions:

"Development proposals should:

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

b) *promote sustainable design and construction to reduce emissions from the demolition and construction of buildings following the best practice guidance in the GLA and London Councils' 'The control of dust and emissions from construction and demolition'*

c) *be at least 'air quality neutral' and not lead to further deterioration of existing poor air quality (such as areas designated as Air Quality Management Areas (AQMAs))*

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

[13] Greater London Authority, 2016. The London Plan Spatial Development Strategy for Greater London consolidated with alterations since 2011. London. GLA.

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

2.16 Policy '5.3 - Sustainable design and construction' states that development proposals should demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and ensure that they are considered at the beginning of the design process. Major development proposals should meet the minimum standards outlined in the Mayor's supplementary planning guidance (SPG) and this should be clearly demonstrated within a design and access statement. The standards include measures to achieve other policies in this Plan and the following sustainable design principles:

- "*minimising carbon dioxide emissions across the site, including the building and services (such as heating and cooling systems);*
- *avoiding internal overheating and contributing to the urban heat island effect;*
- *efficient use of natural resources (including water), including making the most of natural systems both within and around buildings; and*
- *minimising pollution (including noise, air and urban run-off)".*

London Local Air Quality Management, 2016

2.17 Air Quality in London is devolved to the Mayor of London, who has a supervisory role, with powers to intervene and direct local authorities in Greater London under Part IV of the Environment Act 1995. In support of these devolved powers, the Mayor has established a London-specific LAQM system (LLAQM)[14] for the effective and coordinated discharge of their respective responsibilities under Part IV of the Act.

2.18 At the core of LLAQM delivery are three pollutant objectives; these are: nitrogen dioxide (NO_2), particulate matter (PM_{10}) and sulphur dioxide (SO_2). All current Air Quality Management Areas (AQMAs) across the UK are declared for one or more of these pollutants, with NO_2 accounting for the majority. In Greater London, AQMAs are declared for NO_2 and PM_{10} in equal proportions. It is a statutory requirement for local authorities to regularly review and assess air quality in their area and take action to improve air quality when objectives set out in regulation cannot be met.

2.19 The LBC has declared an AQMA that covers the entire administrative area for exceedances of the annual NO_2 objective and 24 hour PM_{10} objective, with the main source considered road transport.

2.20 In response to the AQMA declaration, the LBC has prepared an Air Quality Action Plan (AQAP), which was first published in 2016[15]. Actions to improve air quality across the LBC include the following:

- Monitor and report air quality across the borough;
- Implement air quality control measures through local planning policy;
- Impose a 20 mph speed limit across the borough (baring TfL roads); and
- Implement measures to encourage and enable active and alternative travel options.

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

[15] London Borough of Camden, 2016. Camden's Clean Air Action Plan 2016-2018. LBC

The Mayor's Air Quality Strategy 'Clearing the Air', 2010

2.21 The Mayor of London has set out a detailed air quality strategy[16] for Greater London in order to deliver the required reductions in PM_{10} and NO_2 concentrations to meet the EU limits. The policies and measures within the strategy are divided into transport and non-transport measures. With regard to the proposed development the key policies are as follows:

- Policy '6 - Reducing emissions from construction and demolition sites' which states that the Mayor will work with the London Council to review and update the Best Practice guidance for construction and demolition sites and create SPG to assist implementation;
- Policy '7 - Using the planning process to improve air quality' which states that new developments in London shall as a minimum be 'Air Quality Neutral' and that the Mayor will encourage boroughs to require emissions assessments to be carried out alongside conventional air quality assessments. Where air quality impacts are predicted to arise from developments these will have to be offset by developer contributions and mitigation measures secured through planning conditions, section 106 agreements or the Community Infrastructure Levy;
- Policy '8 - Maximising the air quality benefits of low to zero carbon energy supply' which states that the Mayor will apply emission limits for both PM and oxides of Nitrogen (NOx) for new biomass boilers and NOx emission limits for Combined Heat and Power plant (CHP). Air quality assessments will be required for all developments proposing biomass boilers or CHPs and operators will be required to provide evidence yearly to demonstrate compliance with the emission limits; and
- Policy '9 - Energy efficient buildings' which states that the Mayor will set CO_2 reduction targets for new developments which will be achieved using the Mayor's Energy Hierarchy. These measures will result in reductions of NOx emissions.

Control of Dust and Emissions during Construction and Demolition Supplementary Planning Guidance, 2014

2.22 This SPG[17] seeks to reduce emissions of dust and PM_{10} from construction and demolition activities in London. It also aims to manage emissions of nitrogen oxides (NOx) from construction and demolition machinery. The SPG:

- Provides more detailed guidance on the implementation of all relevant policies in the London Plan and the Mayor's Air Quality Strategy to neighbourhoods, boroughs, developers, architects, consultants and any other parties involved in any aspect of the demolition and construction process;
- Sets out the methodology for assessing the air quality impacts of construction and demolition in London; and
- Identifies good practice for mitigating and managing air quality impacts that is relevant and achievable, with the overarching aim of protecting public health and the environment.

[16] Greater London Authority, 2010. Clearing the Air - The Mayors London Air Quality Strategy. London. GLA.
[17] Greater London Authority, 2014. The Control of Dust and Emissions During Construction and Demolition, Supplementary Planning Guidance. London GLA

2.23 The principles of the SPG apply to all developments in London as their associated construction and demolition activity may all contribute to poor air quality unless properly managed and mitigated.

Sustainable Design and Construction SPG, 2014

2.24 This SPG[18] aims to support developers, local planning authorities and neighbourhoods to achieve sustainable development. It provides guidance on to how to achieve the London Plan objectives effectively, supporting the Mayor's aims for growth, including the delivery of housing and infrastructure.

2.25 In relation to air quality the SPG provides guidance on the following key areas:

- assessment requirements;
- construction and demolition;
- design and occupation;
- air quality neutral policy for buildings and transport; and
- emissions standards for combustion plant.

2.26 The principles of the SPG apply to all developments in London as their associated construction and demolition activity may all contribute to poor air quality unless properly managed and mitigated.

Local Policy

London Borough of Camden Core Strategy and Development Policies Document 2010-2025, 2010

2.28 The current Local Development Framework for LBC covers the period 2010 to 2025, and comprises the Core Strategy[19] and Development Policies[20] documents, which were both adopted by LBC in 2010. These documents set out LBC's vision for the future of the borough, including a variety of policies to guide new development.

2.29 The following Core Strategy policies are relevant to this assessment:

- CS9 - Achieving a successful Central London; and
- CS16 - Improving Camden's health and well-being.

2.30 The following Development policies are relevant to this assessment:

DP32 - Air quality and Camden's Clear Zone.

[18] Greater London Authority, 2015.Sustainable Design and Construction Supplementary Planning Guidance. London. GLA.
[19] London Borough of Camden, 2010. Core Strategy 2010-2025.
[20] London Borough of Camden, 2010. Camden Development Policies 2010-2025.

London Borough of Camden Draft Local Plan, 2015

2.31 Policy 'CC4 - Air Quality' within the Council's draft Local Plan relates specifically to air quality and states the following:

"The Council will take into account the impact of air quality when assessing development proposals, through the consideration of both the exposure of occupants to air pollution and the effect of a development on air quality.

2.32 Air Quality Assessments (AQAs) are required where development is likely to expose residents to high levels of air pollution. Where the AQA shows that a development would cause harm to air quality, the Council will not grant planning permission unless mitigation measures are adopted to reduce the impact to acceptable levels. Similarly, developments in locations of poor air quality will not be acceptable unless designed to mitigate the impact to within acceptable limits. Consideration must be taken to the actions identified in the Council's Air Quality Action Plan.

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

2.34 The Council will only grant planning permission for development in Camden's Clear Zone region that significantly increases travel demand where it considers that appropriate measures to minimise the transport impact of development are incorporated".

Camden Goods Yard Draft Planning Framework

2.35 It is the LBC's intention that the planning framework for Camden Goods Yard[21] will be adopted as a Supplementary Planning Document (SPD). In relation to air quality it states that "*new development should minimise its impact on local air quality and meet the GLA's proposed Air Quality Positive standard (and prior to its implementation the GLA Air Quality Neutral standard)*".

Guidance

Environmental Protection UK/Institute of Air Quality Management Guidance, Land-Use Planning Guidance, 2017

2.37 In January 2017, Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) produced guidance to ensure that air quality is adequately considered in the land-use planning and development control processes[22].

2.38 The guidance document is particularly applicable to assessing the effect of changes in exposure of members of the public resulting from residential and mixed-use developments, especially those within urban areas where air quality is poorer. It is also relevant to other forms of development where a proposal could affect local air quality and for which no other guidance exists.

[21] London Borough of Camden, 2017. Camden Goods Yard Draft Planning Framework.
[22] Institute of Air Quality Management and Environmental Protection UK, 2017. Land-Use Planning & Development Control: Planning for Air Quality.

Institute of Air Quality Management: Construction Dust Guidance, 2016 v1.1

2.39 Construction activities can result in temporary effects from dust. 'Dust' is a generic term which usually refers to particulate matter in the size range 1-75 microns in diameter; the most common impacts from dust emissions are soiling and increased ambient PM_{10} concentrations.

2.40 The Institute of Air Quality Management (IAQM) Construction Dust Guidance provides guidance to consultants and Environmental Health Officers (EHOs) on how to assess air quality effects from construction-related activities. The Construction Dust Guidance provides a method for classifying the likely scale of construction activities based on 'dust emission classes' (small, medium or large), and defining the risk of dust impacts due to the proximity of the site to the closest sensitive receptor and background PM_{10} concentrations in the area. Although the guidance provides criteria for the classification of dust classes, understanding that each site will be unique and a purely prescriptive approach to risk assessment would not be appropriate, the importance of professional judgement is noted throughout the Construction Dust Guidance. The guidance recommends that once the risk of dust impacts are identified appropriate mitigation measures are recommended and included within the Construction Environmental Management Plan (CEMP). The Construction Dust Guidance methodology is in line with The Control of Dust and Emissions during Construction and Demolition SPG.

Defra, Local Air Quality Management Technical Guidance (LAQM TG16), 2016

2.41 Defra, in association with devolved regional environmental protection agencies, has produced technical guidance[23] designed to support local authorities in pursuit of their duties under the Environment Act 1995. It provides the methodology by which key air pollutants such as NO_2, PM_{10} and $PM_{2.5}$ should be monitored, assessed and reported, and provides guidance on the actions to be taken by local authorities to improve local air quality. Whilst London has its own system of LAQM with guidance prepared by the Mayor of London, it in turn refers to this Technical Guidance.

[23] Department for Environment, Farming and Rural Affairs, 2016. Local Air Quality Management Technical Guidance (England) 2016 (TG16). HMSO.

3 CONSULTATION FEEDBACK

3.1 Consideration has been given in this assessment to the formal EIA Scoping Opinion and AQA scoping, and comments were provided by the LBC and consultees in respect of the proposed development. In addition, consultation has also taken place with the LBC Sustainability Officer. These key considerations are summarised as follows:

Table 3.1: AQA Scoping Consultation Feedback

Consultee	Comment	Where in the Report this comment is addressed
LBC	We accept the proposed scope and consider that the methodology has taken account of all relevant guidance. Additional comments are as follows: • Implications for any relevant non-residential uses proposed should be considered in addition to residential uses, particularly where possible short term exceedances apply. • Detailed dispersion modelling will need to be undertaken following the London Council's Air Quality Planning Guidance and LAQM TG. • Model verification should be based on latest LAQM TG. • Local monitoring data as well as background data should be used. • If a transport plan is prepared this should be incorporated into the assessment. • Time-varying traffic movements can be based on local information. • A detailed contour plot of the existing and predicted pollutant concentrations and scale of air quality change with sensitive receptors plotted on the map should be provided. • Any plume dispersion impacts of the development should be considered. • Non-road mobile machinery (NRMM) should be included in the construction impacts. • Real time monitoring will be required to monitor construction impacts.	• Non-residential receptors have not been assessed as annual mean concentrations (monitored and modelled) indicate that short term objectives would not be exceeded. • Modelling and model verification has been undertaken using relevant guidance. • Local monitoring data has been used to verify the model output. • Transport consultants to confirm whether modelled data includes measures contained within the Transport Plan. • Time-varying emissions have not been used as the assessment has focused on annual emissions and impacts. • Contour plots not produced as the predicted impacts at the modelled receptors clearly show the relevant impacts. • Plume dispersion has been undertaken for the CHP impacts. • Demolition and Construction: confirms that as part of the mitigation of construction impacts, all NRMM would meet the relevant standards defined within the London Demolition and Construction SPG. • The need for monitoring will be discussed with the Council based on the outcome of this assessment. The highest risk is associated with the demolition of the existing buildings but this will be relatively short term.

3.2 In consulting with the Sustainability Officer, the overall methodology for the assessment was agreed. It was requested that the Kentish Town Road monitoring site should be used for model verification purposes.

4 ASSESSMENT METHODOLOGY

4.1 This assessment considers the likely significant effects of the demolition of the existing buildings, and the construction and operation of the proposed development on the environment with respect to air quality. The key issues considered in this assessment are as follows:

- the potential impact on local air quality and on identified receptors from the demolition and construction activities at the application site;
- the potential impact of traffic and CHP emissions due to the proposed development at existing and proposed on-site receptors located adjacent to the modelled road network in 2024 when the development is completed;
- the introduction of new residential exposure on-site;
- the cumulative effects of the proposed development and cumulative development on local air quality and identified receptors; and
- determination of the development's air quality neutrality in relation to the transport emissions.

4.2 The methodologies adopted to assess these various components are outlined in the following sections.

Study Area

4.3 The study area comprises of the application site, the surrounding road network to the east of the application site where changes in the traffic volumes are anticipated (Chalk Farm Road) and incorporates new and existing sensitive receptors located within and adjacent to these locations. A 1 x 1 km area has also been modelled as part of the CHP assessment. This provides a sufficient modelled area to capture the largest modelled concentrations associated with the CHP emissions.

Baseline Characterisation

4.4 Existing or baseline ambient air quality refers to the concentrations of relevant substances that are already present in the environment; these are present from various sources such as industrial processes, commercial and domestic activities, agricultural activity and traffic sources.

4.5 The proposed development is located within an AQMA. The AQMA encompasses the whole Borough and has been declared for NO_2 (annual mean) and PM_{10} (24-hour). The proposed development is located outside the Camden Clear Zone.

4.6 In order to establish baseline air quality in the vicinity of the application site, relevant monitoring data has been reviewed and assessed. Data was obtained from a number of sources including the LBC's air quality monitoring data website[24] and Defra's background pollution maps[25].

[24] https://opendata.camden.gov.uk/stories/s/Camden-Air-Quality-Monitoring/bmrm-k7pv
[25] https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2013

Method of Assessment

Demolition and Construction

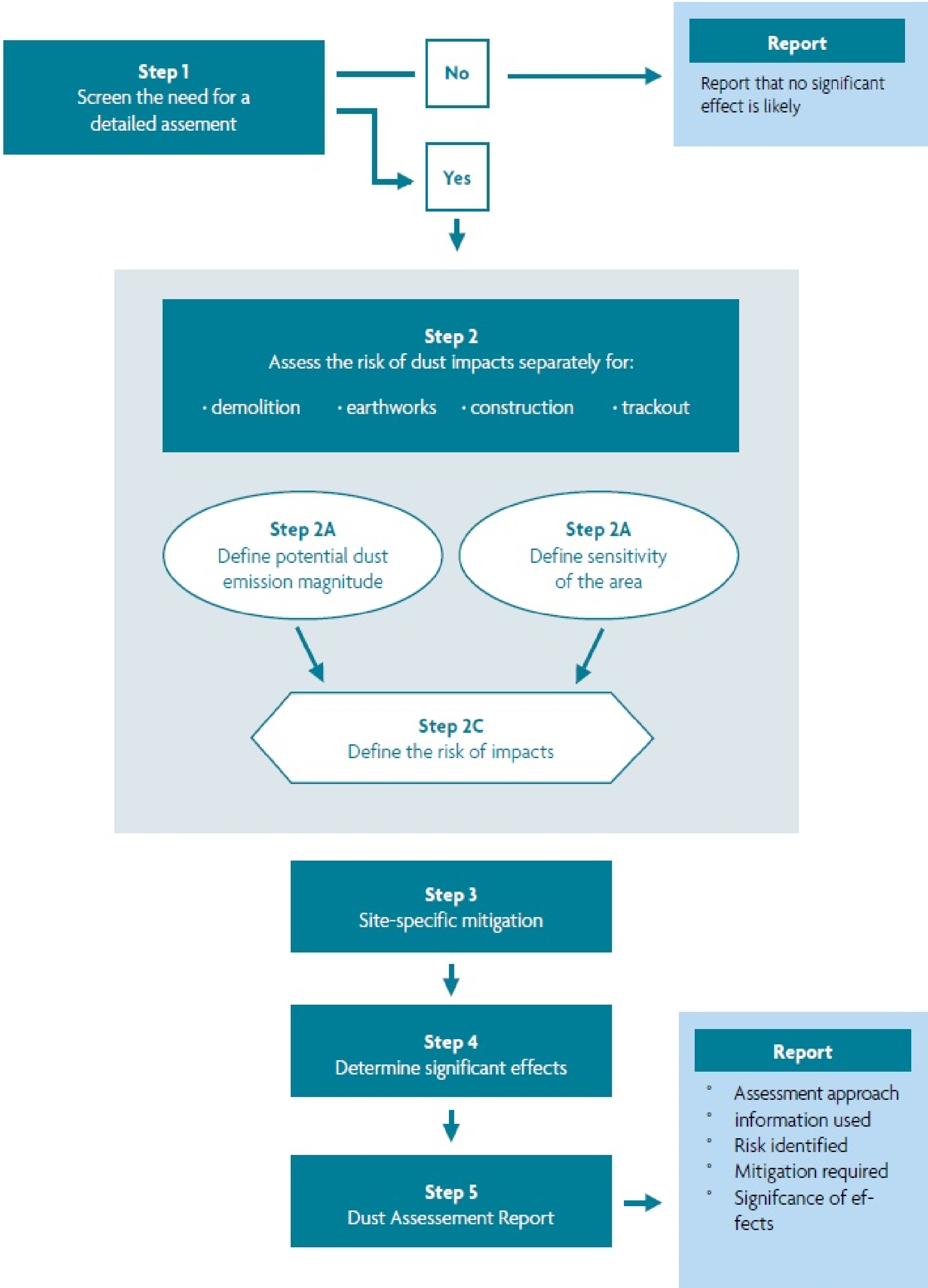
Dust Emissions

4.7 Using the London SPG, the construction activities were divided into four types in order to reflect their different potential impacts. These are as follows:

- Demolition;
- Earthworks;
- Construction; and
- Track out.

4.8 With regard to the proposed development, the potential for dust emissions was assessed for each activity that is likely to take place. As required by the demolition and construction SPG, the assessment procedure assumed no mitigation measures are applied. The conditions with no mitigation thus form the baseline or "do-nothing" situation for a construction site. The assessment procedure uses the steps provided in the guidance and summarised in Figure 4.1.

Figure 4.1: Dust Assessment Procedure



Traffic Emissions

4.9 The impacts of the demolition and construction traffic on local air quality has not been assessed quantitatively due to the inconsistent nature of construction traffic and its short-term impact. Notwithstanding this, the impact of track out has been assessed qualitatively as part of the demolition and construction impacts assessment and mitigation measures have been put forward in relation to the emissions of HDV traffic, primarily in relation to all mobile vehicles associated with the demolition and construction complying with the standards of the London Low Emission Zone (LEZ)

Completed Development

Traffic Emissions

Modelled Scenarios

4.10 A future year has been chosen for the assessment, along with the baseline year (2016) that corresponds with the latest year of monitoring data available from the LBC. The future year represents the assumed first full year following completion of the proposed development. Four scenarios have been modelled as part of the air quality assessment.

These are as follows:

- Current Baseline (2016);
- Future Baseline (2024);
- Future Baseline (2024) + Proposed Development Flows; and
- Future Baseline (2024) + Proposed Development + Cumulative Developments.

4.11 Traffic flows for these scenarios and cumulative scheme were extracted from the Transport Assessment.

4.12 The future scenarios was used to determine the potential impact on existing and proposed receptors adjacent to the modelled road network and on-site as a result of emissions associated with the proposed development in 2024.

ADMS-Roads

4.13 Modelling the impact of traffic emissions on the proposed development was undertaken using the latest version of the ADMS-Roads model[26]. ADMS-Roads is significantly more advanced than that of most other air dispersion models in that it incorporates the latest understanding of the boundary layer structure and goes beyond the simplistic *Pasquill-Gifford* stability categories method with explicit calculation of important parameters. The model uses advanced algorithms for the height-dependence of wind speed, turbulence and stability to produce improved predictions.

4.14 The model is described as a comprehensive tool for investigating air pollution problems due to small networks of roads that may be in combination with industrial and/or point sources, such as a CHP.

Emission Factors

4.15 The Department for Food and Rural Affair (Defra) and the Devolved Administrations have provided an updated Emission Factors Toolkit (Version 7.0) which incorporates updated

[26] Model Version: 4.1.1.0., Interface Version: 4.1.0 (16/02/2017)

NOx emissions factors and vehicle fleet information[27]. These emission factors were integrated into the latest ADMS-Roads modelling software. However, in order to undertake a worst-case assessment, emission factors for 2016 have been used for all modelled years.

Traffic Data

4.16 In respect of the completed development stage, a summary of the modelled traffic data used in the assessment is provided in Table 4.1. The A400 Kentish Town Road and A503 Camden Road have been modelled for the purposes of model verification in the current baseline year only. Traffic data for this link has been downloaded from the Department for Transport (DfT)[28].

4.17 The modelled speeds are also provided. These have been derived from the London Atmospheric Emissions Inventory (LAEI)[29]. However, where a link approaches a junction a speed of 20 kph has been modelled in order to account for slow moving traffic at the junction. This is in accordance with the London Local Air Quality Management Technical Guidance. It has been assumed that the vehicle speeds in 2024 would remain unchanged from the 2016 baseline data.

Table 4.1: Completed Development Modelled Traffic Data

Modelled Year/ Scenario	Link	Baseline flows			Future Baseline + Development Flows			Future Baseline + Development + HS2 Flows		
		24-Hr AADT	%HDV	Speed (kph)	24-Hr AADT	%HDV	Speed (kph)	24-Hr AADT	%HDV	Speed (kph)
Current Baseline (2016)	Chalk Farm Road (East)	11,345	8.4%	18						
	Chalk Farm Road (West)	9,981	6.9%	19						
	Juniper Cr	3,621	7.5%	48						
	Ferdinand St	2,478	10.9%	35						
	Camden Rd	29,874	7.7%	18						
	Kentish Town Rd	14,148	11.8%	17						
Year of Completion (2024)	Chalk Farm Road (East)	11,345	8.4%	18	11,488	9.5%	18	11,768	10.4%	18
	Chalk Farm Road (West)	9,981	6.9%	19	10,149	8.0%	19	10,289	8.6%	19
	Juniper Cr	3,621	7.5%	48	3,903	7.5%	48	4,323	11.6%	48
	Ferdinand St	2,478	10.9%	35	2,478	10.9%	35	2,478	10.9%	35

Street Canyons

4.18 A street canyon may be defined as a relatively narrow street with buildings on both sides. Street canyons may result in elevated pollutant concentrations from road traffic emissions due to a reduced likelihood of the pollutants becoming dispersed in the atmosphere. Street canyons have been considered as part of this assessment along the A400 Kentish Town Road and the A503 Camden Road.

27 https://laqm.defra.gov.uk/documents/EFT2016_v7.0.xlsb.zip
28 http://www.dft.gov.uk/traffic-counts/
29 Mayor of London, 2013. London Atmospheric Emissions Inventory (LAEI).

Surface Roughness

4.19 A surface roughness of 1.5 m has been used in the model. This value is provided by ADMS-Roads as a typical roughness length for a large conurbation. This value has been used across the modelled domain and reflects how air flow interacts with the urban landscape.

Background Concentrations

4.20 Background NOx, NO_2 and PM_{10} concentrations have been obtained from Defra[30]. These 1 km x 1 km grid resolution maps are derived from a base year of 2013, which are then projected to future years representing the modelled baseline (2016). Background concentrations of NOx, NO_2 and PM_{10} derived from Defra are provided in Table 4.2.

Table 8.4: Background Concentrations

Location	X	Y	Pollutant	2016
Proposed Development	528500	184500	NO_2	32.2
			NOx	53.2
			PM_{10}	20.0
Model Verification	529500	184500	NO_2	34.5
			NOx	58.1
			PM_{10}	20.8

NOx/NO_2 Relationship

4.21 Following recent evidence that shows the proportion of primary NO_2 in vehicle exhaust has increased[31]. As such, a new NOx to NO_2 calculator has been devised[32]. This new calculator has been used to determine NO_2 concentrations for this assessment, based on predicted NOx concentrations using ADMS-Roads. Converted NO_2 concentrations are initially compared to local monitoring data in order to verify the model output. If the model performance is considered unacceptable, then the NOx concentrations are adjusted before conversion to NO_2.

Meteorological Data

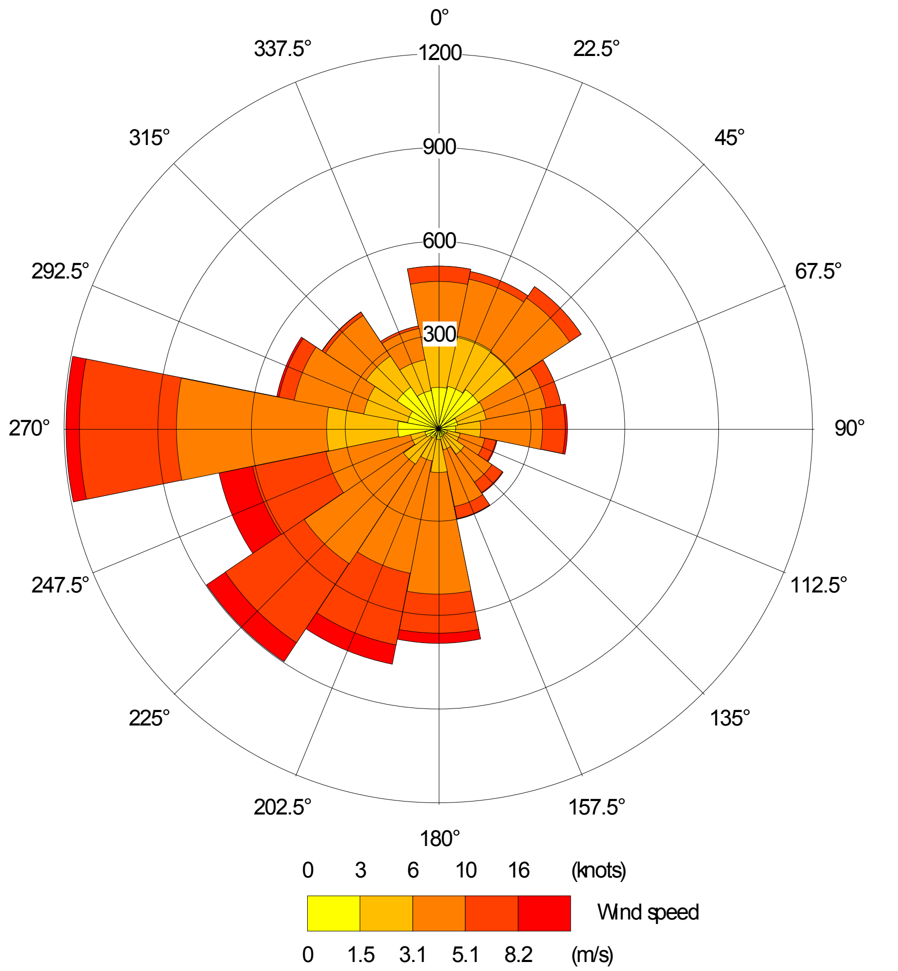
4.22 Hourly sequential meteorological data from Heathrow Airport has been used as this will characterise the meteorological conditions across the proposed development. Wind speed and direction data from Heathrow Airport has been plotted as a wind rose in Figure 4.2. The wind rose provides an indication as to the likely predominant wind direction across the application site.

30 http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2013

31 Trends in Primary Nitrogen Dioxide in the UK, Air Quality Expert Group, 2007

32 https://laqm.defra.gov.uk/documents/no2tonox9_ja-forweb_june2016.xls

Figure 4.2: Heathrow Airport Wind Rose, 2016



Model Output

4.23 It should be noted that the short-term impacts of NO_2 and PM_{10} emissions have not been modelled as dispersion models are inevitably poor at predicting short-term peaks in pollutant concentrations, which are highly variable from year to year, and from site to site. Notwithstanding this, general assumptions have been made about short term concentrations based on the modelled annual mean concentrations.

4.24 Research undertaken in 2003[33] has indicated that the hourly NO_2 objective is unlikely to be exceeded at a roadside location where the annual mean NO_2 concentration is less than 60 μg/m^3.

4.25 For PM_{10}, a relationship between the annual mean and the number of 24-hour mean exceedances has been devised and is as follows:

4.26 No. 24-hour mean exceedances = -18.5 + 0.00145 x annual mean3 + (206/annual mean)

4.27 This relationship has been applied to the modelled annual mean concentrations (traffic emissions only) in order to estimate the number of 24-hourly exceedances.

Model Verification

4.28 The LBC undertakes monitoring of NO_2 at a number of locations within the Borough. The location of the monitoring sites used for model verification site are provided in Table 4.3. The Kentish Town Monitoring site was used at the request of LBC.

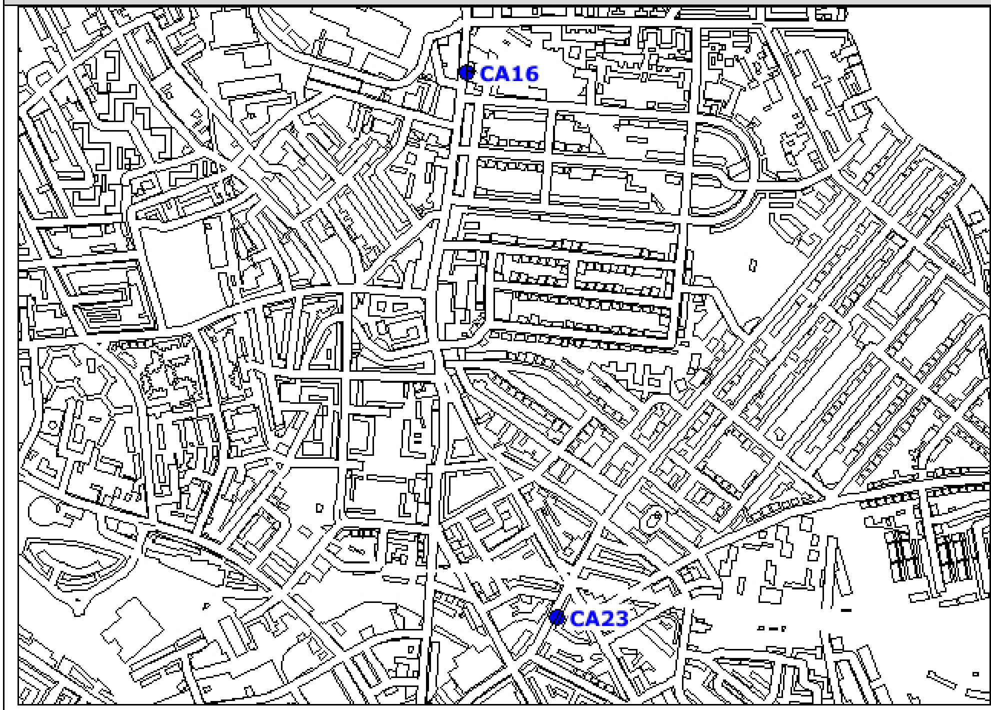
4.29 The location of these verification sites are provided in Figure 4.3.

Table 4.3: Model Verification Locations

Monitoring ID	**Location**	**X**	**Y**	**Height**
CA16	Kentish Town Road	529013	185102	2.5
CA23	Camden Road	529173	184129	2.5

[33] Analysis of Relationship between 1-Hour and Annual Mean Nitrogen Dioxide at UK Roadside and Kerbside Monitoring Sites, Laxen and Marner, 2003

Figure 4.3: Model Verification Locations



Receptor Locations

4.30 In order to assess the potential impact of the proposed development, a number of existing and proposed receptors have been identified adjacent to the modelled road network. These receptors represent the façade of the property. The existing receptors have been chosen given their proximity to the modelled road network. The location of these receptors is provided in Tables 4.4 and 4.5. The location of the modelled receptors is shown in Figures 4.4 and 4.5.

4.31 The receptors identified represent relevant exposure to air quality and are all considered to be highly sensitive uses for the purposes of this assessment, such as residential properties, schools, hospitals or care homes, and where the annual mean objectives apply. Not all receptors adjacent to a modelled road have been included in the assessment as the receptors selected will represent worst case locations e.g. closest to a road and/or modelled junction. Some existing receptors have been modelled at the first-floor level as the ground floor retail units do not represent relevant exposure.

Table 4.4: Existing Off-Site Modelled Receptor Locations

Assessment ID	X	Y	Height	Sensitivity of Receptor
R1	528649	184213	4.5	**High**
R2	528593	184253	4.5	
R3	528571	184265	4.5	
R4	528523	184282	4.5	
R5	528440	184308	4.5	
R6	528314	184347	4.5	
R7	528246	184378	4.5	
R8	528403	184234	1.5	
R9	528346	184193	1.5	

4.32 Local road traffic emissions will have the greatest impact across the proposed development. As such, the receptors identified as part of the proposed development reflect this e.g. ground floor receptors where the impact from traffic emissions will be greatest. . The receptors identified represent the facades of residential units. Children's play areas have not been modelled as they do not represent relevant exposure in relation to the annual mean objectives for NO_2 and PM_{10}. Given the location of the proposed development relative to the local road network the likelihood of the short-term objectives being exceeded at these locations is considered to be low.

Table 4.5: On-Site Modelled Receptor Locations

AQA ID	X	Y	Height	Sensitivity of Receptor	AQA ID	X	Y	Height	Sensitivity of Receptor
A1	528380	184168	1.5	**High**	**E1**	528460	184116	1.5	**High**
A2	528345	184162	1.5		**E2**	528477	184096	1.5	
A3	528358	184138	1.5		**E3**	528464	184085	1.5	
A4	528333	184134	1.5		**E4**	528447	184106	1.5	
B1	528432	184197	1.5		**E5**	528445	184099	1.5	
B2	528474	184155	1.5		**E6**	528451	184090	1.5	
B3	528437	184119	1.5		**E7**	528396	184060	1.5	
B4	528396	184160	1.5		**E8**	528403	184052	1.5	
C1	528477	184175	1.5		**F1**	528389	184148	1.5	
C2	528533	184171	1.5		**F2**	528426	184104	1.5	
C3	528532	184158	1.5		**F3**	528387	184071	1.5	
C4	528494	184139	1.5		**F4**	528350	184115	1.5	
D1	528537	184142	1.5		**G1**	528394	184300	1.5	
D2	528547	184122	1.5		**G2**	528420	184277	1.5	
D3	528531	184127	1.5		**G3**	528387	184268	1.5	
D4	528484	184116	1.5		**G4**	528361	184294	1.5	

Figure 4.4: Existing Modelled Receptor Locations

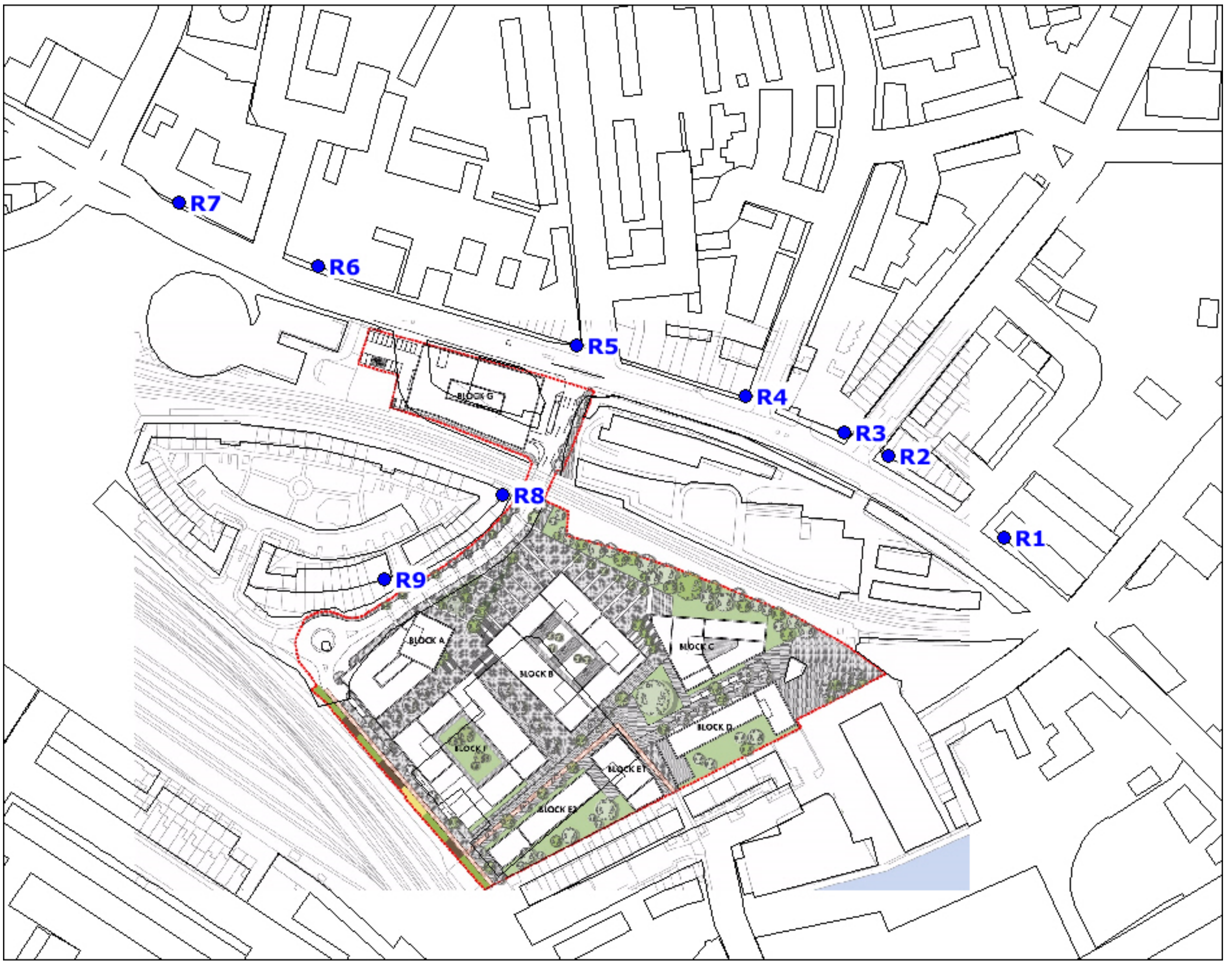
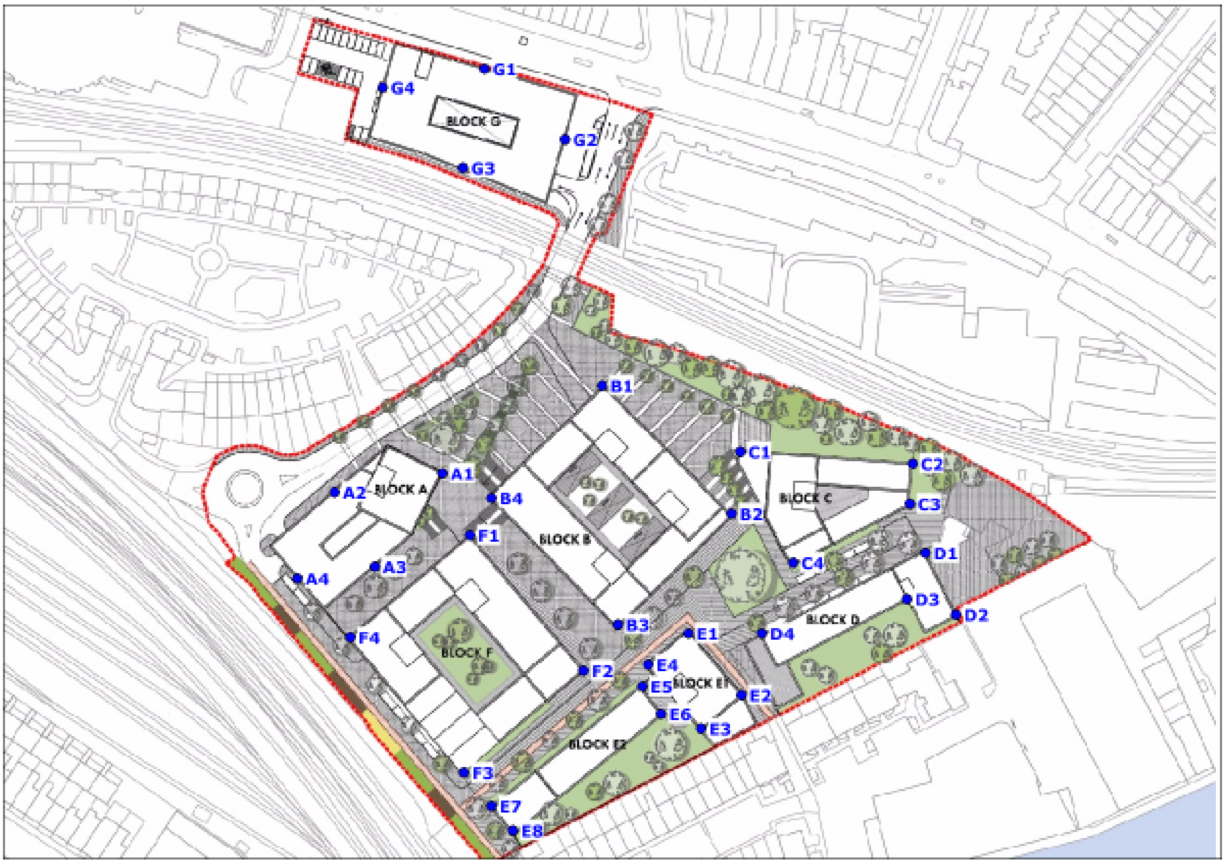


Figure 4.5: Proposed Modelled Receptor Locations



CHP Emissions

Model Output

4.33 Specifications relating to the proposed CHP are detailed in Table 4.6 and have been used in the assessment. The CHP flue is located at the roof level of Block A and would terminate 3.1 m above the roof level.

Table 4.6: Input Parameters for CHP

Input Parameter	Energ-E230 (Low NOx)
OS coordinates of stack (x,y)	528365, 184163
Stack height (m)	55
Stack diameter (m)	0.2
Exit Velocity (m/s)	8.3
Exit temperature (°C)	105
NOx Emission Rate (mg/Nm^3)	50.0

4.34 The six proposed Wessex ModuMax mk^3 boilers have not been modelled as they would only be operational for a maximum of 2 hours per day (600 hours annually for two boilers, 300 hours annually for other boilers). Furthermore, each boiler installed within the proposed development would meet the NOx emissions (40 mg/kWh) as defined within the Sustainable

Design and Construction SPG and these emissions have been considered as part of the Air Quality Neutral Assessment for building emissions contained within Appendix D of the Sustainable Design and Construction Assessment which accompanies this application.

4.35 The impact of the CHP has not been modelled across all floor-levels of the proposed development. This is due to the fact the traffic emissions would be the predominant emission source across the proposed development, with the highest concentrations predicted at ground floor level. Whilst the CHP process contribution would be greater with height above ground level, the Predicted Environment Concentration (PEC) would be lower due to the lower impact of vehicle emissions with height. As such, modelling the impact of the CHP at ground floor level presents a worst-case assessment in terms of the combined PEC of background concentrations plus vehicle and CHP emissions.

Emission Rates

4.36 For the purposes of this assessment, it will be assumed that the CHP would be operational 365 days per year at full load, representing the worst-case scenario. This is based on the continuous operation of the CHP and does not include any downtime due to system failures and/or maintenance. Emission rates from the proposed CHP are detailed in Table 4.6.

NOx/NO_2 Relationship

4.37 For NOx emissions from the CHP plant, the conversion to NO_2 was calculated using EA guidance for calculating NO_2 from NOx concentrations. Short term NO_2 concentrations are taken to be 50 % of the NOx concentrations and long term NO_2 concentrations are taken to be 70 % of the NOx concentrations.

Meteorological Data

4.38 Emissions from the CHP have been modelled using the same meteorological data described earlier in this report.

Significance Criteria

Demolition and Construction

Dust Emissions

4.39 The risk of dust arising in sufficient quantities to cause annoyance and/or health impacts have been determined using four risk categories: negligible, low, medium and high. A development is allocated to a risk category based on two factors:

- the scale and nature of the works which determines the potential dust emission magnitude as small, medium or large (see Table 8.7); and
- the sensitivity of the area to dust impacts, which is defined as low, medium or high sensitivity.

4.40 These two factors have been combined to determine the risk of dust impacts with no mitigation applied (see Table 4.8). The risk category assigned to the proposed development can be different for each of the four potential activities (demolition, earthworks, construction and track out).

Table 4.7: Dust Emission Magnitude

Activity	**Dust Emission Class**		
	Large	**Medium**	**Small**
Demolition	Total building volume >50,000 m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >20 m above ground level	Total building volume 20,000 – 50 000m^3, potentially dusty construction material, demolition activities 10-20 m above ground level	Total building volume <20,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10m above ground, demolition during wetter months
Earthworks	Total site area >10,000 m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height, total material moved >100,000 tonnes	Total site area 2,500 – 10,000 m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4 m - 8 m in height, total material moved 20,000 tonnes – 100,000 tonnes	Total site area <2,500 m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <10,000 tonnes, earthworks during wetter months
Construction	Total building volume >100,000 m^3, piling, on site concrete batching; sandblasting	Total building volume 25,000 m3 – 100,000 m^3, potentially dusty construction material (e.g. concrete), piling, on site concrete batching	Total building volume <25,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber)
Track out	>50 HDV (>3.5t) trips in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m	10 – 50 HDV (>3.5t) trips in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50m – 100 m;	<10 HDV (>3.5t) trips in any one day, surface material with low potential for dust release, unpaved road length <50 m.

Table 4.8: Risk of Dust Impacts				
Construction Activity	**Sensitivity of 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	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible
Construction	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible
Track Out	High	High Risk	Low Risk	Low Risk
	Medium	Medium Risk	Low Risk	Negligible
	Low	Low Risk	Low Risk	Negligible

Completed Development

Traffic Emissions

4.41 The joint guidance released by EPUK and the IAQM provides impact descriptors for individual receptors. These descriptors are provided in Table 4.9.

Table 4.9: Impact Descriptors for Individual Receptors				
Long term average concentration at receptor in assessment year	**% Change in concentration relative to AQ objective**			
	1%	**2-5%**	**6-10%**	**>10%**
75% or less of AQ objective	Negligible	Negligible	Slight	Moderate
76-94% of AQ objective	Negligible	Slight	Moderate	Moderate
95-102% of AQ objective	Slight	Moderate	Moderate	Substantial
103-109% of AQ objective	Moderate	Moderate	Substantial	Substantial
110% or more of AQ objective	Moderate	Substantial	Substantial	Substantial

CHP Emissions

4.42 The significance of the CHP emissions have been considered in the context of the overall air quality impacts (including background concentrations and vehicle emissions) and compared to the significance criteria provided in Table 4.9.

Assumptions and Limitations

4.43 There are many elements within an Air Quality assessment that generate uncertainty within the modelled results. The inherent uncertainties associated with the modelled traffic data are likely to have the greatest impact on the outcome of the assessment.

4.44 There are also uncertainties associated with the vehicle emission factors used throughout the assessment. Recent analyses of historical monitoring data have identified a disparity between the measured concentrations and the projected decline in concentrations associated with vehicle emissions forecasts. As such, there is little evidence of a consistent downward trend in either NO_x or NO_2 concentrations that would be suggested by emission inventory estimates. As such, the assessment has assumed emission rates from 2016 for all modelled years in the event that future emissions do not decrease.

4.45 The uncertainties associated with vehicle emissions can also be applied to background concentrations, which have not declined as anticipated. As such, the assessment has utilised the background concentrations from 2016 for all modelled years.

4.46 Given the assumptions and limitations discussed above the need to undertake model verification becomes more important. Given that this assessment has undertaken model verification at a number of verification sites the baseline data is considered to be robust.

5 BASELINE CONDITIONS

Current Baseline

5.1 The current baseline includes vehicle flows to and from the existing Morrisons supermarket and PFS. The supermarket has parking for 425 vehicles.

Model Verification

5.2 Using the guidance provided in the London Local Air Quality Management Technical Guidance TG (16), the modelled output has been verified against the monitoring data obtained from the monitoring site located along Kentish Town Road and Camden Road see Figure 4.3). Tables 5.1 – 5.2 provide a summary of the model verification process for NO_2. It has not been possible to verify the modelled PM_{10} concentrations as there are no monitoring sites adjacent to the modelled network.

Table 5.1: Comparison of Modelled and Monitored NO_2 Concentrations (μg/m^3)

Verification Location / ID	Modelled Concentration	Monitored Concentration	Difference: [(modelled - monitored)/ monitored] x100
CA16	50.0	57.9	-13.6%
CA23	56.2	61.7	-8.9%

5.3 As described in the Technical Guidance (LLAQM.TG16), in order to provide more confidence in the model predictions and the decisions based on these, the majority of results should be within ±25% (ideally ±10%) of the monitored concentrations. In order to improve the confidence in modelled NO_2 concentrations across the modelled domain the model output was adjusted. This is described further in the next section.

Model Adjustment

5.4 In order to undertake model adjustment, it is first necessary to derive the monitored and modelled road contributions of NOx (excluding background). The modelled road contribution NOx is taken directly from the ADMS-Roads output before it has been converted to NO_2 using the NOx to NO_2 calculator described earlier in this report. The NOx to NO_2 calculator can also be used to derive monitored road contributions of NOx from NO_2 diffusion tube results. A summary of these calculations is provided in Table 5.2.

Table 5.2: Monitored NOx and NO_2 concentrations

Verification Location / ID	Monitored Total NO_2	Defra Background NO_2	Monitored road contribution NO_2 (total – background)	Monitored road contribution NOx (total – background)	Modelled road contribution NOx (excludes background)	Ratio of monitored road contribution NOx / modelled road contribution NOx
CA16	57.9	34.5	23.4	58.7	37.0	1.6
CA23	61.7	34.5	27.2	69.9	53.8	1.3
					Average	1.4

5.5 Once the monitored and modelled road contributions of NOx (excluding background) have been derived the contributions of NOx are compared and a ratio derived. In this case the ratio is 1.4 and this factor has been used to adjust the modelled road contribution of NOx. This is shown in Table 8.12.

Table 5.3: Adjustment of Modelled NOx Contributions

Verification Location / ID	Adjustment factor for modelled road contribution	Adjusted modelled road contribution NOx	Modelled total NO_2 (based on empirical NOx/NO_2 relationship)	Monitored total NO_2	% Difference [(modelled – monitored) / monitored] x 100
CA16	1.4	51.8	55.5	57.9	-4.2%
CA23	1.4	75.4	63.5	61.7	2.9%

5.6 Following adjustment of the modelled NOx concentrations by a factor of 1.4 the total NO_2 concentration at the model verification location has been calculated using the method described earlier in this report. The revised NO_2 concentration, shown in Table 8.12, indicates a more acceptable model performance when compared against the monitored NO_2 concentrations. As such, an adjustment factor of 1.4 has been applied to all modelled NOx concentrations across the model domain before conversion to NO_2.

Existing Air Quality

5.7 Predicted annual mean concentrations for NO_2 and PM_{10} at the existing receptors listed in Table 5.1 are provided in Table 5.2. Predicted concentrations in 2016 are below the relevant air quality objectives at all existing receptors.

Table 5.1: Predicted Annual Mean NO_2 and PM_{10} Concentrations (µg/m^3) at Existing Receptors, 2016

Receptor	NO_2		PM_{10}	
	Annual Mean	% of AQ Objective	Annual Mean	% of AQ Objective
R1	36.3	90.6%	21.2	52.9%
R2	35.9	89.8%	21.1	52.8%
R3	35.8	89.6%	21.1	52.8%
R4	36.4	91.0%	21.2	52.9%
R5	36.3	90.8%	21.2	52.9%
R6	35.4	88.5%	21.1	52.7%
R7	35.2	88.0%	21.1	52.7%
R8	34.6	86.4%	21.0	52.5%
R9	33.7	84.3%	20.9	52.3%

Future Baseline

5.8 Predicted annual mean concentrations for NO_2 and PM_{10} at the existing receptors listed in Table 5.1 are provided in Table 5.2. Predicted concentrations in 2024 are below the relevant air quality objectives at all existing receptors.

Table 5.2: Predicted Annual Mean NO_2 and PM_{10} Concentrations (μg/m³) at Existing Receptors, 2024

Receptor	NO_2		PM_{10}	
	Annual Mean	% of AQ Objective	Annual Mean	% of AQ Objective
R1	36.3	90.6%	21.2	52.9%
R2	35.9	89.8%	21.1	52.8%
R3	35.8	89.6%	21.1	52.8%
R4	36.4	91.0%	21.2	52.9%
R5	36.3	90.8%	21.2	52.9%
R6	35.4	88.5%	21.1	52.7%
R7	35.2	88.0%	21.1	52.7%
R8	34.6	86.4%	21.0	52.5%
R9	33.7	84.3%	20.9	52.3%

Sensitive Receptors

Existing Sensitive Receptors

5.9 These are defined within Table 4.4 and shown in Figure 4.3. No ecological receptors were identified or assessed as part of this report.

New Sensitive Receptors

5.10 These are defined within Table 4.5 and shown on Figure 4.4.

6 POTENTIAL IMPACTS AND LIKELY EFFECTS

Demolition and Construction Effects

6.1 In the absence of mitigation, there are two potential significant sources of emissions that could affect air quality during demolition and construction works:

- coarse and fine dust from construction activities including excavation, earthmoving, materials storage and movement of construction vehicles;
- construction plant, both mobile and stationary (e.g. cranes and generators), which emit a mixture of exhaust gases; and
- the potential impact of exhaust emissions from demolition and construction related traffic.

6.2 In term of Demolition and Construction Environmental Management, the proposed development works would be sequenced as follows:

- PFS parcel Enabling, Demolition, Construction of the PFS Block and Fit Out for temporary supermarket use at ground floor and offices above; MS parcel fully operational;
- PFS parcel operational as temporary supermarket and office use (on-site receptors); MS parcel Enabling, Demolition and Construction of Blocks A,B,C; and
- PFS parcel conversion of the PFS Block from temporary supermarket to a PFS; MS parcel supermarket operational, Blocks B and C near complete with Blocks A, D, E1, E2 and F under construction.

6.3 There are a numerous off-site residential properties within 350 m of the application site and within 50 m of the routes proposed to be used by construction traffic. In addition early phases of the proposed development (Blocks B and C) would be occupied whilst work on latter phases are ongoing. Thus using the IAQM guidance, a detailed assessment of construction impacts is required.

Embedded Mitigation

6.4 Whilst it is acknowledge that best practice measures would be adopted in managing emissions from the demolition and construction works, and have been considered in the as embedded mitigation, the Demolition and Construction SPG requires the assessment of demolition and construction effects to be undertaken without consideration of mitigation.

Dust Emissions

6.5 The assessment of construction activities has focused on demolition, earthworks, construction and track out activities at the application site. Using the criteria provided in Table 6.1 the dust emission magnitude for each activity is as follows:

- Demolition = Small
- Earthworks = Large
- Construction = Large
- Track Out = Medium

6.6 Based on the London Plan SPG guidance the sensitivity of the on-site receptors and surrounding area is summarised in Table 6.1.

Table 6.1: Sensitivity of the Surrounding Area

Potential Impact	Activity			
	Demolition	**Earthworks**	**Construction**	**Track Out**
Dust Soiling	Medium	Medium	Medium	Medium
Human Health	Low	Low	Low	Low

6.7 The dust emission magnitudes and sensitivity of the on-site receptors and surrounding area are combined to determine the risk of dust impacts with no mitigation applied. These are summarised in Table 6.2.

Table 6.2: Summary of Dust Risk

Potential Impact	Activity			
	Demolition	**Earthworks**	**Construction**	**Track Out**
Dust Soiling	Low Risk	Medium Risk	Medium Risk	Low Risk
Human Health	Negligible	Low Risk	Low Risk	Low Risk

6.8 On the basis of the above, the likely effect of the proposed development in respect of dust would be significant at off-site receptors and at occupied phased units on-site.

Traffic Emissions

6.9 As indicated in the Assessment Methodology section, the impacts of the demolition and construction traffic emissions on local air quality has not been assessed quantitatively due to the inconsistent nature of construction traffic and its short-term impact. Notwithstanding this, the impact of track out has been assessed qualitatively as part of the demolition and construction impacts assessment and mitigation measures have been put forward in relation to the emissions of HDV traffic, primarily in relation to all mobile vehicles associated with the demolition / construction complying with the standards of the London Low Emission Zone (LEZ)

Completed Development

6.10 Operational impacts on local air quality would primarily arise from exhaust emissions associated with vehicle movements generated as a result of the proposed development. Emissions from road traffic are the major contributor to poor air quality in urban areas within the UK and could contribute to exceedance of the current air quality objectives within the vicinity of the application site. Accordingly, the likely effects associated with vehicle trips generated by the proposed development have been considered within this assessment.

6.11 Existing (or projected) air quality can also impact the occupants of the proposed development, through the introduction of new sensitive receptors into an area of poor air quality.

6.12 Air emissions can arise from on-site energy generating plant associated with electricity, heating, hot water and cooling systems, with the significance of emissions depending on the choice of plant and fuel.

Embedded Mitigation

6.13 Embedded mitigation measures included within the modelled development flows are provided in the Transport Assessment submitted with the application. These include Travel Plans for the residential and commercial elements of the proposed development to minimise the reliance on single-occupancy car trips and promote non-car travel. Emissions from the proposed CHP include the use of selective catalytic reduction (SCR), which reduce NOx emissions from the CHP.

Traffic Emissions

Nitrogen Dioxide ($N0_2$)

6.14 Predicted annual mean concentrations for NO_2 at existing receptors in 2024 are provided in Table 6.3. The change in predicted concentrations at existing receptors has also been provided, together with the effect rating for each receptor.

Table 6.3: Predicted Annual Mean NO_2 Concentrations (μg/m^3) at Existing Off-Site Receptors, Proposed Development Traffic Only (2024)

Receptor	Future Baseline	Future Baseline + Proposed Development	% of AQ Objective	Change	% Change	Impact
R1	36.3	36.3	90.8%	0.0	0.0%	Negligible
R2	35.9	36.0	90.0%	0.1	0.3%	Negligible
R3	35.8	35.9	89.8%	0.1	0.3%	Negligible
R4	36.4	36.5	91.3%	0.1	0.3%	Negligible
R5	36.3	36.4	91.0%	0.1	0.3%	Negligible
R6	35.4	35.4	88.5%	0.0	0.0%	Negligible
R7	35.2	35.3	88.3%	0.1	0.3%	Negligible
R8	34.6	34.7	86.8%	0.1	0.3%	Negligible
R9	33.7	33.8	84.5%	0.1	0.3%	Negligible

6.15 When comparing the predicted NO_2 concentrations in 2024 with and without the proposed development alone, the effect of development traffic is considered **negligible** at all modelled existing receptors. Overall, the effect of the proposed development traffic on existing receptors would not be significant.

6.16 Predicted annual mean concentrations for NO_2 at proposed receptors in 2024 are provided in Table 6.4.

Table 6.4: Predicted Annual Mean NO_2 Concentrations (µg/m^3) at On-Site Receptors, Proposed Development Traffic Only (2024)

Receptor	Future Baseline + Proposed Development	% of AQ Objective	Receptor	Future Baseline + Proposed Development	% of AQ Objective
A1	33.8	84.5%	**E1**	32.9	82.3%
A2	34.5	86.3%	**E2**	32.8	82.0%
A3	33.2	83.0%	**E3**	32.8	82.0%
A4	33.1	82.8%	**E4**	32.9	82.3%
B1	33.8	84.5%	**E5**	32.8	82.0%
B2	33.2	83.0%	**E6**	32.8	82.0%
B3	32.9	82.3%	**E7**	32.7	81.8%
B4	33.4	83.5%	**E8**	32.7	81.8%
C1	33.3	83.3%	**F1**	33.2	83.0%
C2	33.4	83.5%	**F2**	32.8	82.0%
C3	33.3	83.3%	**F3**	32.7	81.8%
C4	33.1	82.8%	**F4**	32.9	82.3%
D1	33.2	83.0%	**G1**	37.8	94.5%
D2	33.1	82.8%	**G2**	36.3	90.8%
D3	33.1	82.8%	**G3**	34.4	86.0%
D4	32.9	82.3%	**G4**	35.0	87.5%

6.17 In terms of introducing new exposure, the predicted concentrations across the proposed on-site receptors are below the relevant objectives for NO_2. Overall, the impact of NO_2 concentrations across the proposed development would be **Negligible**.

Particulate Matter (PM_{10})

6.18 Predicted annual mean concentrations for PM_{10} at existing receptors in 2024 are provided in Table 6.5. The change in predicted concentrations at existing receptors has also been provided, together with the effect rating for each receptor.

Table 6.5: Predicted Annual Mean PM_{10} Concentrations (μg/m^3) at Existing Off-Site Receptors, Proposed Development Traffic Only (2024)

Receptor	Future Baseline	Future Baseline + Proposed Development	% of AQ Objective	Change	% Change	Impact
R1	21.2	21.2	53.0%	0.0	0.0%	Negligible
R2	21.1	21.1	52.8%	0.0	0.0%	Negligible
R3	21.1	21.1	52.8%	0.0	0.0%	Negligible
R4	21.2	21.2	53.0%	0.0	0.0%	Negligible
R5	21.2	21.2	53.0%	0.0	0.0%	Negligible
R6	21.1	21.1	52.8%	0.0	0.0%	Negligible
R7	21.1	21.1	52.8%	0.0	0.0%	Negligible
R8	21.0	21.0	52.5%	0.0	0.0%	Negligible
R9	20.9	20.9	52.3%	0.0	0.0%	Negligible

6.19 When comparing the predicted PM_{10} concentrations in 2024 with and without the proposed development alone the effect of development traffic is considered **negligible** at all modelled existing receptors. Overall, the effect of the proposed development traffic on existing receptors would not be significant.

6.20 Predicted annual mean concentrations for PM_{10} at proposed on-site receptors in 2024 are provided in Table 6.6.

Table 6.6: Predicted Annual Mean PM_{10} Concentrations ($\mu g/m^3$) at Proposed On-Site Receptors, Proposed Development Traffic Only (2024)

Receptor	Future Baseline + Proposed Development	% of AQ Objective	Receptor	Future Baseline + Proposed Development	% of AQ Objective
A1	20.9	52.3%	**E1**	20.9	52.3%
A2	21.0	52.5%	**E2**	20.9	52.3%
A3	20.9	52.3%	**E3**	20.9	52.3%
A4	20.9	52.3%	**E4**	20.9	52.3%
B1	20.9	52.3%	**E5**	20.9	52.3%
B2	20.9	52.3%	**E6**	20.9	52.3%
B3	20.9	52.3%	**E7**	20.8	52.0%
B4	20.9	52.3%	**E8**	20.8	52.0%
C1	20.9	52.3%	**F1**	20.9	52.3%
C2	20.9	52.3%	**F2**	20.9	52.3%
C3	20.9	52.3%	**F3**	20.8	52.0%
C4	20.9	52.3%	**F4**	20.9	52.3%
D1	20.9	52.3%	**G1**	21.3	53.3%
D2	20.9	52.3%	**G2**	21.2	53.0%
D3	20.9	52.3%	**G3**	21.0	52.5%
D4	20.9	52.3%	**G4**	21.1	52.8%

6.21 In terms of introducing new exposure, the predicted concentrations across the proposed on-site receptors are below the relevant objectives for PM_{10}. Overall, the impact of PM_{10} concentrations across the proposed development is considered **negligible**, which is not significant.

Air Quality Neutral Assessment (Transport Emissions)

6.22 Policy 7.14 within the London Plan states that every "*major*" development in Greater London be at least "*air quality neutral*" and not lead to further deterioration of existing poor air quality.

6.23 The air quality neutral assessment has followed the methodology outlined in the Sustainable Design and Construction SPG and the Air Quality Neutral Planning Support Update[34]. Within these documents, benchmarks have been provided in relation to Transport emissions, together with a methodology for calculating the building related emissions for a particular development.

[34] Greater London Authority, 2014. Air Quality Neutral Planning Support Update: GLA 80371,

6.24 The completed development would generate 2,953 trips per day from the supermarket (2% HDV), 1,858 from the petrol station (1% HDV), 207 from the residential units (9% HDV) and 75 from the office use. No Transport Emission Benchmarks (TEBs) are provided for the supermarket and petrol station. As such, these have been removed from the air quality neutral calculations. For the residential and office uses the total trips per annum and associated emissions are as follows:

Residential (C3):

- Total trips per annum = 207 * 365 = 75,555;
- The NOx emission factor is 0.370 g/veh-km and thus the **Residential Transport NOx Emission** is (75,555 * 0.370) = **28.0 kg/annum**
- The PM_{10} emission factor is 0.0665 g/veh-km and thus the **Residential Transport PM_{10} Emissions** is (75,555 * 0.0665) = **5.0 kg/annum**.

Commercial (B1):

- Total trips per annum = 75 * 365 = 27,375;
- The NOx emission factor is 0.370 g/veh-km and thus the **B1 Transport NOx Emission** is (27,375 * 0.370) = **10.1 kg/annum**
- The PM_{10} emission factor is 0.0665 g/veh-km and thus the **B1 Transport PM_{10} Emissions** is (27,375 * 0.0665) = **1.8 kg/annum**.

Based on these calculations, the total development emissions are as follows:

- Total Transport NOx Emission = **38.1 kg/annum**
- Total Transport PM_{10} Emission = **6.8 kg/annum**

6.25 The Transport Emissions Benchmarks (TEBs) are calculated by multiplying the relevant emission benchmarks by the number of residential properties or floor space?] for office use:

Nitrogen Dioxide:

- TEB NOx = 558 g/dwelling/annum * 750 units = **419.0 kg/annum**
- TEB NOx = 11.4 g/m^2/annum * 10,681m^2 = **121.8 kg/annum**

Particulate Matter:

- TEB PM_{10} = 100 g/dwelling/annum * 750 units = **75.0 kg/annum**
- TEB PM_{10} = 2.05 g/m^2/annum * 10,681m^2 = **21.9 kg/annum**

6.26 Based on the comparison between the total transport emissions and Transport Emissions Benchmarks (TEBs) the proposed development meets the air quality neutral requirements and no mitigation is required.

CHP Emissions

6.27 The Maximum predicted NOx/NO_2 concentrations within 1 km^2 of the proposed CHP is provided in Table 6.6.

Table 6.6: Maximum Predicted Annual Mean Concentrations of NOx/NO_2 (μg/m^3), 2024

CHP Process Contribution (PC)		Background	Predicted Environmental Concentration (PEC)
NOx	NO_2		
0.0076	0.053	32.2	32.2

6.38 The maximum predicted off-site concentration occurs approximately 325 m north-east of the proposed CHP. This area is considered relevant exposure with regard to air quality. However, the predicted increase in concentrations in this area is not significant in terms of the maximum predicted impact of the CHP emissions.

6.29 The receptors identified in Table 6.6 were also modelled in order to represent the impact of the CHP emissions on the proposed development. The predicted concentrations at these locations are provided in Table 6.7.

6.30 The impact of the CHP reaches a maximum of +0.053 $\mu g/m^3$ at the modelled receptors, both on and off-site. As such, the combined impact when taking into account the CHP and traffic emissions would still be below the relevant air quality objective. Overall, the impact of the CHP would be **Negligible** and therefore not significant. This includes the existing off-site receptors, where the impact of the proposed CHP will be less than the maximum predicted concentration.

Table 6.7: Predicted Annual Mean Concentrations of NOx and NO_2 (µg/m3) At Proposed On-Site Receptors, 2024

Receptor	CHP Process Contribution (PC)		Background	Predicted Environmental Concentration (PEC): Background + Traffic + CHP	% of AQ Objective
	NOx	NOx			
A1	0.000	0.0000	32.2	33.8	84.5%
A2	0.000	0.0000	32.2	34.5	86.3%
A3	0.000	0.0000	32.2	33.2	83.0%
A4	0.000	0.0000	32.2	33.1	82.8%
B1	0.000	0.0001	32.2	33.8	84.5%
B2	0.001	0.0004	32.2	33.2	83.0%
B3	0.000	0.0002	32.2	32.9	82.3%
B4	0.000	0.0000	32.2	33.4	83.5%
C1	0.001	0.0004	32.2	33.3	83.3%
C2	0.002	0.0016	32.2	33.4	83.5%
C3	0.002	0.0015	32.2	33.3	83.3%
C4	0.001	0.0008	32.2	33.1	82.8%
D1	0.002	0.0017	32.2	33.2	83.0%
D2	0.003	0.0020	32.2	33.1	82.8%
D3	0.002	0.0016	32.2	33.1	82.8%
D4	0.001	0.0008	32.2	32.9	82.3%
E1	0.001	0.0005	32.2	32.9	82.3%
E2	0.001	0.0009	32.2	32.8	82.0%
E3	0.001	0.0008	32.2	32.8	82.0%
E4	0.001	0.0004	32.2	32.9	82.3%
E5	0.001	0.0005	32.2	32.8	82.0%
E6	0.001	0.0006	32.2	32.8	82.0%
E7	0.000	0.0003	32.2	32.7	81.8%
E8	0.001	0.0005	32.2	32.7	81.8%
F1	0.000	0.0000	32.2	33.2	83.0%
F2	0.000	0.0002	32.2	32.8	82.0%
F3	0.000	0.0002	32.2	32.7	81.8%
F4	0.000	0.0000	32.2	32.9	82.3%
G1	0.001	0.0006	32.2	37.8	94.5%
G2	0.001	0.0005	32.2	36.3	90.8%
G3	0.000	0.0003	32.2	34.4	86.0%
G4	0.001	0.0005	32.2	35.0	87.5%

7 MITIGATION AND RESIDUAL EFFECTS

7.1 As part of the Applicant's commitment to ensure an appropriate development response, the Applicant and its design team have developed a number of measures within the development proposals to ensure that the potential for adverse effects are avoided. These are discussed in the following paragraphs.

Demolition and Construction

Dust Emissions

7.2 The Applicant would implement Best Practice Measures during the development works. These measures are summarised in Table 7.1 for ease of reference and are applicable to a medium to high risk sites. These measures would help reduce the effects of the demolition and construction activities in relation to dust soiling and PM_{10} to an acceptable level.

7.3 The above measures would be captured within the proposed development's CMP to be secured by means of an appropriately worded planning condition. The significance of residual dust effect would therefore be reduced to temporary **Negligible** through adoption of these measures.

Table 7.1: Mitigation of Demolition and Construction Impacts

Demolition and Construction Activity

Mitigation Measures

Communications	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site
	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
	Display the head or regional office contact information.
	Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site.
Site Management	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
	Make a complaints log available to the local authority when asked.
	Record any exceptional incidents that cause dust and air quality pollutant emissions, either on or off the site, and the action taken to resolve the situation is recorded in the log book.
Monitoring	Carry out regular site inspections to monitor compliance with air quality and dust control procedures, record inspection results, and make an inspection log available to the local authority when asked.
	Increase the frequency of site inspections by those accountable for dust and air quality pollutant emissions issues when activities with a high potential to produce dust and emissions and dust are being carried out, and during prolonged dry or windy conditions.
Preparing and maintaining the site	Plan site layout: machinery and dust causing activities should be located away from receptors.
	Erect solid screens or barriers around dust activities or the site boundary that are, at least, as high as any stockpiles on site.
	Fully enclose site or specific operations where there is a high potential for dust production and the site is actives 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 as described below.
	Cover, seed or fence stockpiles to prevent wind whipping
Operating vehicle/ machinery	Ensure all non-road mobile machinery (NRMM) comply with standards.
	All mobile vehicles associated with the demolition / construction should comply with the standards of the London Low Emission Zone.
	Ensure all vehicles switch off engines when stationary – no idling vehicles.
	Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where possible.
	Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials
Operations	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
	Ensure an adequate water supply on the site for effective dust/particulate matter mitigation (using recycled water where possible).
	Use enclosed chutes, conveyors and covered skips.
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
	Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods
Waste Management	Reuse and recycle waste to reduce dust from waste materials
	Avoid bonfires and burning of waste materials.

Completed Development

Traffic Emissions and CHP Emissions

7.4 The predicted change in annual mean NO_2 and PM_{10} concentrations at existing receptors are considered negligible at all modelled receptors. As such, the overall impact of the proposed development is not considered significant. As such, no mitigation is considered necessary.

7.5 The introduction of new exposure is not considered significant in terms of the impacts from road traffic emissions and the proposed CHP emissions. As such, no mitigation measures are considered necessary to protect the future inhabitants of the proposed development from poor air quality.

7.6 Notwithstanding this, the IAQM/EPUK air quality planning guidance makes the following recommendations with regards the mitigation of potential operational impacts. These are as follows and are being adopted by the developer:

- The provision of at least one Electric Vehicle (EV) "rapid charge" point per 10 residential dwellings and/or 1000m^2 of commercial floorspace. Where on-site parking is provided for residential dwellings, EV charging points for each parking space should be made;
- Travel plan that sets out measures to encourage sustainable means of transport (public, cycling and walking) via subsidised or free-ticketing, improved links to bus stops, improved infrastructure and layouts to improve accessibility and safety; and
- All gas-fired boilers to meet a minimum standard of <40mgNOx/kWh.

7.7 Accordingly, the residual impacts would be **Negligible**.

8 SUMMARY OF MITIGATION AND RESIDUAL EFFECTS

8.1 Table 8.1 and 8.2 provide a tabulated summary of the outcomes of the Air Quality Impact Assessment of the proposed development.

Table 8.1: Summary of Proposed Mitigation and Enhancement Measures

Potential Effects Identified	Proposed Mitigation / Enhancement Measures
Demolition and Construction	
Dust soiling and elevated PM_{10} concentrations due to demolition and construction	Best Practice Air Quality Management Measures to be implemented on-site by means of a CMP.
Completed Development	
Increase in air quality pollutants due to traffic and CHP emissions	None required
Impact of traffic and CHP emissions	None required

Table 8.2: Summary of Residual Effects

Receptor	Description of Residual Effect	Nature of Residual Effect*					
		Significance **	+ -	D I	P T	R IR	St Mt Lt
Demolition and Construction							
On and Off-site residential	Dust soiling and elevated PM_{10} concentrations due to demolition and construction	Negligible	-	D	T	R & IR	St
Completed Development							
Off-site residential	Increase in air quality pollutants due to traffic and CHP emissions	Negligible	N/A	D	P	IR	Lt
On-site residential	Impact of traffic and CHP emissions	Negligible	N/A	D	P	IR	Lt

Notes:
* - = Adverse/ + = Beneficial; D = Direct/ I = Indirect; P = Permanent/ T = Temporary; R=Reversible/ IR= Irreversible; St- Short term/ Mt –Medium term/ Lt –Long term.
**Negligible/Minor/Moderate/Major

Likely Significant Environmental Effects

8.2 During the demolition and construction stage, standard control measures which would be applied to the proposed development should reduce any potential effects of dust on any existing sensitive receptors and therefore these effects are not likely to be significant.

8.3 On completion of the proposed development, model predictions have shown that there would be no significant increase in pollutant concentrations to any identified existing or proposed on-site receptors, and therefore no likely significant effects.

9 CUMULATIVE EFFECTS

Demolition and Construction

9.1 Other cumulative schemes considered within this report are expected to implement appropriate mitigation measures during their demolition and construction phases via a CMP to be agreed with the LBC. All NRMM is expected to comply with the GLA SPG. The cumulative demolition and construction effects are therefore considered to be not significant.

Completed Development

Nitrogen Dioxide ($N0_2$)

9.2 Predicted annual mean concentrations for NO_2 at existing receptors in 2024, including committed development traffic flows. The change in predicted concentrations at existing receptors has also been provided, together with the effect rating for each receptor.

9.3 Predicted annual mean concentrations for NO_2 at proposed receptors in 2024 are provided in Table 9.1.

Table 9.1: Predicted Annual Mean NO_2 Concentrations (µg/m³) at Existing Receptors, Proposed Development Traffic & Cumulative Schemes Traffic (2024)

Receptor	Future Baseline	Future Baseline + Proposed Development + Cumulative Schemes	% of AQ Objective	Change	% Change	Impact
R1	36.3	36.6	91.5%	0.3	0.8%	Negligible
R2	35.9	36.2	90.5%	0.3	0.8%	Negligible
R3	35.8	36.1	90.3%	0.3	0.8%	Negligible
R4	36.4	36.8	92.0%	0.4	1.1%	Negligible
R5	36.3	36.7	91.8%	0.4	1.1%	Negligible
R6	35.4	35.6	89.0%	0.2	0.6%	Negligible
R7	35.2	35.4	88.5%	0.2	0.6%	Negligible
R8	34.6	35.2	88.0%	0.6	1.7%	Slight
R9	33.7	34.2	85.5%	0.5	1.5%	Negligible

9.4 When comparing the predicted NO_2 concentrations in 2024 with and without the proposed and cumulative schemes the effect at existing receptors would be **negligible or slight**. Overall, the effect of the proposed and cumulative developments would not be significant.

Table 9.2: Predicted Annual Mean NO_2 Concentrations (µg/m^3) at Proposed On-Site Receptors, Proposed Development & Cumulative Schemes Traffic (2024)

Receptor	Future Baseline + Proposed Development + Cumulative Schemes	% of AQ Objective	Receptor	Future Baseline + Proposed Development + Cumulative Schemes	% of AQ Objective
A1	34.1	85.3%	**E1**	33.0	82.5%
A2	35.1	87.8%	**E2**	32.9	82.3%
A3	33.4	83.5%	**E3**	32.8	82.0%
A4	33.3	83.3%	**E4**	32.9	82.3%
B1	34.1	85.3%	**E5**	32.9	82.3%
B2	33.3	83.3%	**E6**	32.9	82.3%
B3	33.0	82.5%	**E7**	32.7	81.8%
B4	33.6	84.0%	**E8**	32.7	81.8%
C1	33.5	83.8%	**F1**	33.4	83.5%
C2	33.5	83.8%	**F2**	32.9	82.3%
C3	33.4	83.5%	**F3**	32.7	81.8%
C4	33.2	83.0%	**F4**	33.0	82.5%
D1	33.3	83.3%	**G1**	38.1	95.3%
D2	33.2	83.0%	**G2**	36.7	91.8%
D3	33.1	82.8%	**G3**	34.6	86.5%
D4	33.0	82.5%	**G4**	35.2	88.0%

9.5 In terms of introducing new exposure, the predicted concentrations at the proposed on-site receptors are below the relevant objectives for NO_2. Overall, the impact of NO_2 concentrations across the proposed development in combination with the cumulative schemes would be **negligible**.

Particulate Matter (PM_{10})

9.6 Predicted annual mean concentrations for NO_2 at existing receptors in 2024, including cumulative development traffic flows, are provided in Table 8.28. The change in predicted concentrations at existing receptors has also been provided, together with the effect rating for each receptor.

9.7 Predicted annual mean concentrations for PM_{10} at proposed receptors in 2024 are provided in Table 9.3.

Table 9.3: Predicted Annual Mean PM_{10} Concentrations (µg/m^3) at Existing Receptors, Proposed Development Traffic & Cumulative Scheme Traffic (2024)						
Receptor	**Future Baseline**	**Future Baseline + Proposed Development + Cumulative Schemes**	**% of AQ Objective**	**Change**	**% Change**	**Impact**
R1	21.2	21.2	53.0%	0.0	Negligible	53.0%
R2	21.1	21.1	52.8%	0.0	Negligible	52.8%
R3	21.1	21.1	52.8%	0.0	Negligible	52.8%
R4	21.2	21.2	53.0%	0.0	Negligible	53.0%
R5	21.2	21.2	53.0%	0.0	Negligible	53.0%
R6	21.1	21.1	52.8%	0.0	Negligible	52.8%
R7	21.1	21.1	52.8%	0.0	Negligible	52.8%
R8	21.0	21.1	52.8%	0.1	Negligible	52.8%
R9	20.9	21.0	52.5%	0.1	Negligible	52.5%

9.10 When comparing the predicted PM_{10} concentrations in 2024 with and without the proposed and cumulative developments the effect at existing receptors would be **Negligible**. Overall, the impact of the proposed and cumulative schemes is not considered significant.

Table 9.4: Predicted Annual Mean PM_{10} Concentrations ($\mu g/m^3$) at Proposed Receptors, Proposed Development & Cumulative Scheme (2024)

Receptor	Future Baseline + Proposed Development + Cumulative Schemes	% of AQ Objective	Receptor	Future Baseline + Proposed Development + Cumulative Schemes	% of AQ Objective
A1	21.0	52.5%	**E1**	20.9	52.3%
A2	21.0	52.5%	**E2**	20.9	52.3%
A3	20.9	52.3%	**E3**	20.9	52.3%
A4	20.9	52.3%	**E4**	20.9	52.3%
B1	21.0	52.5%	**E5**	20.9	52.3%
B2	20.9	52.3%	**E6**	20.9	52.3%
B3	20.9	52.3%	**E7**	20.8	52.0%
B4	20.9	52.3%	**E8**	20.8	52.0%
C1	20.9	52.3%	**F1**	20.9	52.3%
C2	20.9	52.3%	**F2**	20.9	52.3%
C3	20.9	52.3%	**F3**	20.8	52.0%
C4	20.9	52.3%	**F4**	20.9	52.3%
D1	20.9	52.3%	**G1**	21.3	53.3%
D2	20.9	52.3%	**G2**	21.2	53.0%
D3	20.9	52.3%	**G3**	21.0	52.5%
D4	20.9	52.3%	**G4**	21.1	52.8%

9.11 In terms of introducing new exposure, the predicted concentrations at the proposed on-site receptors are below the relevant objectives for PM_{10}. Overall, the impact of PM_{10} concentrations across the proposed development in combination with the cumulative schemes would be **Negligible**.

10 SUMMARY AND CONCLUSIONS

10.1 This report has assessed the likely significant effects of the demolition of the existing buildings, and the construction and operation of the proposed development on the environment with respect to air quality. The key issues considered are as follows:

- the potential impact on local air quality and existing receptors from construction activities at the site;
- the potential impact of traffic and CHP emissions due to the proposed development at existing and proposed receptors located adjacent to the modelled road network; and
- the introduction of new exposure adjacent to the modelled road network.

Demolition and Construction

10.2 A qualitative assessment of the potential effects from construction activities has been undertaken using the latest guidance issued by the Greater London Authority in July 2014.

10.3 During the demolition and construction works, there is the potential that emissions of dust arising from the application site could result in nuisance at nearby existing residential properties and those parts of the proposed development built and occupied in the early phases whilst construction work continues on the remainder of the application site.

10.4 Based on criteria set out in the Institute of Air Quality Management the construction works present a high risk of resulting in dust impacts in the absence of appropriate mitigation. With the implementation of standard best practice mitigation measures, which would be set out within a CMP to be agreed with LBTH, it is anticipated that dust effects could be mitigated to at worst to be of temporary Slight Adverse significance at existing and future on-site receptors.

10.5 The impacts of the demolition and construction traffic emissions on local air quality has not been assessed quantitatively due to the inconsistent nature of construction traffic and its short-term impact.

10.6 The cumulative scenario includes a significant number of HDV movements associated with other cumulative schemes in the area, such as HS2. Based on these cumulative traffic flows, the impact of these HDV movements are not considered significant along Chalk Farm Road. These HDV flows are more than those associated with the proposed development (as shown in Table 8.26 and 8.28) so the impact of demolition and construction traffic from the proposed development is considered negligible. Notwithstanding this, the impact of track out has been assessed qualitatively as part of the demolition and construction impacts assessment and mitigation measures have been put forward in relation to the emissions of HDV traffic, primarily in relation to all mobile vehicles associated with the demolition / construction complying with the standards of the London Low Emission Zone (LEZ).

Completed Development

10.7 The air quality assessment has considered changes in traffic levels along the local road network as a result of the proposed development. Nitrogen oxides (NOx) and particulate matter (PM_{10}) have been modelled for the assessment. Changes in air quality impacts at existing receptors as a result of the proposed CHP plant and from changes to traffic flows have been considered following the most recent Environmental Protection UK and the Institute of Air Quality Management (IAQM) air quality planning guidance.

10.8 The change in predicted PM_{10} and NO_2 concentrations at existing receptors in 2024 following completion of the proposed development would be negligible (not significant) in terms of effect.

10.9 The assessment has also considered the cumulative impacts from the proposed and committed developments in the area. The change in predicted PM_{10} and NO_2 concentrations at existing receptors in 2024 following completion of the proposed and committed developments is considered negligible (not significant) in terms of effect. As such, no mitigation is considered necessary.

10.10 The assessment has also modelled the effect of the proposed CHP. The effects are not considered significant and no mitigation is considered necessary. If a CHP is installed with a lower output than the Ener-G E230 then the modelled assessment within this report would present a worst-case assessment.

10.11 In terms of introducing new exposure, the predicted PM_{10} and NO_2 concentrations at the proposed receptors are below the relevant objectives.

ADDENDUM

September 2017

This addendum has been produced in response to comments made by the London Borough of Camden (LBC) and the Greater London Authority (GLA):

1. **Predicted Environmental Concentrations (PECs) including CHP emissions across existing modelled receptors along Chalk Farm Road**

The impact of the combined CHP and traffic emissions at the existing modelled receptors have been assessed. The PECs at these receptors is provided in Table A1.

Table 6.3: Annual Mean NO_2 PECs (µg/m^3) at Existing Off-Site Receptors, Proposed Development & Cumulative Scheme & CHP Emissions (2024)

Receptor	Future Baseline	Future Baseline + Proposed Development (Traffic and CHP Emissions)	CHP Contribution	% of AQ Objective	Change	% Change	Impact
R1	36.3	36.3	0.005	90.8%	0.0	0.0%	Negligible
R2	35.9	36.0	0.004	90.0%	0.1	0.3%	Negligible
R3	35.8	35.9	0.003	89.8%	0.1	0.3%	Negligible
R4	36.4	36.5	0.003	91.3%	0.1	0.3%	Negligible
R5	36.3	36.4	0.001	91.0%	0.1	0.3%	Negligible
R6	35.4	35.4	0.001	88.5%	0.0	0.0%	Negligible
R7	35.2	35.3	0.002	88.3%	0.1	0.3%	Negligible
R8	34.6	34.7	0.000	86.8%	0.1	0.3%	Negligible
R9	33.7	33.8	0.000	84.5%	0.1	0.3%	Negligible

The impact of the additional contribution of the CHP emissions across the existing modelled receptors is not considered significant.

2. **Predicted Environmental Concentrations (PECs) across the proposed development at height above ground level**

In order to assess the impact of the combined CHP and traffic emissions across the proposed development a number of levels have been assessed. This will account for the decrease in the impact of vehicle emissions with height above ground level versus the increase in the impact of CHP emissions. Not all floors have been modelled but a number of elevations have been modelled representing the ground floor (1.5m), fourth floor (13m), ninth floor (30m) and fourteenth floor (45m). The Predicted Environmental Concentration (PEC) at these locations across the proposed development are provided in Table A2.

Table A2: Annual Mean NO_2 PECs (µg/m^3) at Proposed Receptors, Proposed Development & Cumulative Scheme (2024)

Receptor	1.5m	13m	30m	45m	Receptor	1.5m	13m	30m	45m
A1	34.1	33.0	32.4	32.3	**E1**	33.0	32.8	N/A	N/A
A2	35.1	32.8	32.4	32.3	**E2**	32.9	32.8	N/A	N/A
A3	33.4	32.8	32.4	32.3	**E3**	32.8	32.7	N/A	N/A
A4	33.3	32.8	32.4	32.3	**E4**	32.9	32.8	N/A	N/A
B1	34.1	33.1	32.4	N/A	**E5**	32.9	32.7	N/A	N/A
B2	33.3	33.0	32.5	N/A	**E6**	32.9	32.7	N/A	N/A
B3	33.0	32.8	32.4	N/A	**E7**	32.7	32.6	N/A	N/A
B4	33.6	32.9	32.4	N/A	**E8**	32.7	32.6	N/A	N/A
C1	33.5	33.0	32.4	N/A	**F1**	33.4	32.9	32.4	N/A
C2	33.5	33.1	32.5	N/A	**F2**	32.9	32.7	32.4	N/A
C3	33.4	33.0	32.5	N/A	**F3**	32.7	32.6	32.4	N/A
C4	33.2	32.9	32.5	N/A	**F4**	33.0	32.7	32.4	N/A
D1	33.3	33.0	N/A	N/A	**G1**	38.1	33.1	32.4	N/A
D2	33.2	32.9	N/A	N/A	**G2**	36.7	33.3	32.4	N/A
D3	33.1	32.9	N/A	N/A	**G3**	34.6	33.2	32.4	N/A
D4	33.0	32.8	N/A	N/A	**G4**	35.2	33.1	32.4	N/A

Predicted concentrations are below the relevant air quality objective at all receptors.

3. Consideration of queuing traffic due to PFS

The modelled roads have been modelled using a speed of 20kph, which essentially represents stationary or slow-moving traffic. This represents a worst-case assessment regardless the access changes to the PFS.

4. Air Quality Neutral Assessment including transport emissions from the supermarket and PFS

The completed development would generate 2,953 trips per day from the supermarket (2% HDV), 1,858 from the petrol station (1% HDV), 207 from the residential units (9% HDV) and 75 from the office use. The total trips per annum and associated emissions are as follows:

Residential (C3):

- Total trips per annum = 207 * 365 = 75,555;
- The NOx emission factor is 0.370 g/veh-km and thus the **Residential Transport NOx Emission** is (75,555 * 0.370) = **28.0 kg/annum**
- The PM_{10} emission factor is 0.0665 g/veh-km and thus the **Residential Transport PM_{10} Emissions** is (75,555 * 0.0665) = **5.0 kg/annum**.

Commercial (B1):

- Total trips per annum = 75 * 365 = 27,375;
- The NOx emission factor is 0.370 g/veh-km and thus the **B1 Transport NOx Emission** is (27,375 * 0.370) = **10.1 kg/annum**
- The PM_{10} emission factor is 0.0665 g/veh-km and thus the **B1 Transport PM_{10} Emissions** is (27,375 * 0.0665) = **1.8 kg/annum**.

Retail (A1):

- Total trips per annum = 4,811 * 365 = 1,756,015;
- The NOx emission factor is 0.370 g/veh-km and thus the **A1 Transport NOx Emission** is (1,756,015 * 0.370) = **649.7 kg/annum**
- The PM_{10} emission factor is 0.0665 g/veh-km and thus the **A1 Transport PM_{10} Emissions** is (1,756,015 * 0.0665) = **116.8 kg/annum**.

Based on these calculations, the total development emissions are as follows:

- Total Transport NOx Emission = **687.8 kg/annum**
- Total Transport PM_{10} Emission = **123.6 kg/annum**

The Transport Emissions Benchmarks (TEBs) are calculated by multiplying the relevant emission benchmarks by the number of residential properties or floor space for office and retail use:

Nitrogen Dioxide:

- TEB NOx (C3) = 558 g/dwelling/annum * 750 units = **419.0 kg/annum**
- TEB NOx (B1) = 11.4 g/m^2/annum * 10,681m^2 = **121.8 kg/annum**
- TEB NOx (A1) = 219 g/m^2/annum * 20,867m^2 = **4,569.9 kg/annum**

Particulate Matter:

- TEB PM_{10} (C3) = 100 g/dwelling/annum * 750 units = **75.0 kg/annum**
- TEB PM_{10} (B1) = 2.05 g/m^2/annum * 10,681m^2 = **21.9 kg/annum**
- TEB PM_{10} (A1) = 39.3 g/m^2/annum * 20,867m^2 = **820.1 kg/annum**

Based on the comparison between the total transport emissions and Transport Emissions Benchmarks (TEBs) the proposed development meets the air quality neutral requirements and no mitigation is required.

5. Construction Impact Assumptions

Following review of the surrounding area and the proximity of nearby sensitive receptors the sensitivity of the surrounding area (Table 6.1) has been updated and is provided in Table A3

Table A3: Sensitivity of the Surrounding Area

Potential Impact	Activity			
	Demolition	**Earthworks**	**Construction**	**Track Out**
Dust Soiling	High	High	High	High
Human Health	Medium	Medium	Medium	Medium

The dust emission magnitudes and sensitivity of the on-site receptors and surrounding area are combined to determine the risk of dust impacts with no mitigation applied. These are summarised in Table A4.

Table A4: Summary of Dust Risk				
Potential Impact	**Activity**			
	Demolition	**Earthworks**	**Construction**	**Track Out**
Dust Soiling	Medium Risk	High Risk	High Risk	Low Risk
Human Health	Low Risk	Medium Risk	Medium Risk	Low Risk

On the basis of the above, the likely effect of the proposed development in respect of dust would be significant at off-site receptors and at occupied phased units on-site as well as existing off-site receptors.

6. Construction Mitigation

Mitigation measures associated with a medium to high risk site are provided in Table A5.

Table A5: Mitigation of Demolition and Construction Impacts	
Construction Activity	**Mitigation Measures**
Site Management	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site
	Develop a Dust Management Plan.
	Display the name and contact details of person(s) accountable for air quality pollutant emissions and dust issues on the site boundary.
	Display the head or regional office contact information.
	Record and respond to all dust and air quality pollutant emissions complaints.
	Make a complaints log available to the local authority when asked.
	Carry out regular site inspections to monitor compliance with air quality and dust control procedures, record inspection results, and make an inspection log available to the local authority when asked.
	Increase the frequency of site inspections by those accountable for dust and air quality pollutant emissions issues when activities with a high potential to produce dust and emissions and dust are being carried out, and during prolonged dry or windy conditions.
	Record any exceptional incidents that cause dust and air quality pollutant emissions, either on or off the site, and the action taken to resolve the situation is recorded in the log book.
	Hold regular liaison meetings with other high risk construction sites within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised.
Preparing and Maintaining the Site	Plan site layout: machinery and dust causing activities should be located away from receptors.
	Erect solid screens or barriers around dust activities or the site boundary that are, at least, as high as any stockpiles on site.
	Fully enclosure site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
	Avoid site runoff of water or mud.
	Keep site fencing, barriers and scaffolding clean using wet methods.
	Remove materials from site as soon as possible.
	Cover, seed or fence stockpiles to prevent wind whipping.
	Carry out regular dust soiling checks of buildings within 100m of site boundary and cleaning to be provided if necessary.
Operating Vehicle / Machinery and Sustainable Travel	Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone.
	Ensure all non-road mobile machinery (NRMM) comply with the standards set within this guidance.
	Ensure all vehicles switch off engines when stationary – no idling vehicles.
	Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where possible.
	Impose and signpost a maximum-speed-limit of 10mph on surfaced haul routes and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
	Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
	Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).
Operations	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
	Ensure an adequate water supply on the site for effective dust/particulate matter mitigation (using recycled water where possible).
	Use enclosed chutes, conveyors and covered skips.
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
	Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Waste Management	Reuse and recycle waste to reduce dust from waste materials
	Avoid bonfires and burning of waste materials.