ARDENT
CONSULTING ENGINEERS

TRIBE AVONMOUTH HOUSE LTD.

AVONMOUTH HOUSE, 6 AVONMOUTH STREET, LONDON

AIR QUALITY ASSESSMENT

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HEAD OFFICE: 3rd Floor, The Hallmark Building, 52-56 Leadenhall Street, London, EC3M 5JE **T** | 020 7680 4088
ESSEX: 1 - 2 Crescent Court, Billericay, Essex, CM12 9AQ **T** | 01277 657 677
KENT: Suite 10, Building 40, Churchill Business Centre, Kings Hill, Kent, ME19 4YU **T** | 01732 752 155
MIDLANDS: Office 3, The Garage Studios, 41-43 St Mary's Gate, Nottingham, NG1 1PU **T** | 0115 697 0940
SOUTH WEST: City Point, Temple Gate, Bristol, BS1 6PL **T** | 0117 456 4994
SUFFOLK: Suite 110, Suffolk Enterprise Centre, 44 Felaw Street, Ipswich, IP2 8SJ **T** | 01473 407 321

Email: enquiries@ardent-ce.co.uk

CONTENTS

APPENDICES

FIGURES

TABLES

DOCUMENT CONTROL SHEET

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1.0 INTRODUCTION

Proposed Development

1.1 Ardent Consulting Engineers (ACE) have been commissioned by Tribe Avonmouth House Ltd. to carry out an air quality assessment (AQA) in support of a planning application for a proposed mixed-use development.

1.2 The Site is located within the London Borough of Southwark (LBS), and the proposed development comprises one building ranging from two to sixteen storeys in height, with proposed commercial land use (flexible land use Class E/F1(a)) located on the basement, ground and 1st floors and residences (student accommodation) located on the upper floors.

Scope

1.3 This report describes existing and future air quality within the study area and considers the suitability of the Site for the proposed development and the potential impact of the development on local air quality during both the demolition and construction and the operational phases.

1.4 The air pollutants of concern during the demolition and construction period are dust and particulate matter (PM_{10}) emissions from on-site demolition and construction activities and as a result of material tracked out by demolition and construction vehicles, and nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$) emissions from demolition and construction vehicles. The main air pollutants of concern during the operational phase are NO_2, PM_{10} and $PM_{2.5}$ emissions from vehicle traffic, including vehicles generated by the proposed development and existing vehicles using the local road network, and NO_2 emissions from moving locomotives using the nearby railway lines. This air quality assessment (AQA) considers the potential effects of these pollutants, as well as determining the 'air quality neutrality' of the proposed development in terms of transport and building emissions.

1.5 The proposed energy strategy will be comprised of air-source heat pumps (ASHPs), which will not have any associated on-site emissions. As such, the overall effect of these plant can be screened out as being 'not significant'.

1.6 This AQA has been prepared taking into consideration relevant local and national guidance, policy and legislation.

Consultation

1.7 Consultation with LBE has been undertaken in order to discuss and agree the scope and methodology of the AQA. Email correspondence took place between ACE and LBE (Regulatory Services Officer, Planning Enforcement and Environment Team) between April and June 2021.

2.0 LEGISLATION, POLICY AND GUIDANCE

National Air Quality Legislation and Strategy

The Air Quality Strategy

2.1 The Air Quality Strategy (DEFRA, 2007) established the policy framework for ambient air quality management in the UK, with the objective of ensuring a quality of ambient air for all that would not pose a significant risk to health or quality of life. This document set out the National Air Quality Objectives (NAQOs) and the policy for achieving them. It followed part IV of the Environment Act (UK Government, 1995) which introduced a system of Local Air Quality Management (LAQM) requiring local authorities to regularly review and assess air quality within their boundary and appraise plans in light of these assessments.

2.2 Where a NAQO is unlikely to be met, the local authority must designate an Air Quality Management Area (AQMA) and draw up an Air Quality Action Plan (AQAP) which should include measures expected to ensure that the NAQOs are met within the AQMA.

National Air Quality Objectives

2.3 NAQOs were defined by The Air Quality Strategy (DEFRA, 2007) and enshrined in regulations by the Air Quality Standards Regulation (Statutory Instrument, 2010, No 1001) and Air Quality Standards (Amendment) Regulations (Statutory Instrument, 2016 No. 1184), which implemented the European Union Directive on ambient air quality and cleaner air for Europe (Directive 2008/50/EC).

2.4 Relevant objectives are set out in **Table 2-1**.

Table 2-1: NO_2, PM_{10} and $PM_{2.5}$ Objectives

Pollutant	Time Period	Objective
Nitrogen Dioxide (NO_2)	1-hour mean	200 µg/m^3 not to be exceeded more than 18 times a year
	Annual mean	40 µg/m^3
Particulate Matter (PM_{10})	24-hour mean	50 µg/m^3 not to be exceeded more than 35[1] times a year
	Annual mean	40 µg/m^3 [2]
Particulate Matter ($PM_{2.5}$)	Annual mean	25 µg/m^3 [3]
	Annual mean	20 µg/m^3 [4]
	Exposure reduction target	15% reduction between 2010 and 2020 at Urban Background sites

2.5 Analysis of long-term monitoring data suggests that if the annual mean NO_2 concentration is less than 60 µg/m^3 then the 1-hour mean NO_2 objective is unlikely to be exceeded where road transport is the main source of pollution. This concentration has therefore been used in this AQA to screen whether an exceedance of the 1-hour mean objective is likely. Similarly, an annual mean PM_{10} concentration of 32 µg/m^3 is used to screen whether an exceedance of the 24-hour mean PM_{10} objective is likely.

2.6 The London Local Air Quality Management (LLAQM) Technical Guidance 2019 (LLAQM.TG(19)), (Mayor of London, 2019) provides guidance to local authorities

[1] 7 times a year for Scotland

[2] 18 µg/m^3 for Scotland

[3] 12 µg/m^3 for Scotland

[4] Indicative stage 2 limit value post 2020, derived based on the exposure reduction target of a 15% reduction between 2010 and 2020. This value has been used as the relevant air quality objective throughout this assessment in order to ensure a conservative approach.

in London as to where objectives apply. The definition of relevant exposure used in this assessment, as based on the LLAQM guidance, are set out in **Table 2-2**.

Table 2-2: Relevant Exposure

Averaging Period	Relevant Locations	Objectives should apply	Objectives don't usually apply
Annual mean	Where individuals are exposed for a cumulative period of 6 months in a year	Facades of residential properties, gardens of residences, schools, hospitals, care homes etc.	Façades of offices, hotels, kerbside sites or any other location where public exposure is expected to be short term
24-hour mean	Where individuals are expected to be exposed for 24-hours or longer	As above, with the addition of hotels	Façades of offices, kerbside sites or any other location where public exposure is expected to be short term
1-hour mean	Where individuals are expected to spend one hour or longer	As above, with the addition of kerbside sites, those parts of car parks, bus stations and railway stations etc. which are not fully enclosed and outdoor locations where members of the public might reasonably be expected to spend one hour or more	Kerbside sites where the public would not be expected to have regular access

National Air Quality Plan for Nitrogen Dioxide (NO_2) in the UK

2.7 The National Air Quality Plan for Nitrogen Dioxide (NO_2) in the UK (DEFRA and DfT, 2017) was written as a joint venture between the Department for Environment, Food and Rural Affairs (DEFRA) and the Department for Transport (DfT) and aims to tackle roadside concentrations of NO_2 in the UK. It includes a number of measures such as those aimed at investing in Ultra-Low Emission Vehicles (ULEVs)

charging infrastructure, public transport and grants to help local authorities in improving air quality.

2.8 The plan requires all local authorities in England with areas expected not to meet the EU Limit Values by 2020 (known as 'air quality hotspots') to develop plans to bring concentrations within these values in *"the shortest time possible".* These plans are to be reviewed by the government and suggestions included in the plan include actions such as utilising retrofitting technologies, changing road layout and encouraging public transport and ULEV use. Where these approaches are not considered sufficient, the local authority may need to consider implementation of a Clean Air Zone which places restrictions on vehicle access to an area and may include charging certain (or all) vehicles or restrictions on the type of vehicle allowed to access an area.

The Road to Zero Strategy

2.9 The 'Road to Zero' strategy (HM Government, 2018) set out the governments aims regarding zero emissions vehicles. These include the aim that all new cars and vans have zero tailpipe emissions by 2040 and for almost every car to be zero emission by 2050. Measures are aimed at encouraging uptake of the cleanest vehicles and support electric charging infrastructure.

Clean Air Strategy

2.10 The Clean Air Strategy (DEFRA, 2019) sets out policies to lower national emissions of pollutants in order to reduce background pollution and human exposure. It aims to create a strong framework to tackle air pollution and to reduce the number of people living in locations with $PM_{2.5}$ concentrations exceeding 10 $\mu g/m^3$ by 50% by 2025.

National Planning Policy

2.11 The National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, 2021) sets out the Government's planning policies for England and how they expect these to be implemented. Consideration of air quality within planning is considered an important element of this framework which recommends that transport and the potential impact on the environment should

be considered at an early stage in order to allow for mitigation or even avoidance of impacts through location and layout of developments.

2.12 It is recommended that both the impacts of a potential development on the environment and the risk to new development from existing pollution be taken into account when planning policy is drafted and specified contributing to compliance with relevant objectives and should be consistent with any local AQAP.

2.13 The NPPF also recommends that *"existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."*

2.14 The Planning Practice Guidance (PPG) provides guidance on how planning can enact the policies set out in NPPF. It is set out as separate papers for different sectors and therefore PPG Air Quality (Ministry of Housing, Communities and Local Government, 2019) is aimed at addressing policy relating specifically to air quality. This document gives guidelines for when air quality is likely to be relevant to a planning decision:

"Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity."

2.15 The 'Air Quality' PPG also states that more detailed information such as whether the development could have a significant impact on air quality, baseline air quality and whether occupiers of the development could experience poor air quality may be required in order to make an informed decision. Further, it notes that any assessment should be proportionate, taking into account the scale of the proposed development, as well as any potential impacts.

2.16 Some suggestions on mitigation measures are set out within the PPG, such as separation distances, filtration/ventilation, green infrastructure, promotion of low emission forms of transport, control of dust and emissions from construction and, finally, contributing funding to measures such as those identified in AQAPs to offset impacts from the development.

Regional Policy and Guidance

The London Plan

2.17 The 'London Plan 2021' has been developed (Mayor of London, 2021). Policy SI1 'Air Quality' states that:

A. Development Plans, through relevant strategic, site-specific and area-based policies, should seek opportunities to identify and deliver further improvements to air quality and should not reduce air quality benefits that result from the Mayor's or boroughs' activities to improve air quality.

B. To tackle poor air quality, protect health and meet legal obligations the following criteria should be addressed:

1. Development proposals should not:

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

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

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

2. In order to meet the requirements in Part 1, as a minimum:

d) development proposals must be at least Air Quality Neutral.

e) development proposals should use design solutions to prevent or minimise increased exposure to existing air pollution and make

provision to address local problems of air quality in preference to post-design or retro-fitted mitigation measures.

f) major development proposals must be submitted with an Air Quality Assessment. Air quality assessments should show how the development will meet the requirements of B1.

g) development proposals in Air Quality Focus Areas or that are likely to be used by large numbers of people particularly vulnerable to poor air quality, such as children or older people should demonstrate that design measures have been used to minimise exposure.

3. Masterplans and development briefs for large-scale development proposals subject to an Environmental Impact Assessment should consider how local air quality can be improved across the area of the proposal as part of an air quality positive approach. To achieve this a statement should be submitted demonstrating:

h) how proposals have considered ways to maximise benefits to local air quality, and

i) what measures or design features will be put in place to reduce exposure to pollution, and how they will achieve this.

4. In order to reduce the impact on air quality during the construction and demolition phase development proposals must demonstrate how they plan to comply with the Non-Road Mobile Machinery Low Emission Zone and reduce emissions from the demolition and construction of buildings following best practice guidance.

5. Development proposals should ensure that where emissions need to be reduced to meet the requirements of Air Quality Neutral or to make the impact of development on local air quality acceptable, this is done on-site. Where it can be demonstrated that emissions cannot be further reduced by on-site measures, off-site measures to improve local air

quality may be acceptable, provided that equivalent air quality benefits can be demonstrated within the area affected by the development.

Sustainable Design and Construction SPG

2.18 Supplementary Planning Guidance (SPG) on 'Sustainable Design and Construction' (GLA, 2014a) was developed as part of the Implementation Framework for the London Plan 2016 (GLA, 2016). In relation to air quality, the guidance stated the most significant priorities to be:

- *"Developers are to design their schemes so that they are at least 'air quality neutral';*
- *Developments should be designed to minimise the generation of air pollution;*
- *Developments should be designed to minimise and mitigate against increased exposure to poor air quality;*
- *Developers should select plant that meets the standards for emissions from combined heat and power and biomass plants set out in Appendix 7 (of the document); and*
- *Developers and contractors should follow the guidance set out in the SPG on 'The control of dust and emissions during construction and demolition' when constructing their development (Greater London Authority, 2014b)."*

2.19 The requirement that major developments be 'air quality neutral' relates to a comparison against benchmarks set out in the Air Quality Neutral Planning Support Update: GLA 80371 (Air Quality Consultants Ltd., 2014) . Further details of these benchmarks are provided in **Appendix B**. Where a development is not considered to be 'Air Quality Neutral', it is recommended that on-site mitigation measures such as green infrastructure, changes to combustion plant specification, abatement technology or exposure reduction are considered in preference to offsite mitigation measures.

2.20 The 'Sustainable Design and Construction' SPG has recently been revoked, however, the current London Plan still includes the requirement that development

proposal must be 'at least Air Quality Neutral' (see Paragraph 2.17) and no further guidance concerning the assessment of 'air quality neutrality' has since been published. As such, the 'air quality neutral' assessment presented within this AQA is based on the information provided within the 'Sustainable Design and Construction' SPG and Air Quality Neutral Planning Support Update: GLA 80371.

Control of Dust and Emissions During Construction and Demolition SPG

2.21 The Control of Dust and Emissions During Construction and Demolition SPG (GLA, 2014b) requires that an 'Air Quality and Dust Risk Assessment' is carried out and the report submitted as part of all planning applications within London. It also requires that an Air Quality and Dust Management Plan is submitted prior to the commencement of works.

2.22 The approach for assessing construction dust impacts follows that set out within the Institute of Air Quality Management (IAQM) Guidance on the assessment of dust from demolition and construction (IAQM, 2014) and sets out recommendations for mitigation and monitoring of construction dust.

The London Environment Strategy

2.23 The London Environmental Strategy (Mayor of London, 2018) considers policies aimed at improving the environment in London, across a number of different areas such as air quality, noise and climate change. There are a number of objectives but notable in relation to air quality is the objective: *"for London to have the best air quality of any major world city by 2050, going beyond the legal requirements to protect human health and minimise inequalities."*

2.24 Chapter 4 of the Environmental Strategy relates specifically to air quality and identifies a number of key issues to be addressed:

- Achieving legal compliance as quickly as possible;
- Diesel vehicles, especially cars and vans;
- Tackling all sources of pollution;
- Government action;

- Maximising co-benefits between air quality and climate change policies; and

- Further reductions are needed in PM_{10} and $PM_{2.5}$, particularly from transboundary pollution, tyre and brake wear and wood burning.

Local Policy

Local Plans

2.25 LBS is currently undergoing the process of developing the New Southwark Plan. The latest draft version (including proposed changes) (LBS, 2020) includes the following three relevant policies:

- SP6 'Cleaner, Greener, Safer' states that "*…This will be achieved through…Improving our natural environment through the use of urban greening to….improve air quality…*";

- P64 'Improving Air Quality' states that:

  "*Development must:*

  1. *Achieve or exceed air quality neutral standards; and*

  2. *Address the impacts of poor air quality on building occupiers and public realm users by reducing exposure to and mitigating the effects of poor air quality. This must be achieved through design solutions that include:*

     1. *Orientation and layout of buildings, taking into account vulnerable building occupiers, and public realm and amenity space users; and*

     2. *Ventilation systems; and*

     3. *Urban greening appropriate for providing air quality benefits proportionate to the scale of the development; and*

4. *Appropriate abatement technologies to bring emissions within the equivalent of 'ultra-low' NO_x boiler emission levels where decentralised energy networks are implemented or utilised.*

Any shortfall in air quality standard on site must be secured off site through planning obligations or as a financial contribution"; and

- P60 'Trees' states that "*…The selection and position of trees should improve air quality…*".

2.26 The New Southwark Plan's Area Vision for the Elephant and Castle area also states that "*Development in Elephant and Castle should…Support the creation of a distinctive environment…reduces exposure to air pollution…*".

2.27 Until the New Southwark Plan is adopted the current Local Plan is in place. The current Local Plan includes the Saved Southwark Plan (LBS, 2013), which contains the following four relevant policies:

- Policy 1.7 'Development within Town and Local Centres' states that "*…Within the centres, the LPA will permit developments providing a range of uses, including…residential and employment…uses, where the following criteria are met:…The road network has sufficient capacity to take additional servicing traffic generated by the proposal without causing adverse effects on the environment, traffic circulation or air quality…*";
- Policy 3.6 'Air Quality' states that "*Planning permission will not be granted for development that would lead to a reduction in air quality*";
- Policy 4.2 'Quality of Residential Accommodation' states that "*Planning permission will be granted for residential development, including dwellings within mixed-use schemes, provided that they…include high standards of…protection from pollution…*"; and
- Policy 5.2 'Transport Impacts' states that "*Planning permission will be granted for development unless…There is an adverse impact on transport networks for example through significant increases in traffic or pollution…*".

Southwark AQAP

2.28 In June 2003 LBS declared an AQMA (Southwark AQMA) which encompasses the northern part of the borough as a result of exceedances of the annual mean NO_2 and 24-hour mean PM_{10} objectives. Since that time, an AQAP (LBS, 2017) has been adopted by LBS which lists a number of actions to be undertaken by LBS during the period 2017 – 2022 in order to improve air quality.

Assessment Guidance

2.29 This assessment has been based on a number of guidance documents, the most significant of which are set out below:

London Local Air Quality Management Technical Guidance (LLAQM.TG(19))

2.30 The LLAQM document (Mayor of London, 2019) was published for use by London local authorities in review and assessment work but includes a number of technical guidelines on carrying out modelling assessment and management of monitoring data which set out best practice and are therefore relevant to all air quality assessments.

Land-Use Planning and Development Control: Planning For Air Quality

2.31 Environmental Protection UK (EPUK) and the IAQM (EPUK & IAQM, 2017) have published joint guidance on the assessment of air quality impacts for planning purposes. This includes information on when an AQA is required, what information an AQA should contain and the assessment of significance.

The Control of Dust and Emissions During Construction and Demolition SPG

2.32 The Greater London Authority's (GLA's) SPG on 'Control of Dust and Emissions During Construction and Demolition' (GLA, 2014b) includes a methodology for identifying the risk of potential dust sources associated with demolition, construction, earthworks and trackout in London. This is then used to identify the level of mitigation necessary in order for the impacts to be 'not significant'.

Guidance on the Assessment of Dust from Demolition and Construction

2.33 This IAQM's 'Guidance on the Assessment of Dust from Demolition and Construction' (IAQM, 2014) includes a methodology for identifying the risk magnitude of potential dust sources associated with demolition, construction, earthworks and trackout. This is then used to identify the level of mitigation necessary in order for the impacts to be not significant. The London SPG 'The Control of Dust and Emissions During Construction and Demolition' (GLA, 2014b) is based on this guidance, however, the original document is more detailed and, therefore, is used to provide additional information where necessary.

Southwark 'Technical Guidance on Air Quality'

2.34 LBS has published a 'Technical Guidance on Air Quality' document (LBS, 2017) that sets out LBS' requirements for reducing air pollution associated with developments and planning applications in LBS, including recommendations regarding the circumstances in which AQAs may be required, and preferred AQA methodologies.

3.0 METHODOLOGY

3.1 The methodology set out in the following sections has been identified as being the most appropriate approach to assessing the potential impacts associated with the proposed development and their level of significance, along with any required mitigation.

Baseline Air Quality; Publicly Available Data

3.2 Information regarding baseline air quality has been obtained by collating the results of monitoring carried out by LBS and referring to maps of AQMAs, Air Quality Focus Areas (AQFAs) and any predicted exceedances of the EU Limit Values identified by DEFRA's Pollution Climate Mapping (PCM) model (DEFRA, 2020b). Background concentrations have been defined based on the national pollution maps published by DEFRA (DEFRA, 2020a).

Demolition and Construction Dust Impacts

3.3 There is a potential for dust and PM_{10} generated by on-site demolition, earthworks and construction activities and as a result of off-site trackout by demolition and construction vehicles to impact sensitive receptors within the study area.

3.4 The suspension of dust and particulate matter is related to weather conditions and wind direction, ground and particle characteristics and on-site activities. There is a potential for impacts to occur when dust generating activities coincide with dry, windy conditions and where sensitive receptors are located downwind of the dust source.

3.5 Separation distance is an important factor as large particles (>30 µm) which are responsible for most dust annoyance largely deposit within 100 m of sources. Intermediate particles (10-30 µm) can travel 200-500 m but are less likely to trigger annoyance. Significant annoyance is therefore generally limited to a few hundred metres of the source. Small particles (<10 µm) are deposited slowly and may travel up to 1 km. Whilst these particles are responsible for most impacts on human health, impacts are not likely to be experienced at significant distance due to dispersion effects.

3.6 The assessment of demolition and construction dust impacts has been carried out following the SPG on 'The Control of Dust and Emissions During Construction and Demolition (GLA, 2014b), which is based on the IAQM 'Guidance on the Assessment of Dust from Construction and Demolition' (IAQM, 2014). Within this guidance, an 'impact' is described as a change in pollutant concentration or dust deposition and an 'effect' is described as the consequence of an impact.

3.7 The assessment considered three potential dust impacts:

- Loss of amenity due to dust soiling;
- Human health effects due to an increase in concentrations of PM_{10}; and
- Harm caused to ecological receptors due to dust deposition.

3.8 Full details of the approach taken to assessing dust are provided in **Appendix C**, the stages of the assessment are:

- Identify whether there are sensitive receptors within the relevant distances (study area) during the demolition and construction phase;
- Assess risk of dust impacts for each site activity type (demolition, earthworks, construction and trackout) – this includes identifying the emissions magnitude for each activity type and the overall sensitivity of the area and then combining these factors to identify risk;
- Identify mitigation measures, based on assessed risk, sufficient to ensure off-site impacts are not significant; and
- Assess impacts with mitigation in place. These should normally be not significant.

3.9 The IAQM guidance makes it clear that no assessment of the significance of impacts without mitigation should be carried out as mitigation measures will be required due to planning conditions as well as best practice for construction companies. The GLA and IAQM guidance states that the residual impact, taking into account the proposed mitigation will usually be 'not significant'.

Demolition and Construction Traffic Impacts

3.10 The potential impacts as a result of demolition and construction traffic generated by the proposed development have been qualitatively assessed taking into consideration the anticipated duration of the demolition and construction phase and any mitigation measures anticipated to be implemented. It is not currently known whether any committed developments and associated traffic are present within the study area and, therefore, committed development traffic has not been explicitly considered.

Operational Traffic Impacts

3.11 The potential impacts as a result of operational traffic generated by the proposed development have been qualitatively assessed taking into consideration the anticipated volume and composition of generated traffic as compared to the EPUK & IAQM guidance (EPUK & IAQM, 2017).

3.12 The IAQM/EPUK guidance 'Land Use Planning and Development Control: Planning for Air Quality' (EPUK & IAQM, 2017) includes a list of indicative criteria for where a detailed air quality assessment may be needed. The criteria relating to screening air quality impacts relating to additional traffic are:

- An increase in Light Duty Vehicle (LDV) traffic of 500 Annual Average Daily Traffic (AADT) (or 100 AADT within or adjacent to an AQMA); AND / OR
- An increase in Heavy Duty Vehicle (HDV) traffic of 100 AADT (or 25 AADT within or adjacent to an AQMA).

3.13 The above criteria apply to any individual link and therefore, a development generating over 500 AADT (or 100 AADT) may be considered to fall below the screening criteria where the increase is spread over a number of different road links.

Site Suitability

Screening

3.14 The potential for air quality impacts as a result of local air quality (including emissions from the local road network) on proposed sensitive receptors within the development itself has been screened qualitatively, taking into consideration baseline air quality, the layout of the proposed development and the location of the Site in relation to known areas of poor air quality (i.e. AQMAs and AQFAs) as well as nearby emission sources (e.g. the local road network).

3.15 The potential for significant impacts as a result of emissions associated with moving locomotives using the nearby railway line has been assessed using the screening criteria outlined within DEFRA's Local Air Quality Management Technical Guidance (TG16) (LAQM.TG(16)) (DEFRA, 2021). This guidance outlines that there is only a risk of exceedances of the annual mean NO_2 objective as a result of moving locomotives in instances where:

- There is relevant exposure within 30 m of rail lines with a heavy traffic of diesel passenger trains (as set out within the guidance); AND
- Background annual mean NO_2 concentrations are > 25 µg/m^3.

Detailed Assessment

3.16 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been predicted for a number of locations for human health exposure within the proposed development, including worst-case locations. Predicted concentrations have then been compared to the appropriate assessment criteria (see **Table 2-1** and **Table 2-2**) in order to determine the significance of any impact.

3.17 Relevant sensitive locations are those where members of the public will be regularly present over the averaging period of the objective. The locations within the proposed development to which these objectives apply are the proposed residential properties and the proposed flexible Class E / F1a (relevant in terms of the annual mean NO_2, PM_{10} and $PM_{2.5}$ objectives, the 24-hour mean PM_{10} objective

and the 1-hour mean NO_2 objective[5]) and the green roof[6] (relevant in terms of the 1-hour mean NO_2 objective only).

3.18 Based on the criteria above, six receptor locations have been selected for assessment representing the façades of the proposed residences and flexible Class E/F1(a) land use and the proposed green roof. Details of these receptors are presented in **Table 3-1** and receptor locations are shown in **Figure 3-1**, **Figure 3-2** and **Figure 3-3**.

3.19 In addition, concentrations have been modelled at four nearby diffusion tube monitoring sites (SDT39, SDT82, SDT84 and SDT141) (see **Table 4-1** and **Figure 4-1**) in order to calculate model verification factors. Further details of model verification are provided in **Appendix D**.

[5] The objectives do not apply at offices or other Class E land uses where members of the public will not typically be present. However, for Class E land uses where members of the public may temporarily be present (e.g. retail or recreational purposes) then the 1-hour mean NO_2 objective will apply, and for Class E land uses where members of the public will be present for longer periods (e.g. day nurseries) and Class F1a land uses the annual mean NO_2, PM_{10} and $PM_{2.5}$ objectives, the 1-hour mean NO_2 objective and the 24-hour mean PM_{10} objective will apply.

[6] It is not currently known whether the green roof will be accessible, therefore, its inclusion as a receptor is precautionary.

Table 3-1: Description of Modelled Receptors

Receptor	Description	Coordinates		Height (m)[a]	No. properties represented
		X	Y		
1	Class E/F1(a) land use to the rear of the building	532137	179347	1.5	One Class E/F1(a)
	Class E//F1(a) land use to the rear of the building			5.7	One Class/F1(a) E
	Green roof			9.9	n/a
2	Class E/F1(a) land use adjacent to Tiverton Street	532155	179334	1.5	One Class E/F1(a)
	Class E/F1(a) land use adjacent to Tiverton Street			5.7	One Class E/F1(a)
	Residence adjacent to Tiverton Street			9.9	Four residences
3	Class E/F1(a) land use adjacent to Avonmouth Street	532167	179360	5.7	One Class E/F1(a)
	Residence adjacent to Avonmouth Street			9.9	Three residences
4	Class E/F1(a) land use set back from Avonmouth Street	532149	179366	5.7	One Class E/F1(a)
	Green roof			9.9	n/a
5	Residence set back from Avonmouth Street	532156	179367	9.9	Two residences
6	Residence adjacent to Tiverton Street	532159	179338	9.9	Four residences

[a] Receptors have been modelled at heights of 1.5 m, 5.7 m and 9.9 m to represent Ground floor, 1st floor and 2nd floor receptor locations respectively.

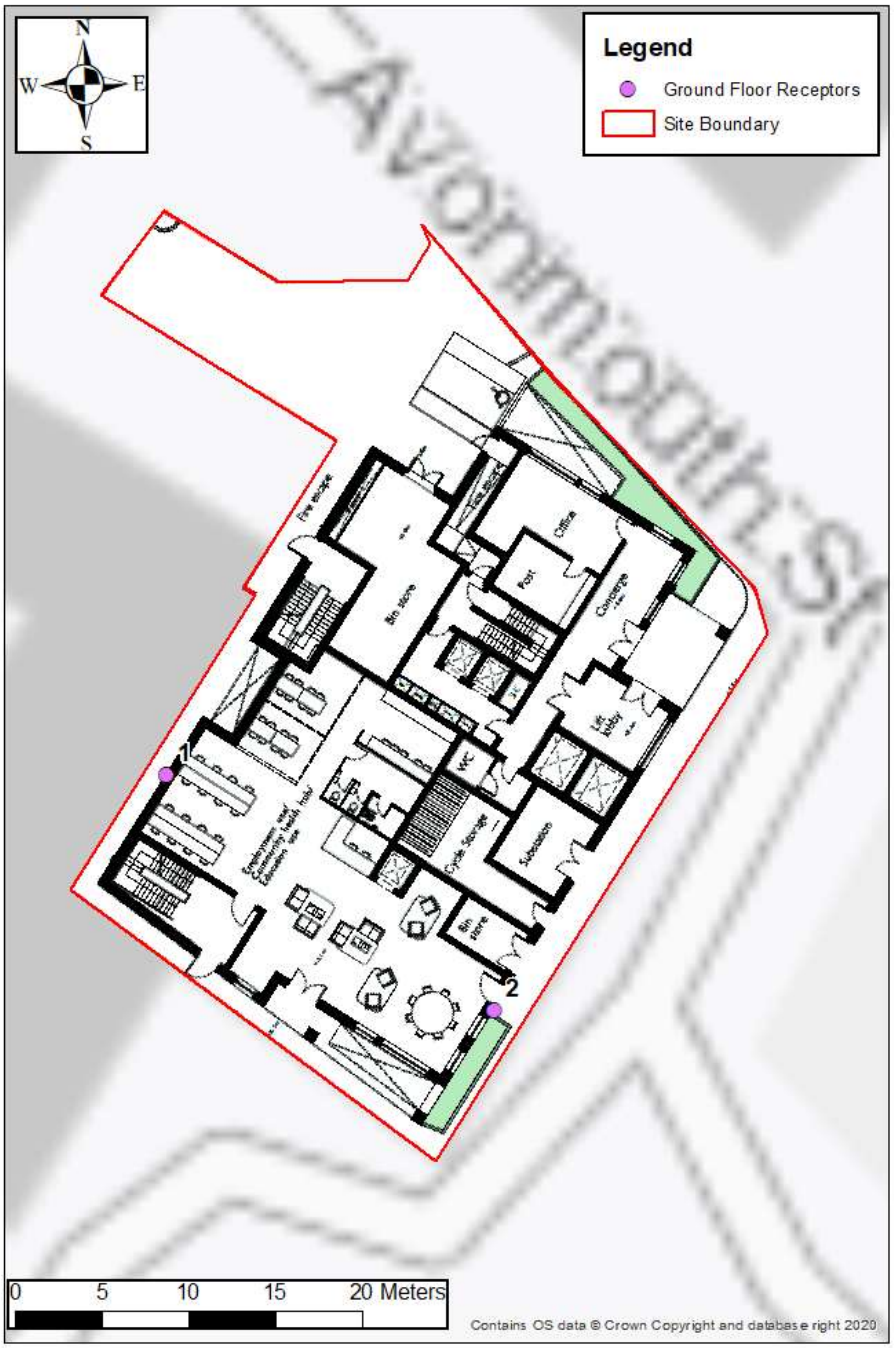

Figure 3-1: Modelled Receptor Locations; Ground Floor

(contains information taken from Stitch Architects & Urban Designers' drawing no. 21235-STCH-XX-00-DR-A-0101 Rev. F)

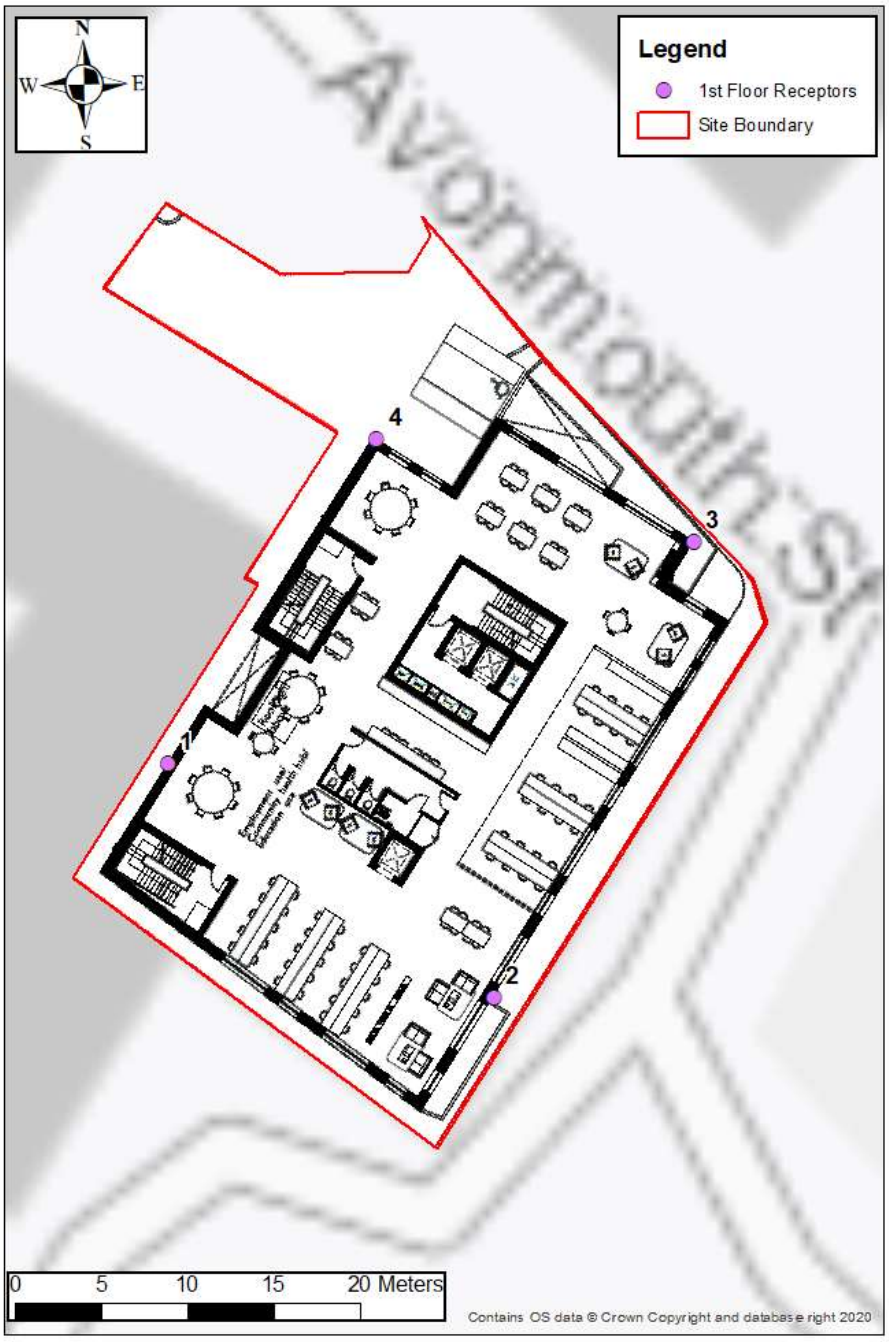

Figure 3-2: Modelled Receptor Locations; 1st Floor

(contains information taken from Stitch Architects & Urban Designers' drawing no. 21235-STCH-XX-01-DR-A-0102 Rev. F)

Figure 3-3: Modelled Receptor Locations; 2nd Floor

(contains information taken from Stitch Architects & Urban Designers' drawing no. 21235-STCH-XX-02-DR-A-0103 Rev. F)

3.20 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ at the identified receptors have been modelled using the ADMS-Roads dispersion model (v5). This model requires a number of inputs including traffic flow volumes (AADT), composition and average speeds as well as road characteristics such as width, gradient and street canyons, as applicable. Traffic flow volumes and traffic composition data have been taken from the DfT database (DfT, 2021) and the London Atmospheric Emissions Inventory (LAEI) database (GLA, 2020). Traffic data have been factored forwards to the modelled 'current'[7] and future[8] year scenarios, as required, using growth factors provided by the project's transport consultant (ACE). Average speeds for each road link have been estimated based on road conditions, taking into consideration speed limits and likely congestion. A summary of traffic data used in this assessment is provided in **Appendix F**.

3.21 The model also requires meteorological data and inputs. The model has been run utilising 2019 data from the London City meteorological station which is considered to be suitably representative of conditions within the study area. **Appendix D** provides additional information on the meteorological inputs.

3.22 The emissions associated with the traffic have been calculated using the Emissions Factor Toolkit (EFT) v10.1 (DEFRA, 2020c). This utilises emissions factors taken from the European Monitoring and Evaluation Programme (EMEP) / European Environment Agency (EEA) Air Pollution Emission Inventory Guidebook 2019 (EMEP / EEA, 2019) which is consistent with the COPERT 5.3 emission calculation tool (EMISIA, 2019), fleet composition data collected as part of the National Atmospheric Emissions Inventory (NAEI) and by Transport for London (TfL), along with data relating to the fleet and vehicle turnover in the UK. Traffic data have been entered into the EFT to provide emissions rates of NO_x, PM_{10} and $PM_{2.5}$ for each of the road links modelled, for a specified year (from 2018 to 2030), road type, vehicle fleet composition and speed. Whilst nitrogen oxides (NO_x) emissions

[7] The modelled 'current' year scenario is used to verify the model. The 'current' year for the purposes of this assessment is 2019, as this is the most recent year for which monitoring data are available with which to verify the model.

[8] The 'future' baseline year for the purposes of this AQA has been taken to be 2024, as this is the earliest year that any part of the proposed development is anticipated to be occupied.

rates are related to exhaust only, emissions rates for PM_{10} and $PM_{2.5}$ also include increments for road, tyre and break wear.

Assumptions and Limitations

3.23 There are many components that contribute to the uncertainty in predicted concentrations. The model used in this assessment is dependent on the traffic data that have been input which will have inherent uncertainties associated with them. There is then the uncertainty as the model is required to simplify real-world conditions into a series of algorithms.

3.24 Traffic data is not currently available for the several roads located in close proximity to the Site (Avonmouth Street, Tiverton Street, Bath Terrace and Rockingham Street), therefore, the model assumes that traffic flows along these roads will be comparable to traffic flows along nearby Harper Street. It is considered that volumes of traffic along Harper Street are likely to be greater than along the aforementioned roads located close to the Site, therefore, this model assumption is likely to result in an overprediction traffic emissions close to the Site, thus providing a conservative assessment. The roads for which this assumption has been made are located a considerable distance from all modelled verification sites and, therefore, it is considered that this assumption will not materially affect the model verification.

3.25 It is not currently known whether any committed developments and associated traffic are present within the study area and, therefore, committed development traffic has not been explicitly considered. However, the application of growth factors will account for general growth in traffic volumes.

3.26 The model relies on meteorological data for 2019 which may not represent conditions in the future. Climate change may result in changes wind conditions in the future, which will influence dispersion.

3.27 Per-vehicle exhaust emissions are predicted to reduce year-on-year due to technological advances and changes to the vehicle mix such as uptake of Euro VI/6 vehicles as well as Low and Ultra Low emission technology. Whilst there has been uncertainty regarding the accuracy of these predictions in the past, recent evidence (Air Quality Consultants Ltd., 2020a) suggests that the current emissions

factor predictions are likely to sufficiently reflect real world conditions without the need for a sensitivity test. Additionally, the model has undergone a verification process in order to adjust the model to real-world conditions (i.e. local monitoring). It is, therefore, considered appropriate to use emissions factors as provided by the EFT for this assessment without further adjustment beyond appropriate verification.

3.28 It should be noted that the traffic data used by this assessment and the emissions factors within the latest EFT are based on assumptions which were current before the occurrence of the Covid-19 pandemic. As such, these data will not reflect any changes that have occurred or may occur in the future as a result of behavioural change caused by the pandemic and / or as a result of measures implemented by governing authorities (e.g. lockdowns).

Air Quality Impacts Significance Criteria

3.29 In the absence of official guidance on the assessment of the potential for existing emissions sources to impact on sensitive locations introduced within the proposed development, this assessment has been limited to a comparison of predicted concentrations at sensitive locations within the proposed development, against the relevant objectives (see **Table 2-1** and **Table 2-2**).

Air Quality Neutral

3.30 The approach set out within the Air Quality Neutral Planning Support Update (Air Quality Consultants Ltd., 2014) has been followed in order to assess whether the proposed development is better or worse than 'air quality neutral' in terms of transport and building emissions.

4.0 BASELINE CONDITIONS

Site Context and Study Area

4.1 The Site is bounded by Avonmouth Street / Tiverton Street to the north, east and south and by existing government, commercial and entertainment properties to the west. The surrounding area is predominantly a mix of government, commercial, residential and entertainment properties and recreational green space (Newington Gardens), and there are existing railway lines located approximately 65 m to the southwest of the Site. The Site is currently occupied by a commercial use.

4.2 The study area in relation to air quality has been defined as follows:

- For the demolition and construction dust risk assessment the study area is defined as the area up to 350 m from the Site boundary and up to 50 m of the route(s) that will be used by demolition and construction vehicles on the public highway (up to 500 m from the Site entrance(s)). This is based on the IAQM guidance (IAQM, 2014) which is more precautionary in this instance than the London guidance (GLA, 2014b);
- For the demolition and construction and operational traffic screening assessment, the study area is defined as all main roads (and adjacent sensitive properties) where vehicles generated by the proposed development may travel; and
- For the assessment of Site suitability the study area is defined as the area within the Site boundary and sources which may influence this area.

EU Limit Values

4.3 The Site is located within the 'Greater London Urban Area' which has been reported to the EU as exceeding the NO_2 Limit Value and, therefore, is identified within the National Air Quality Action Plan for Nitrogen Dioxide (NO_2) in the UK (DEFRA and DfT, 2017) as requiring the implementation of a Clean Air Zone. Two charging Clean Air Zones have been implemented in Greater London; the Low Emission Zone (LEZ) and the Ultra-Low Emission Zone (ULEZ). The Site is located within

both the LEZ and the ULEZ. LEZ standards are Euro VI (NO_x and particulate matter (PM)) for HDVs and the ULEZ standards are Euro 3 for motorcycles, Euro 4 (NO_x) for petrol cars and Light Goods Vehicles (LGVs), Euro 6 (NO_x and PM) for diesel cars and LGVs and Euro VI (NO_x and PM) for HDVs.

4.4 The closest Automatic Urban and Rural Network (AURN) monitoring sites are Horseferry Road (London Westminster) (an urban background site), SWK5 (Old Kent Road) (a roadside / urban traffic site) and Site B0 (London Bloomsbury) (an urban background site). The Horseferry Road (London Westminster) monitoring site is located approximately 2.4 km to the west of the development Site; in 2019 this site measured annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ (34 µg/m^3, 17 µg/m^3 and 12 µg/m^3 respectively) that were below the annual mean EU Limits and no exceedance of the 1-hour mean NO_2 EU limit value or 24-hour mean PM_{10} EU Limit Values. Site SWK5 (Old Kent Road) is located approximately 3.3 km to the southeast of the development Site; in 2019 this site measured annual mean concentrations of NO_2 and PM_{10} (35 µg/m^3 and 24 µg/m^3 respectively) that were below the annual mean EU Limits and no exceedance of the 1-hour mean NO_2 EU limit value or 24-hour mean PM_{10} EU Limit Values. Site B0 (London Bloomsbury) is located approximately 3.4 km to the southeast of the development Site; in 2019 this site measured annual mean concentrations of NO_2 ,PM_{10} and $PM_{2.5}$ (32 µg/m^3, 18 µg/m^3 and 11 µg/m^3 respectively) that were below the annual mean EU Limits and no exceedance of the 1-hour mean NO_2 EU limit value or 24-hour mean PM_{10} EU Limit Values.

4.5 The closest location to the Site at which DEFRA's PCM model (DEFRA, 2020b) predicts an exceedance of the annual mean NO_2 Limit Value in in the 'current' year scenario (i.e. 2019[7]) is along New Kent Road (A201), located approximately 265 m to the southwest of the Site. However, by the future year scenario (i.e. 2024[8]) predicted NO_2 concentrations along this section of road, and all other nearby roads, fall below the Limit Value. Furthermore, the model does not predict any

exceedances of the annual mean PM_{10} or $PM_{2.5}$ Limit Values in close proximity to the Site in 2018, 2020 or 2025[9].

LLAQM

4.6 LBS has assessed air quality within its area as part of its responsibilities under LLAQM and in June 2003 declared an AQMA (Southwark AMQA) as a result of exceedances of the annual mean NO_2 objective and the 24-hour mean PM_{10} objective. Southwark AQMA covers an area encompassing the northern part of the borough, extending from Rotherhithe to Walworth and Camberwell and up to the boundary on the River Thames; the area is along the A2, A200, A215 and A202 south to the A205. The Site is located within Southwark AQMA.

AQFAs

4.7 The GLA has declared a number of AQFAs within Greater London. AQFAs are locations that both exceed the annual mean NO_2 EU Limit Value and are locations with high levels of human exposure. The Site is located within an AQFA (Elephant and Castle to St George's Circus and Kennington Lane).

Monitoring

4.8 In 2019 LBS carried out monitoring of NO_2 at three automatic monitoring sites and monitoring of PM_{10} at two automatic monitoring sites. One of these sites (SWK6) is located in close proximity to the development Site.

4.9 LBS has also undertaken monitoring of NO_2 at a number of diffusion tube monitoring sites, 12 of which are located in relatively close proximity to the development Site. The locations of the closest and / or most representative local

[9] Predicted annual mean PM_{10} and $PM_{2.5}$ concentrations are not available for either 2019 or 2024, therefore, predicted concentrations for 2018, 2020 and 2024 have been considered as these is the closest years to the 'current' and future year scenarios that are available.

monitoring sites are shown in **Figure 4-1** and details of these sites as well as monitoring results for 2015 - 2020[10] are presented in **Table 4-1** and **Table 4-2**.

4.10 Exceedances of the annual mean NO_2 objective were measured at three sites in 2019; sites SDT29, SDT82 and SDT113. Exceedances of the annual mean object were also measured at site SWK6 in 2015, at sites SDT12/13/14, SDT39 and SDT41 from 2015 – 2017, at sites SDT29, SDT31 and SDT38 from 2015 – 2018, at site SDT57 in 2016 and 2017, at sites SDT82 and SDT84 from 2016 to 2018 and at site SDT113 in 2017 and 2018.

4.11 No exceedances of the 1-hour mean NO_2 objective were measured by automatic monitoring site SWK6 from 2015 – 2019. However, annual mean concentrations greater than 60 µg/m^3, thus indicating a potential exceedance of the 1-hour mean objectives, were measured at diffusion tube monitoring site SDT12/13/14 in 2015, sites SDT29 and SDT38 from 2015 – 2017, sites SDT82 in 2016 and 2017 site SDT113 in 2017.

4.12 An overall trend of decreasing measured annual mean concentrations is apparent at sites SWK6, SDT12/13/14, SDT29, SDT31, SDT38, SDT39 and SDT41 during the period 2015 – 2019. There is insufficient available information to be able to confidently determine a trend at sites SDT57, SDT82, SDT84, SDT112, SDT113 and SDT141 during this time period.

[10] As a result of the Covid-19 pandemic and associated behavioural changes and measures implemented by the governing authorities (e.g. lockdowns, travel restrictions etc.) measured concentrations during 2020 are not considered to be representative of 'normal' conditions. As such, measured 2020 concentrations are presented for information only, and have not been discussed or given weight in determining the conclusions of this assessment.

Table 4-1: Local Monitoring Site Measured Annual Mean NO_2 Concentrations 2015 – 2020 (µg/m³)

Site ID	Site Name	Site Type	Measured Annual Mean Concentrations (µg/m³)					
			2015	2016	2017	2018	2019	2020
Automatic Monitoring Site								
SWK6	Elephant & Castle	Urban Background	**41**	39	34	32	30	21
Diffusion Tube Monitoring Site								
SDT12 / 13 / 14 [a, b]	AQMS Elephant & Castle	Urban Background	**66**	**54**	**42**	35	33	20
SDT29	Opposite Haddon Hall Tower Bridge Road	Kerbside	**68**	**76**	**74**	**57**	**51**	38
SDT31	Bricklayers Arms West	Kerbside	**50**	**51**	**47**	**41**	39	28
SDT38	Walworth Road opposite junction to Elephant Road	Kerbside	**81**	**88**	**64**	**45**	40	30
SDT39	Lamppost 3 New Kent Road north (Metro Central)	Kerbside	**54**	**48**	**46**	40	36	25
SDT41	Lamppost 29 New Kent Road north side (Rodney Place)	Kerbside	**53**	**51**	**46**	40	38	35
SDT57	Notre Dame School	Kerbside	-	**52**	**44**	40	35	25
SDT82	Lamppost 01 Adjacent to 125 Borough High Street	Kerbside	-	**70**	**61**	**50**	**45**	31

Site ID	Site Name	Site Type	Measured Annual Mean Concentrations (µg/m³)					
			2015	2016	2017	2018	2019	2020
SDT84	Lamppost 8 Little Dorritt Park Entrance	Kerbside	-	**56**	**50**	**41**	39	29
SDT112	Parking Sign Adjacent to 3 West Square	Kerbside	-	-	31	28	25	18
SDT113	Lamppost Adjacent to 43 Westminster Bridge Road	Kerbside	-	-	**74**	**59**	**46**	38
SDT141	ConnectKerbsite Borough Road	Kerbside	-	-	-	-	34	26
Objective			**40**					

Exceedances of the annual mean objective are highlighted in **BOLD**.
Data have been taken from LBS's Air Quality Annual Status Reports (ASRs) for 2020 (LBS, 2021) and 2016 (LBS, 2017).
Concentrations are rounded to zero decimal places, taking into consideration the level of accuracy of the data source.
[a] Co-located with automatic monitoring site SWK6.
[b] Triplicate monitoring site.

Table 4-2: Local Automatic Monitoring Site Measured Number of Hours >200 NO_2 2015 – 2020 (µg/m³)

Site ID	Site Name	Site Type	Number of Hours >200 µg/m³					
			2015	2016	2017	2018	2019	2020
SWK6	Elephant & Castle	Urban Background	0	0	0	0	0	0
Objective			**18**					

Data have been taken from LBS's Air Quality ASR for 2020 (LBS, 2021).
Concentrations are rounded to zero decimal places, taking into consideration the level of accuracy of the data source.

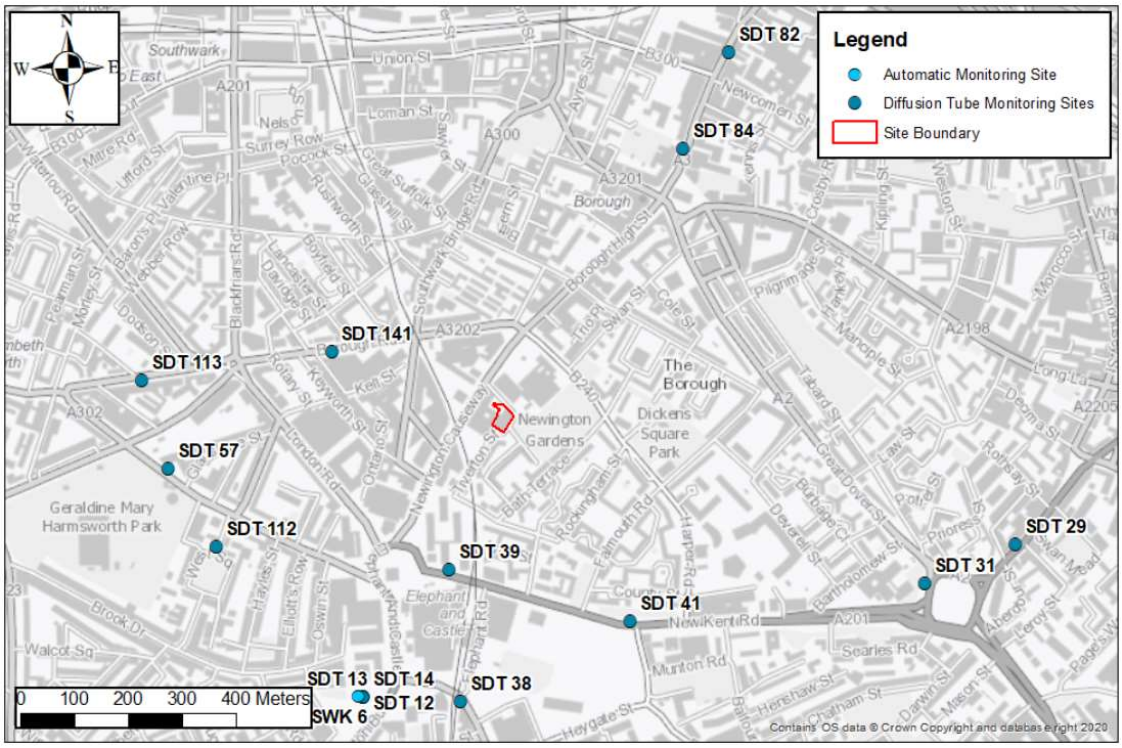

Figure 4-1: Local Monitoring Sites

4.13 In 2019 LBS also carried out monitoring of PM_{10} at two automatic monitoring sites, one of which (SWK6) is located in close proximity to the Site. The location of this site is shown in **Figure 4-1** and details of this site and monitoring results for the last five years are presented in **Table 4-3**. No exceedances of either the annual mean or the 24-hour mean PM_{10} objectives were measured at automatic monitoring site SWK6 between 2015 and 2019.

Table 4-3: Measured Annual Mean Concentrations and Exceedances of the 24-Hour Mean PM_{10} Objective 2015 - 2020

Site ID	Site Name	Site Type	2015	2016	2017	2018	2019	2020
Annual Mean (µg/m³)								
SWK6	Elephant & Castle	Urban Background	20	26	19	20	17	16
Objective			**40**					
No. Days >50 µg/m³								
SWK6	Elephant & Castle	Urban Background	1	21	1	2	14	3
Objective			**35**					

Data have been taken from LBS's Air Quality ASR for 2020 (LBS, 2021).
Concentrations are rounded to zero decimal places, taking into consideration the level of accuracy of the data source.

Predicted Background Concentrations

4.14 Predicted background concentrations within the Site have been obtained from national maps provided by DEFRA (DEFRA, 2020a). The mapped NO_2 and PM_{10} backgrounds have been compared against concentrations measured at automatic monitoring site SWK6 (see **Table 4-1** and **Table 4-3**) and factors have been taken from these comparisons and applied to the background concentrations provided by DEFRA (see **Appendix D**). There are no nearby monitoring sites that measure concentrations of $PM_{2.5}$, therefore, $PM_{2.5}$ concentrations provided by DEFRA have been adjusted by the factor derived for PM_{10} as there is likely to be a similar relationship. The adjusted predicted background concentrations are presented in **Table 4-4**.

4.15 The predicted annual mean background concentrations are all below the relevant objectives within the Site for both the current[7] and future[8] year scenarios.

Table 4-4: Predicted Annual Mean Background Concentrations within the Site (µg/m³)

Year	NO_2	PM_{10}	$PM_{2.5}$
2019	33	17	11
2024	28	16	10
Objectives	**40**	**40**	**20**

Predicted concentrations are rounded to zero decimal places taking into consideration the level of accuracy of the data sources.

5.0 PREDICTED IMPACTS

Demolition and Construction Dust Impacts

Screening Assessment

5.1 The primary potential effects as a result of dust generated during demolition and construction activities relate to annoyance and loss of amenity caused by dust soiling, health impacts relating to PM_{10} and ecological impacts due to dust deposition.

5.2 Based on the screening criteria set out by the GLA and IAQM, it is considered necessary to carry out a demolition and construction dust risk assessment for dust soiling and human health impacts as there are sensitive human receptors located within 350 m of the Site boundary and within 50 m of roads along which dust may be tracked by demolition and construction vehicles.

5.3 There are no ecological sites located within 50 m of the site boundary or roads along which dust may be tracked by demolition and construction vehicles. As such, the potential ecological impact of dust can be screened out as being 'not significant'.

Further Assessment

Dust Emission Magnitude

5.4 The dust emission magnitude relating to demolition, earthworks and construction and as a result of trackout of dust by demolition and construction vehicles have been determined based on the GLA guidance (as set out in **Appendix C**).

5.5 Proposed demolition activities include the demolition of an existing two-storey building which occupies the Site, which is estimated to have a total volume of <20,000 m^3. Based on this, the dust emission magnitude associated with demolition activities is considered to be 'small'.

5.6 Proposed earthworks are likely to occur across the majority of the Site area, which is approximately 1,174 m^2 in area (i.e. <2,500 m^2). The soil at the Site is deep with a sand to sandy loam texture and river terrace sand / gravel subsoil with an

arenaceous[11] to rudaceous[12] grain size, and is, therefore, considered to be slightly to moderately dusty in nature. Based on these factors, the dust emission magnitude associated with earthworks activities is considered to be 'small'.

5.7 Construction activities will comprise the construction of a building ranging in height from two to sixteen storeys. The total building volume is anticipated to be between 25,000 m^3 and 100,000 m^3, therefore, the dust emission magnitude associated with construction activities is considered to be 'medium'.

5.8 The average volume of demolition and construction traffic that is anticipated to access the Site is currently unknown however, taking into consideration the size of the Site and the anticipated magnitude of construction activities, the dust emission magnitude is considered to be 'medium'.

Area Sensitivity

5.9 The sensitivity of the area to dust soiling and human health impacts has been assessed based on the criteria shown in **Appendix C**.

5.10 Residential properties are considered to be of 'high' sensitivity to dust soiling, whereas commercial properties, government buildings and hotels are considered to be of 'medium' sensitivity. There are estimated to be approximately 10-20 existing residential properties as well as a commercial and government properties located within 20 m of the Site boundary. Based on this, the overall sensitivity of the area surrounding the Site to dust soiling is considered to be 'high'.

5.11 The guidance states that trackout can occur on roads up to 50 m from 'small' sites. The routing of demolition and construction traffic leaving the Site is currently unknown, therefore, the worst-case assumption has been that vehicles could travel along any main roads. There are estimated to be between 40 and 70 existing residential properties as well as government and commercial properties and a hotel located within 20 m of roads which may be subject to trackout by HGVs.

[11] Typical particle size of 0.06 mm – 2.0 mm.

[12] Typical particle size of >2.0 mm.

Based on this, the overall sensitivity of the area surrounding roads which may experience trackout is considered to be 'high'.

5.12 Residential properties are also considered to be 'high' sensitivity receptors in terms of human health impacts, whereas commercial properties, government buildings and hotels are considered to be of 'medium' sensitivity. For the purposes of the demolition and construction dust risk assessment, the assumption has been made that annual mean concentrations of PM_{10} concentrations within the study area are comparable to the highest of the modelled 'current' year (2019) concentrations at identified receptors (i.e. 17 $\mu g/m^3$). Based on this and the number of sensitive properties located in close proximity to the Site boundary and / or roads along which material may be tracked by demolition and construction traffic (see Paragraphs 5.10 and 5.11), the overall sensitivity of the area surrounding the Site and the area surrounding roads which may experience trackout are considered to be 'medium'.

Risk of Impacts

5.13 The risk of demolition and construction dust impacts, without mitigation, has been assessed based on the tables provided in **Appendix C** and the identified risks are shown in **Table 5-1**.

Table 5-1: Risk of Construction Dust Impacts Without Mitigation

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

5.14 Overall, taking into consideration the risks set out in **Table 5-1**, appropriate mitigation measures corresponding to a 'medium risk' site are generally required, although where measures relate to earthworks activities only then mitigation measures corresponding to a 'low risk' site are sufficient. The recommended list of mitigation measures is set out in **Section 6.0**.

5.15 The IAQM guidance (IAQM, 2014) recommends that no judgement of the significance of demolition and construction dust effects should be made without taking mitigation into account. This is due to the fact that mitigation measures are

assumed to be secured by planning conditions and legal requirements as well as construction codes of conduct. Following implementation of the recommended mitigation (as set out in **Section 6.0**), residual impacts will be 'not significant'. In order to address the potential for cumulative effects, the measures recommended include a requirement for liaison with any nearby 'high risk' sites (see **Section 6.0** for further details).

Demolition and Construction Traffic

5.16 There is likely to be significant fluctuation in the numbers of vehicle movements associated with development constructions throughout the construction period, with peak periods generally being related to delivery of materials. When these vehicle movements are averaged over a year, they will be significantly lower that peak movements.

5.17 The volume and distribution of development-generated demolition and construction traffic is currently unknown. However, for schemes similar in nature to the proposed development, impacts associated with demolition and construction traffic are often less than impacts associated with operational traffic. The impacts of operational traffic are discussed in Paragraph 5.21.

5.18 It should also be taken into consideration that any impacts associated with demolition and construction traffic will be temporary in nature; the demolition and construction phase of the proposed development is anticipated to have a duration of less than two years.

5.19 Furthermore, it is expected that further details regarding demolition and construction traffic are likely to be included within a Construction Environmental Management Plan (CEMP) or similar, which would include details of HDV and other demolition and construction-related traffic movements such as numbers, routing and times of day that these movements will occur, as well as measures to prevent or minimise the impact of HDVs where possible within particularly sensitive locations.

5.20 Taking into consideration the above, it is judged that the overall effect of emissions associated with demolition and construction traffic is likely to be 'not significant'.

Operational Traffic

5.21 The proposed development is predicted to result in an increase of 24 AADT[13]. As such, traffic generation falls below the EPUK & IAQM screening criteria for within an AQMA (see Paragraph 3.12) and the impacts of operational development-generated traffic on existing sensitive properties in the local area can, therefore, be screened out as being 'not significant' without the need for a detailed assessment.

Site Suitability

Screening Assessment

5.22 The proposed development will introduce new areas of sensitive exposure and the Site is located within both an AQMA and an AQFA. As such, it has been considered necessary to undertake a detailed assessment (see Paragraphs 5.24 to 5.26).

5.23 Sensitive locations within the proposed development are set back by >30 m from the nearby railway lines and, therefore, according to the screening criteria set out in DEFRA's Local Air Quality Management Technical Guidance (TG16) (LAQM.TG(16)) (DEFRA, 2021) (see Paragraph 3.15) there is no risk of exceedance of the annual mean NO_2 objective as a result of emissions associated with moving locamotives.

Detailed Assessment

5.24 Predicted annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ in 2024 at modelled receptor locations (as identified in **Table 3-1** and **Figure 3-3**) are presented in **Table 5-2**.

5.25 Predicted annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ are well below the annual mean objectives at all relevant receptors. Furthermore, predicted annual mean NO_2 and PM_{10} concentrations are below 60 µg/m^3 and 32 µg/m^3 respectively at all relevant receptors, indicating that exceedances of the short-term NO_2 and PM_{10} objectives are not likely at any receptor.

[13] This figure has been provided by the transport consultants; ACE.

5.26 Based on the predicted concentrations of pollutants it is considered that new residents and users of the proposed development will experience good air quality and that, therefore, the Site is suitable for its intended end-use.

Table 5-2: Predicted Annual Mean Concentrations at Receptors in 2024 (µg/m³)

Receptor	NO_2	PM_{10}	$PM_{2.5}$
1 (G floor)[a]	28	16	10
1 (1st floor)[a]	28	16	10
1 (2nd floor)[b]	28	16	10
2 (G floor)[a]	29	16	10
2 (1st floor)[a]	28	16	10
2 (2nd floor)	28	16	10
3 (1st floor)[a]	29	16	10
3 (2nd floor)	28	16	10
4 (1st floor)[a]	28	16	10
4 (2nd floor)[b]	28	16	10
5	28	16	10
6	28	16	10
Objectives	**40 (60) [c]**	**40 (32) [c]**	**20**

Predicted concentrations are rounded to zero decimal places taking into consideration the level of accuracy of the model and data sources.

[a] Only the 1-hour mean NO_2 objective applies at this receptor, unless the E(f) land use class is present, in which case the annual mean NO_2, PM_{10} and $PM_{2.5}$ objectives and the 24-hour mean PM_{10} objective apply. Should a land use class be introduced where members of the public are not typically present then none of the above objectives will apply.

[b] Only the 1-hour mean NO_2 objective applies at this receptor.

[c] Concentrations of 60 µg/m³ and 32 µg/m³ have been used as proxies for the 1-hour mean NO_2 objective and the 24-hour mean PM_{20} objective respectively.

Air Quality Neutral Calculations

Building Emissions

5.27 The proposed energy strategy will be comprised of ASHPs and, therefore, there will be no on-site emissions associated with the energy strategy. As such, the proposed development will be better than 'air quality neutral' in terms of building emissions.

Transport Emissions

5.28 The air quality neutral calculations for transport are dependent upon the proposed land use classes. As the proposed land use Class E/F1(a) space within the

development is flexible, two alternative calculations have been undertaken; one assuming office space (former land use class B[14]) as this is the land use which has been assumed during the calculation of proposed development trip generation (provided by ACE), and one assuming non-residential institutions (former land-use class D1) as this is the worst-case assumption in terms of benchmark trip generation[15].

Approach 1

5.29 The air quality neutral calculations for transport emissions (presented in **Table 5-3** to **Table 5-6**) have been undertaken assuming that the flexible Class E/F1(a) land use will be office space (former B1 land use class).

Table 5-3: Proposed Development Trip Generation

Land use/Class	Trips/day	Trips/annum	Distance travelled/trip (km)	Distance Travelled / annum (km)
C3 (Residential)	8	2,920	4.3	12,556
B1 (Office)	16	5,840	3.0	17,520

[14] The guidance on which the 'air quality neutral' assessment is based (Air Quality Neutral Planning Support Update: GLA 80371 (Air Quality Consultants Ltd., 2014)) was produced prior to the change to the definition of land use classes in autumn 2020, therefore, the older land use class definitions are referred to and attributed to the proposed development land uses.

[15] Trip generation information is not available for all land uses which are included within flexible Class E/F1(a) land use, therefore, the worst-case of those options for which data is available has been considered.

Table 5-4: Proposed Development Transport Emission Calculation

Land use/Class	Emissions Factors (g/vehicle-km)		Annual Transport Emissions (kg/annum)	
	NO_x	PM_{10}	NO_x	PM_{10}
C3 (Residential)	0.4224	0.0733	5.3	0.9
B1 (Office)	0.4224	0.0733	7.4	1.3

Table 5-5: Transport Benchmark Calculation

Land use/Class	No. Dwellings / GIA	Transport Benchmark (kg / annum / dwelling or m^2)		Development Transport Emission Benchmark (TEB) (kg / annum)	
		NO_x	PM_{10}	NO_x	PM_{10}
C3 (Residential)	233	0.23	0.04	54.5	9.5
B1 (Office)	1,733	0.001	0.0002	2.2	0.4

Table 5-6: Comparison of Benchmarked and Development Emissions (kg/annum)

Land use/Class	Development TEB		Proposed Development Emissions		Comparison to Benchmarked Emissions	
	NO_x	PM_{10}	NO_x	PM_{10}	NO_x	PM_{10}
C3 (Residential)	54.5	9.5	5.3	0.9	-49.2	-8.6
B1 (Office)	2.2	0.4	7.4	1.3	+5.2	0.9
Combined	**56.7**	**9.9**	**12.7**	**2.2**	**-44.0**	**-7.7**

5.30 The transport NO_x and PM_{10} emissions are above the calculated Transport Emissions Benchmark (TEB) for the assumed office land use, but are substantially below for TEB for the residential land use. Overall, the development NO_x and PM_{10} emissions are substantially below the calculated TEB for the whole development and, therefore, the proposed development is considered to be better than 'air quality neutral' in terms of transport emissions.

Approach 2

5.31 Air quality neutral calculations have also been undertaken assuming that the flexible Class E/F1(a) land use will be non-residential institutions (former land-use class D1). As transport emission benchmark data is not available for this land use class, the calculations have been limited to considering trip generation.

Table 5-7: Development Trip Generation

Land use/Class	Trips/day	Trips / Annum
C3 (Residential)	8	2,920
D1 (Non-residential Institutions)	16	5,840

Table 5-8: Trip Generation Benchmark Calculation

Land use/Class	No. Dwellings / GIA	Benchmark Trip Rate (trips / dwelling or m^2 / annum)	Trips / Annum
C3 (Residential)	233	129	910,282
D1 (Non-residential Institutions)	1,733	0.007	121

Table 5-9: Comparison of Benchmarked and Development Trip Rates (trips / annum)

Land use/Class	Development Benchmark	Proposed Development	Comparison to Benchmark
C3 (Residential)	910,282	2,920	-907,362
D1 (Non-residential Institutions)	121	5,840	+5,719
Combined	**910,403**	**8,760**	**-901,643**

5.32 The trip rates are above the calculated benchmark for the assumed non-residential institute land use, but are substantially below for the residential land use. Overall, the development trips rate is substantially below the calculated benchmark for the whole development and, therefore, the proposed development is considered to be better than 'air quality neutral' in terms of trip rates.

6.0 MITIGATION

Demolition and Construction Dust

6.1 The following standard mitigation measures have been identified based on the identified level of risk (see **Table 5-1**) and the recommendations within the SPD on 'The Control of Dust and Emissions during Construction and Demolition' (GLA, 2014b). A Dust Management Plan (DMP) should be submitted to LBS prior to works commencing on site.

Site Management

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site;
- Develop a DMP;
- 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 emission 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 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 in the log book; and

- Hold regular liaison meetings with high risk construction sites located within 500 m of the Site boundary, to ensure that plans are co-ordinated and dust and particulate matter emissions are minimised.

Preparing and maintaining the site

- Plan site layout so that machinery and dust causing activities are located away from receptors;
- Erect solid screens or barriers around dusty 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 active for an extensive period;
- Install green walls, screens or other green infrastructure to minimise the impact of dust and pollution;
- 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; and
- Carry out regular dust soiling checks of buildings within 100 m of the Site boundary and cleaning to be provided if necessary.

Monitoring

- Put in place real-time dust and air quality pollutant monitors across the Site and ensure they are checked regularly;
- Agree monitoring locations with the local authority; and
- Where possible, commence baseline monitoring at least three months before activities being.

Operating vehicle/machinery and sustainable travel

- Ensure all on-road vehicles comply with the requirements of the London LEZ;
- Ensure all non-road mobile machinery (NRMM) comply with the standards set out within the SPG (GLA, 2014a);
- 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 practicable;
- Impose and signpost a maximum-speed-limit of 10 mph on surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate);
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials; and
- 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 and conveyors and covered skips;
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate; and

- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

- Avoid bonfires and burning of waste materials; and
- Reuse and recycle waste to reduce dust from waste materials.

Demolition

- Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust);
- Ensure water suppression is used during demolition operations;
- Avoid explosive blasting, using appropriate manual or mechanical alternatives; and
- Bag and remove any biological debris or damp down such material before demolition.

Earthworks

- Re-vegetate earthworks and exposed areas / soil stockpiles to stabilise surfaces;
- Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil; and
- Only remove secure covers in small areas during work and not all at once.

Construction

- Avoid scabbling (roughening of concrete surfaces) if possible;
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;

- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to precent escape of material and overfilling during delivery; and
- For smaller suppliers of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.

Trackout

- Regularly use a water-assisted dust sweeper on the access and local roads, as necessary, to remove any material tracked out of the Site;
- Avoid dry sweeping of large areas;
- Ensure vehicles entering and leaving sites are securely covered to prevent escape of materials during transport;
- Record all inspections of any haul routes and subsequent action in a site log book
- Any haul routes installed shall be hard surfaced, an regularly damped down with fixed or mobile sprinkler systems and regularly cleaned;
- Any haul routes shall be inspected for integrity and necessary repairs will be instigated to the surface as soon as reasonably practicable;
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the Site where reasonably practicable);
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the Site exit, wherever Site size and layout permits;
- Access gates to be located at least 10 m from receptors where possible; and
- Apply dust suppressants to locations where a large volume of vehicles enter and exit the construction site.

Demolition and Construction Development-Generated Traffic

6.2 The overall effect of demolition and construction traffic generated by the proposed development on sensitive locations in the study area is likely to be 'not significant'. Therefore, no further mitigation measures are considered to be necessary.

Operational Development-Generated Traffic

6.3 The overall effect, without mitigation, of operational traffic generated by the proposed development on sensitive locations in the study area is 'not significant'. Therefore, no further mitigation measures are considered to be necessary.

Site Suitability

6.4 Concentrations of pollutants at sensitive locations within the proposed development are predicted to be well below the relevant objectives and, therefore, new residents are anticipated to experience good air quality. As such, no further mitigation measures are considered necessary.

Air Quality Neutral

6.5 The proposed development is considered to be substantially better than 'air quality neutral' in terms of both building and transport. As such, no further mitigation measures are considered to be necessary.

7.0 CONCLUSIONS

7.1 The potential air quality impacts associated with the proposed mixed-use development at 6 Avonmouth Street in LBS have been assessed.

7.2 There is the potential for dust soiling and human health impacts as a result of dust and PM_{10} generated by on-site demolition, earthworks and construction activities and as a result of trackout by demolition and construction vehicles, however, with the proposed mitigation measures in place, the residual overall effect will be 'not significant'.

7.3 Potential impacts from emissions associated with demolition and construction traffic generated by the proposed development will be temporary only, and may be mitigated to some degree by the implementation of a CEMP. It is judged that the overall effect is likely to be 'not significant'.

7.4 The volume of operational traffic associated with the proposed development falls below the relevant screening criteria and, therefore, potential impacts of emissions from operational development-generated traffic can be screened out as being 'not significant'.

7.5 Concentrations of pollutants at sensitive locations within the proposed development are predicted to be well below the relevant objectives and, therefore, new residents are anticipated to experience good air quality.

7.6 The proposed development is substantially better than 'air quality neutral' in terms of both building and transport.

7.7 It is concluded that the overall effect of the proposed development, with the implementation of the identified appropriate mitigation, will be 'not significant'.

8.0 REFERENCES

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Appendix A Glossary

Abbreviations	Meaning
AADT	Annual Average Daily Traffic
ACE	Ardent Consulting Engineers
ADMS	Air Dispersion Modelling System
AQA	Air Quality Assessment
AQAP	Air Quality Action Plan
AQFA	Air Quality Focus Area
AQMA	Air Quality Management Area
ASHP	air-source heat pump
ASR	Annual Status Report
AURN	Automatic Urban and Rural Network
BST	British Summer Time
CAZ	Central Activity Zone
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
Diffusion Tube	A passive sampler used for collecting NO2 in the air
DMP	Dust Management Plan
EEA	European Environment Agency
EFT	Emission Factor Toolkit
EMEP	European Monitoring and Evaluation Programme
EPUK	Environmental Protection UK
GIA	Gross Internal Area
GLA	Greater London Authority
HDV	Heavy Duty Vehicle; a vehicle with a gross vehicle weight greater than 3.5 tonnes, includes Heavy Goods Vehicles and buses
HGV	Heavy Goods Vehicle
IAQM	Institute of Air Quality Management
LAEI	London Atmospheric Emissions Inventory
LAQM	Local Air Quality Management
LBS	London Borough of Southwark
LDV	Light Duty Vehicle; a vehicle with a gross vehicle weight equal to or less than 3.5 tonnes. Includes cars, Light Goods Vehicles and motorbikes
LEZ	Low Emission Zone
LGV	Light Goods Vehicle
LLAQM	London Local Air Quality Management

Abbreviations	Meaning
NAEI	National Atmospheric Emissions Inventory
NAQO	National Air Quality Objective as set out in Air Quality Strategy and the Air Quality Regulations
NO	nitric oxide
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides, generally considered to be nitric oxide and NO_2. The main source is from combustion of fossil fuels, including petrol and diesel used in road vehicles and natural gas used in gas-fired boilers.
NPPF	National Planning Policy Framework
NRMM	Non-road mobile machinery
O_3	ozone
PCM	Pollution Climate Mapping
PM	Particulate Matter
PM_{10} or $PM_{2.5}$	Small airborne particles less than 10/2.5 µg in diameter
PPG	Planning Practice Guidance
Receptor	A location where the effects of pollution may occur
RMSE	Root Mean Square Error
SPG	Supplementary Planning Guidance
TEB	Transport Emission Benchmark
TfL	Transport for London
ULEV	Ultra-Low Emission Vehicles
ULEZ	Ultra-Low Emission Zone

Appendix B Air Quality Neutral Transport Benchmarks

B1.1 Transport Emission Benchmarks (TEBs) have been defined within the Air Quality Neutral Guidance **(Air Quality Consultants, 2014)** for NO_x and PM_{10}, for Retail (A1 and A2), Commercial (B1) and living accommodation (C3) use classes. These are set out in **Table B.1**.

Table B.1: 'Air Quality Neutral' Transport Emissions Benchmarks (TEBs) [16]

Land Use Class	Benchmark		
	CAZ	Inner	Outer
NOx (g/m²/annum)			
Retail (A1)	169	219	249
Office (B1)	1.27	11.4	68.5
NOx (g/dwelling/annum)			
Residential (C3,C4)	234	558	1,553
PM10 (g/m²/annum)			
Retail (A1)	29.3	39.3	42.9
Office (B1)	0.22	2.05	11.8
PM10 (g/dwelling/annum)			
Residential (C3,C4)	40.7	100	267

Gross Internal Area (GIA) is used to define the area.

B1.2 The emission for comparison against the TEB is calculated for each land-use category as:

trips/annum * average distance per trip * emission rate

B1.3 The average distance per trip and emissions rates should be those set out within the guidance and are shown in **Table B.2** and **Table B.3**.

[16] The land use class names given here are those included within the 'Air Quality Neutral Planning Support Update' (Air Quality Consultants Ltd., 2014). Since the time that this document was published the land use classes have changed, however, for simplicity, the 'air quality neutral' assessment methodology follows the naming conventions given in the 'Air Quality Neutral Planning Support Update' document.

Table B.2: Average Distance Travelled by Car per Trip [16]

Land Use Class	Distance (km)		
	CAZ	Inner	Outer
Retail (A1)	9.3	5.9	5.4
Office (B1)	3.0	7.7	10.8
Residential (C3,C4)	4.3	3.7	11.4

Table B.3: Emissions Factors [16]

Pollutant	Distance (km)		
	CAZ	Inner	Outer
NOx	0.4224	0.370	0.353
PM_{10}	0.0733	0.0665	0.0606

B1.4 Where TEBs have not been calculated, the air quality neutrality of a proposed development can be shown through comparison against trip numbers set out in **Table B.4**.

Table B.4: Benchmark Trips per Annum [16]

Land Use	Number of Trips (trips/m^2/annum)		
	CAZ	Inner	Outer
A3	153	137	170
A4	2.0	8.0	-
A5	-	32.4	590
B2	-	15.6	18.3
B8	-	5.5	6.5
C1	1.9	5.0	6.9
C2	-	3.8	19.5
D1	0.07	65.1	46.1
D2	5.0	22.5	49.0

Appendix C London SPG Dust Assessment Approach

Step 1: Screen the need for an assessment

C1.1 Step 1 is the screen the need for an assessment against the following criteria:

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

C1.2 Where there are no sensitive receptors within these distances, it can be concluded that the impact is negligible and no further assessment relating to construction dust impacts is required.

Step 2: Assess the risk of dust impacts

C1.3 The risk of dust at sufficient quantum to cause annoyance/health/ecological impacts should be based on:

- The scale and nature of the works (potential dust emission magnitude) (**Table C.1**); and
- The sensitivity of the area to dust impacts based on the matrices shown in **Table C.2**, **Table C.3** and **Table C.4**.

C1.4 These factors are then combined to determine the risk of dust impacts without mitigation applied for each of the four activities (Demolition, Earthworks, Construction and Trackout) following the matrices shown in **Table C.5**, **Table C.6** and **Table C.7**.

Table C.1: Potential Dust Emission Magnitude

Size	Definition
Demolition	
Small	Total building volume <20,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10 m above ground, demolition during wetter months.
Medium	Total building volume 20,000 m^3 – 50,000 m^3, potentially dusty construction material, demolition activities 10-20 m above ground level.
Large	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.
Earthworks	
Small	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 <20,000 tonnes earthworks during wetter months.
Medium	Total site area 2,500 m^2 – 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.
Large	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.
Construction	
Small	Total building volume <25,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber).
Medium	Total building volume 25,000 m^3 – 100,000 m^3, potentially dusty construction material (e.g. concrete), on site concrete batching.
Large	Total building volume >100, 000 m^3, on site concrete batching, sandblasting.
Trackout	
Small	<10 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m.
Medium	10-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m.
Large	>50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m.

Table C.2: Sensitivity of the Area to Dust Soiling Effects on People and Property

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

Table C.3: Sensitivity of the Area to Human Health Impacts

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

Table C.4: Sensitivity of the Area to Ecological Impacts

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

Table C.5: Risk of Impacts – Demolition

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

Table C.6: Risk of Impacts – Earthworks and Construction

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

Table C.7: Risk of Impacts – Trackout

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

Step 3: Site-specific Mitigation

C1.5 Based on the outcome of Step 2, appropriate mitigation measures are recommended. The guidance includes a list of mitigation measures for Low, Medium and High risk sites but final recommendations should be based on professional judgement and take into account particular site sensitivities and differences in risk for different activities or areas of the site. The mitigation recommended in the guidance are shown in **Table C.8**.

Table C.8: Mitigation Measures (H = Highly Recommended, D = Desirable and N = Not Recommended)

Mitigation Measure	Low Risk	Medium Risk	High Risk
Site Management			
Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	N	H	H
Develop and implement a Dust Management Plan (DMP).	D	H	H
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.	H	H	H
Display the head or regional office contact information	H	H	H
Record and respond to all dust and air quality pollutant emission complaints.	H	H	H
Make the complaints log available to the local authority when asked.	H	H	H
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.	H	H	H
Increase the frequency of site inspections by those accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.	H	H	H
Record any exceptional incidents that cause dust and air quality pollutant emissions, either on- or off- site, and the action taken to resolve the situation in the log book.	H	H	H
Hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised.	N	N	H
Monitoring			
Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of site boundary, with cleaning to be provided if necessary.	D	D	H
Agree dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.	N	H	H

Mitigation Measure	Low Risk	Medium Risk	High Risk
Preparing and maintaining the site			
Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	H	H	H
Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.	H	H	H
Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period.	D	H	H
Install green walls, screens or other green infrastructure to minimise the impact of dust and pollution.	N	D	D
Avoid site runoff of water or mud.	H	H	H
Keep site fencing, barriers and scaffolding clean using wet methods.	D	H	H
Remove materials from site as soon as possible.	D	H	H
Cover, seed or fence stockpiles to prevent wind whipping.	N	H	H
Carry out regular dust soiling checks of buildings within 100 m of site boundary and cleaning to be provided if necessary.	N	D	D
Provide showers and ensure a change of shoes and clothes are required before going off-site to reduce transport of dust.	N	N	D
Agree monitoring locations with the Local Authority.	N	H	H
Where possible, commence baseline monitoring at least three months before phase begins.	N	H	H
Put in place real-time dust and air quality pollutant monitors across the site and ensure they are checked regularly.	N	H	H
Operating vehicle/machinery and sustainable travel			
Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone and the London NRMM standards, where applicable	H	H	H
Ensure all non-road mobile machinery (NRMM) comply with the standards set out within the SPG	H	H	H
Ensure all vehicles switch off engines when stationary - no idling vehicles.	H	H	H
Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.	H	H	H
Impose and signpost a maximum-speed-limit of 15 mph on surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate)	D	D	H

Mitigation Measure	Low Risk	Medium Risk	High Risk
Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.	N	H	H
Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)	H	H	H
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.	H	H	H
Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.	H	H	H
Use enclosed chutes and conveyors and covered skips.	H	H	H
Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	H	H	H
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.	D	H	H
Waste Management			
Avoid bonfires and burning of waste materials.	H	H	H
Reuse and recycle waste to reduce dust from waste materials.	H	H	H
Demolition			
Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).	D	D	H
Ensure water suppression is used during demolition operations.	H	H	H
Avoid explosive blasting, using appropriate manual or mechanical alternatives.	H	H	H
Bag and remove any biological debris or damp down such material before demolition.	H	H	H
Earthworks			
Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.	N	D	H
Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil.	N	D	H
Only remove the cover in small areas during work and not all at once	N	D	H
Construction			
Avoid scabbling (roughening of concrete surfaces) if possible	D	D	H

Mitigation Measure	Low Risk	Medium Risk	High Risk
Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.	D	H	H
Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.	N	D	H
For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.	N	D	D
Trackout			
Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site.	D	H	H
Avoid dry sweeping of large areas.	D	H	H
Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	D	H	H
Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	N	H	H
Record all inspections of haul routes and any subsequent action in a site log book.	D	H	H
Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.	N	H	H
Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	D	H	H
Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.	N	H	H
Access gates to be located at least 10 m from receptors where possible.	N	H	H
Apply dust suppressants to locations where a large volume of vehicles enter and exit the construction site.	N	D	H

Step 4: Determine Significant Effects

C1.6 Recommended mitigation measures should be sufficient to ensure that the impact is normally 'not significant'. There may at times be limitations to appropriate mitigation measures (such as lack of water) and therefore, an assessment should always be made based on the characteristic of each site and the surrounding area.

Step 5: Dust Assessment Report

C1.7 The dust assessment report should include enough detail to ensure that the basis for the determination of emission magnitude and sensitivity of the area, and therefore the site risk, are clear. The required mitigation so also be set out within the report, along with a description of the mechanism that will ensure that the appropriate level of mitigation will be implemented (such as through a planning condition).

Appendix D Model Inputs and Results Processing

D1 Model Inputs and Results Processing Tools

Table D.1: Model Inputs

Model Version	ADMS-Roads v5, April 2020
Street Canyons	The ADMS Advanced Street Canyon Module was used to represent the effect of reduced dispersion and recirculating pollutants in street canyons. The canyons are shown in **Appendix F**.
British Summer Time (BST)	Adjustment for BST was made within the model, based on the following dates and times: BST begins – 01:00 on 31/03/2019 BST ends – 02:00 on 27/10/2019
Emission Factor Toolkit (EFT)	V10.1, August 2020
Time Varying Emissions Factors	Based on Department for Transport (DfT) statistics, Table TRA0307: Motor Vehicle Traffic Distributed by Time of Day and Day of the Week on all roads, Great Britain: 2019.
Meteorological Data	2019 hourly meteorological data from the London City meteorological site has been used in the model. The wind rose is shown in **Figure D.1**.
Latitude	51.5°

Surface Roughness	A value of 1.5 for 'large urban areas' was used to represent the study area. A value of 0.4515 has been used to represent the meteorological station site.
Minimum Monin-Obukhov Length	A value of 100 for 'large conurbations >1 million' has been used to represent the study area. A value of 29.7294 has been used to represent the meteorological station site.
Nitrogen oxides (NO_x) to (nitrogen dioxide) NO_2 conversion	NO_2 from NO_x calculator version 8.1, August 2020 **(DEFRA, 2020d)**
Background Maps	2018 reference year background maps **(DEFRA, 2020a)**

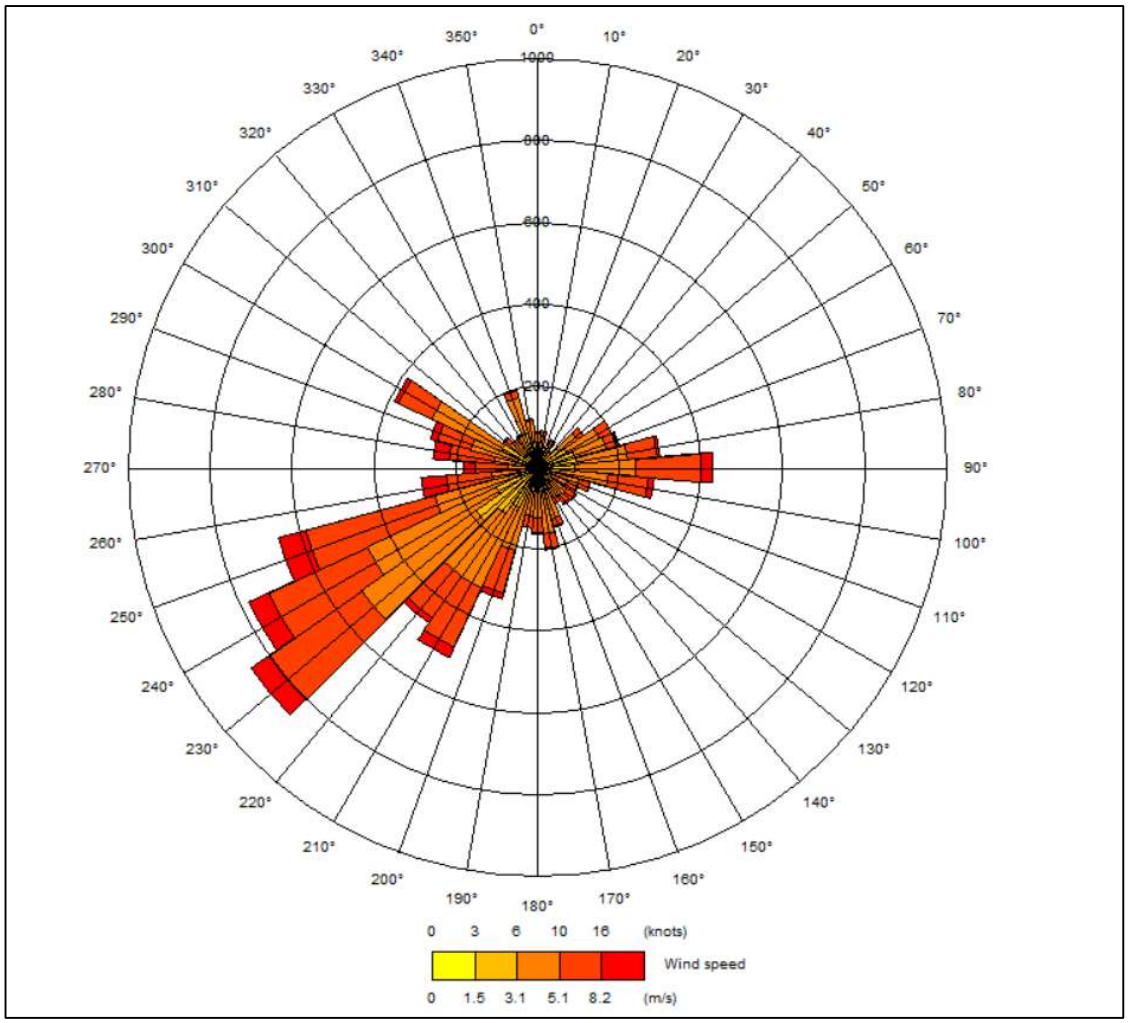

Figure D.1: 2019 London City Wind Rose

D2 Background Calibration

D2.1 In order to ensure that background concentrations used in this assessment reflect real-world conditions as accurately as possible, a calibration exercise has been carried out, utilising data measured in 2019 at automatic monitoring site SWK6 (Elephant & Castle). Measured annual mean NO_2 and PM_{10} concentrations have been compared against the annual mean NO_2 and PM_{10} concentrations predicted by DEFRA's background maps **(DEFRA, 2020a)** to find background NO_2 and PM_{10} calibration factors (see **Table D.2**). These calibration factors have been applied to the predicted NO_2 and PM_{10} background concentrations.

D2.2 There are no suitable urban background $PM_{2.5}$ monitoring sites located in close proximity to the Site, therefore, an adjustment factor for the DEFRA background maps predicted annual mean background concentrations of $PM_{2.5}$ has not been calculated. The adjustment factor calculated for PM_{10} has been applied to predicted $PM_{2.5}$ background concentrations.

Table D.2: Background Calibration Factors

	NO_2	PM_{10}
2019 Data Capture (%):	97	86
Measured Concentration (µg/m^3):	30	17
Mapped Concentration (µg/m^3):	31	20
Calibration Factor [a]:	**0.97**	**0.84**

[a] Based on unrounded number.

D3 Verification

NO_2 Verification

D3.1 Most NO_2 is produced in the atmosphere by a reaction between nitric oxide (NO) and ozone (O_3). It is, therefore, most appropriate to verify the model in terms of primary pollutant emission of nitrogen oxides (NO_x = NO + NO_2). The model has been run to predict the annual mean road-NO_x contribution in 2019 at two monitoring locations (diffusion tube monitoring sites SDT39, SDT82, SDT84 and SDT141). Concentrations at sites SDT39, SDT82, SDT84 and SDT141 have been modelled at heights of 2.4 m, 2.4 m, 2.0 m and 2.5 m, the heights of the diffusion tubes respectively.

D3.2 The choice of appropriate monitoring sites for verification has been based on:

- Appropriateness of site (i.e. roadside rather than background sites, presence of similar nearby emissions sources etc.);
- Distance from the study area;
- Availability of traffic data for nearby roads to allow modelling;
- Data capture (monitoring site SDT39 had 92% data capture in 2019 and monitoring sites SDT82, SDT84 and SDT141 all had 83% data capture in 2019).

D3.3 The model output of road-NO_x has been compared with the 'measured' road-NO_x at each monitoring site. The 'measured' road-NO_x for each monitoring site has been calculated using DEFRA's NO_x from NO_2 calculator **(DEFRA, 2020d)** based on measured NO_2 concentrations and predicted background NO_2 concentrations at each site.

D3.4 A primary adjustment factor has been determined as the slope of the best fit line between the 'measured' and modelled road contributions, forced through zero (see **Figure D.2**). This factor has then applied to the modelled road-NO_x concentrations. The total modelled NO_2 concentrations at each site have then been determined by combining the adjusted modelled road-NO_x with the predicted background NO_2 concentration using the NO_x to NO_2 calculator, and a secondary adjustment factor has been calculated as the slope of best fit between the measured NO_2 and primary adjusted, modelled NO_2, forced through zero (**Figure D.3**).

D3.5 The following primary and secondary adjustment factors have been applied to all modelled NO_2 data:

Primary adjustment factor: 0.45047

Secondary adjustment factor: 1.00902

D3.6 The calculated primary adjustment factor implies that overall, the model is over-predicting the road-NO_x contribution. The secondary NO_2 adjustment is considered to have a minor effect on the overall results.

D3.7 **Figure D.4** compares the adjusted modelled, total NO_2 at each of the modelling sites with the measured total NO_2 and shows the 1:1 relationship as well as ±10% and ±25% of the 1:1 line. The results for all verification sites lie within the ±10% line.

D3.8 The Root Mean Square Error (RMSE) has been calculated as 2.8 µg/m^3 (i.e. 7.1% of the relevant objective). DEFRA's Local Air Quality Management Technical Guidance (TG16) (LAQM.TG(16)) **(DEFRA, 2021)** recommends that ideally an RMSE within 10% of the relevant objective should be derived, though an RMSE that is equal to or less than 25% of the relevant objective is considered to be acceptable. A such, the calculated RMSE for this assessment is considered to indicate that the model is performing well.

D3.9 Whilst the calculated adjustment factors are considered to be reliable and applicable to the model it is more worst-case not to apply the factors, as the primary adjustment factor is less than 1. This approach has been taken in order to provide a conservative assessment.

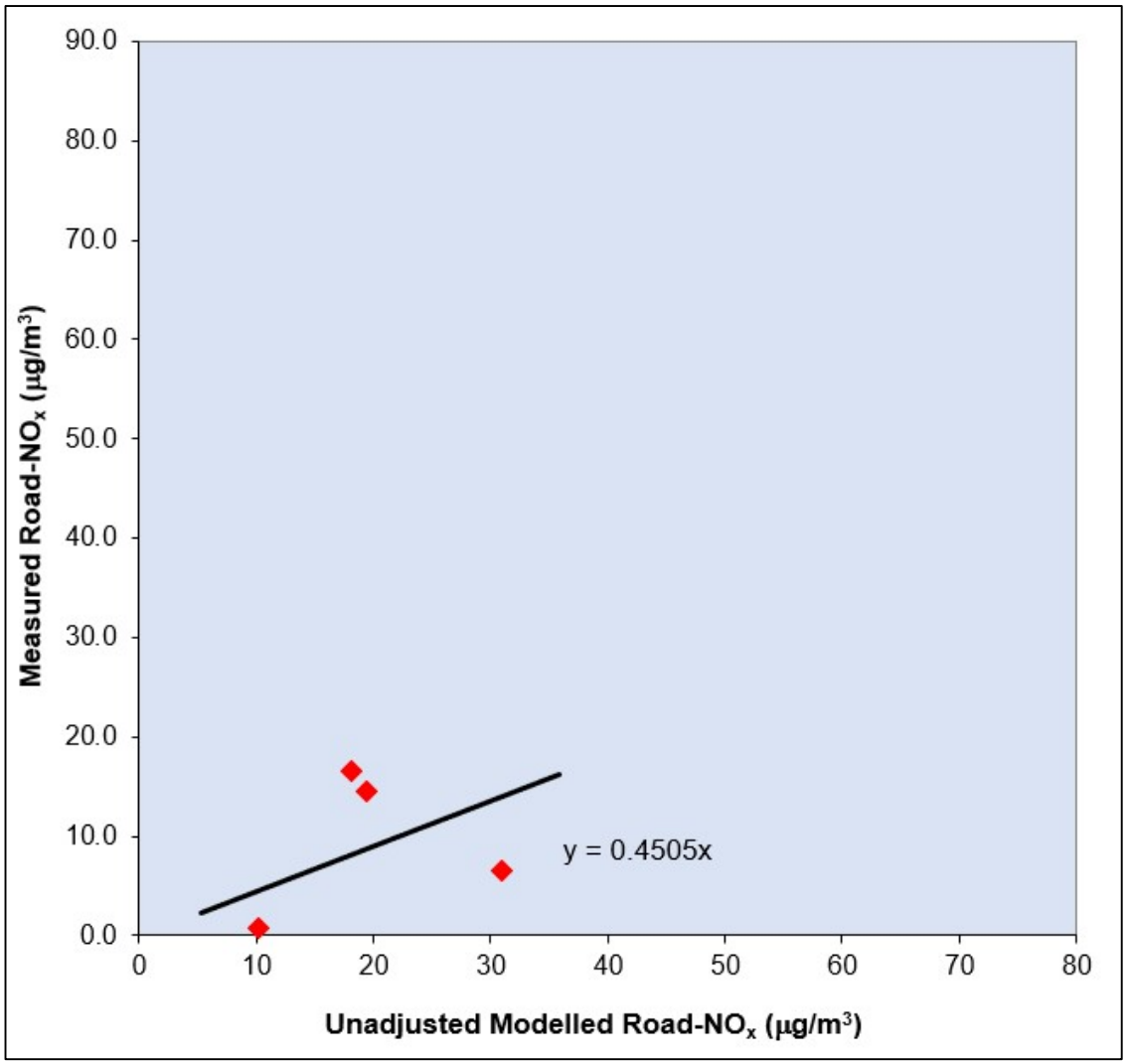

Figure D.2: Measured Road-NO_x / Unadjusted Modelled Road-NO_x

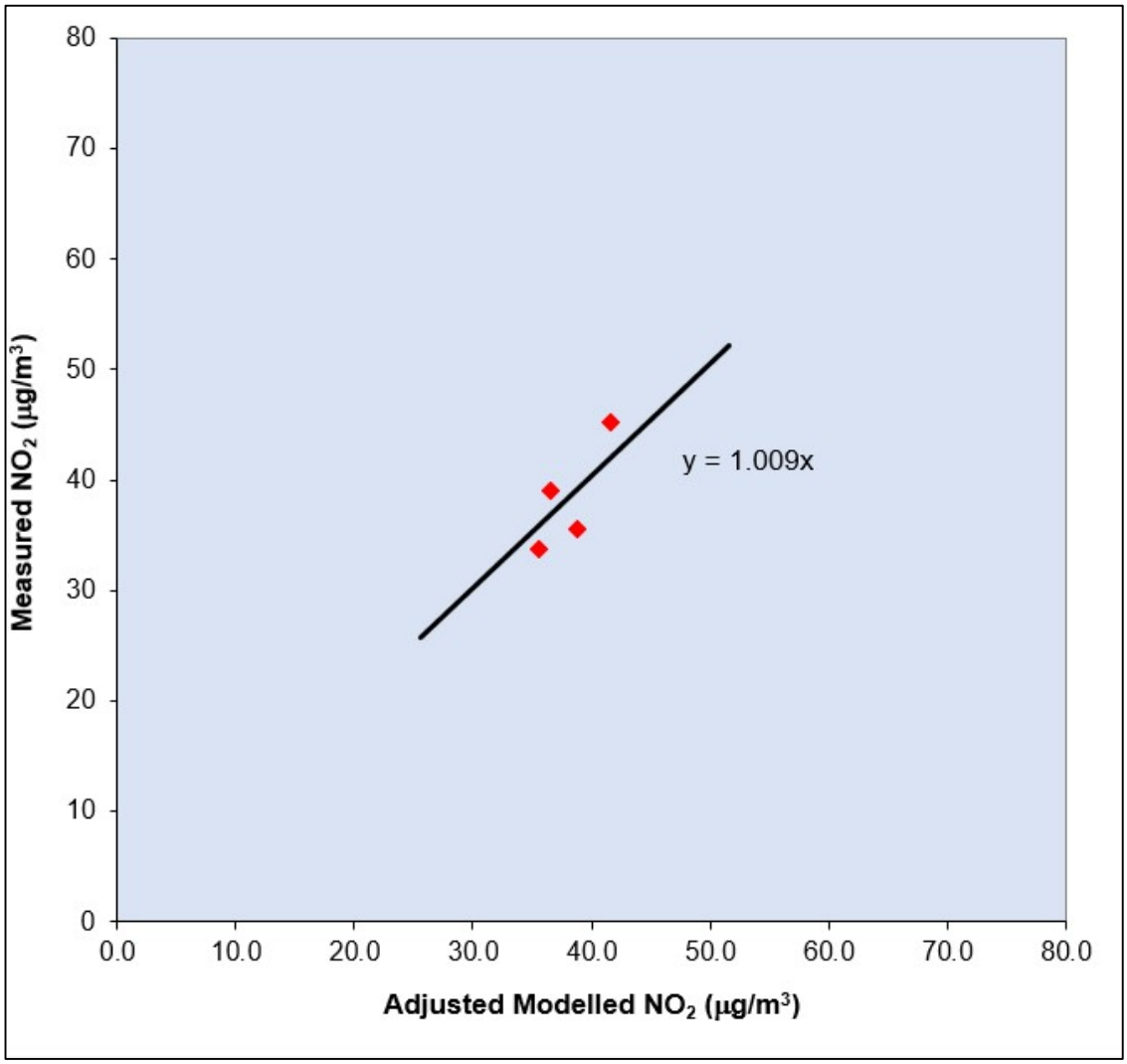

Figure D.3: Measured NO_2 / Primary Adjusted Modelled NO_2

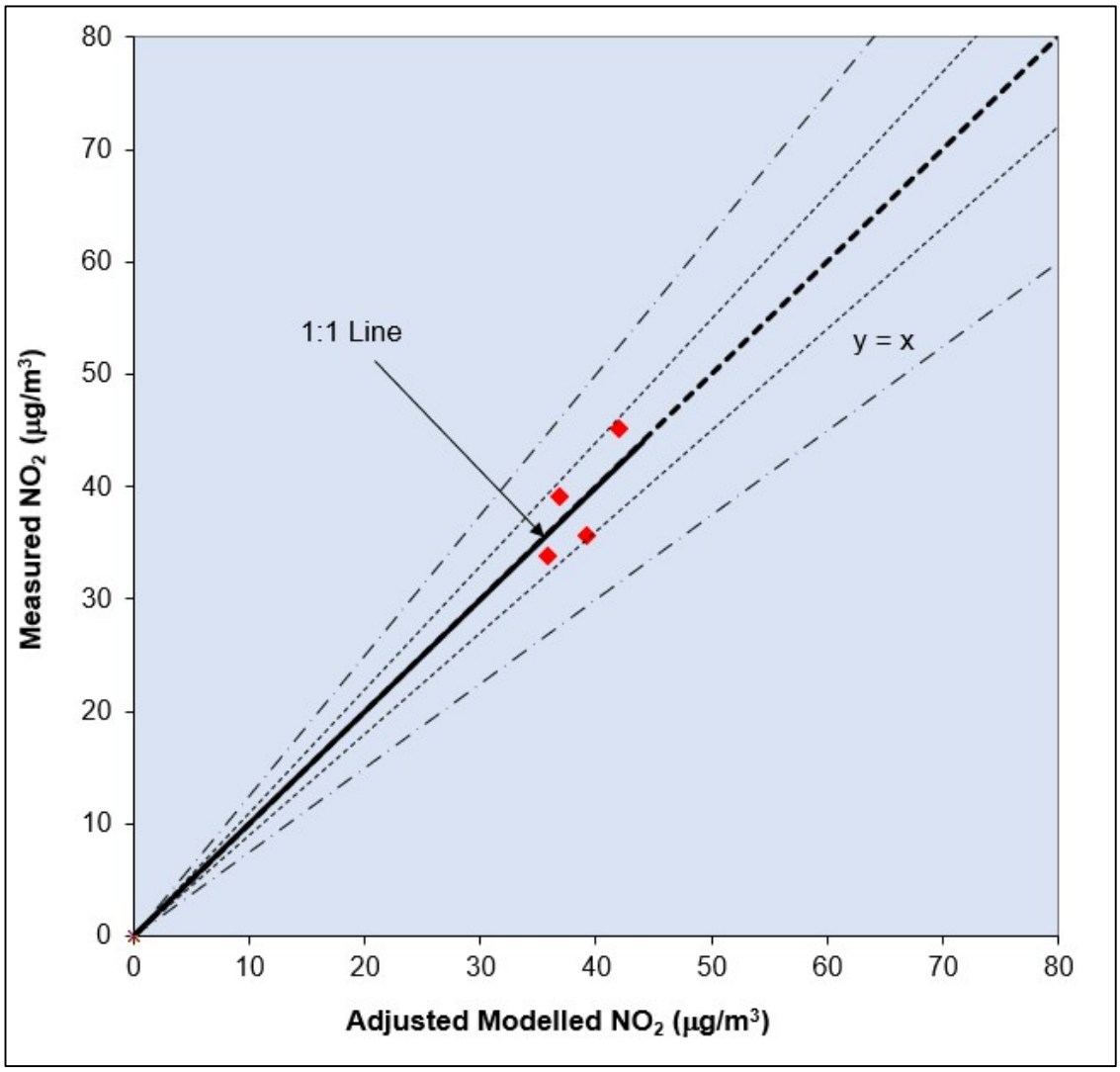

Figure D.4: Measured NO_2 / Fully Adjusted Modelled NO_2

PM_{10} and $PM_{2.5}$

D3.10 There are no suitable roadside PM_{10} or $PM_{2.5}$ monitoring sites located in close proximity to the development Site. Therefore, the approach taken for verifying for road-NO_x (i.e. the application of a factor of 1) has also been applied to the modelled annual mean concentrations of road-PM_{10} and road-$PM_{2.5}$.

Appendix F Summary of Modelled Road Network

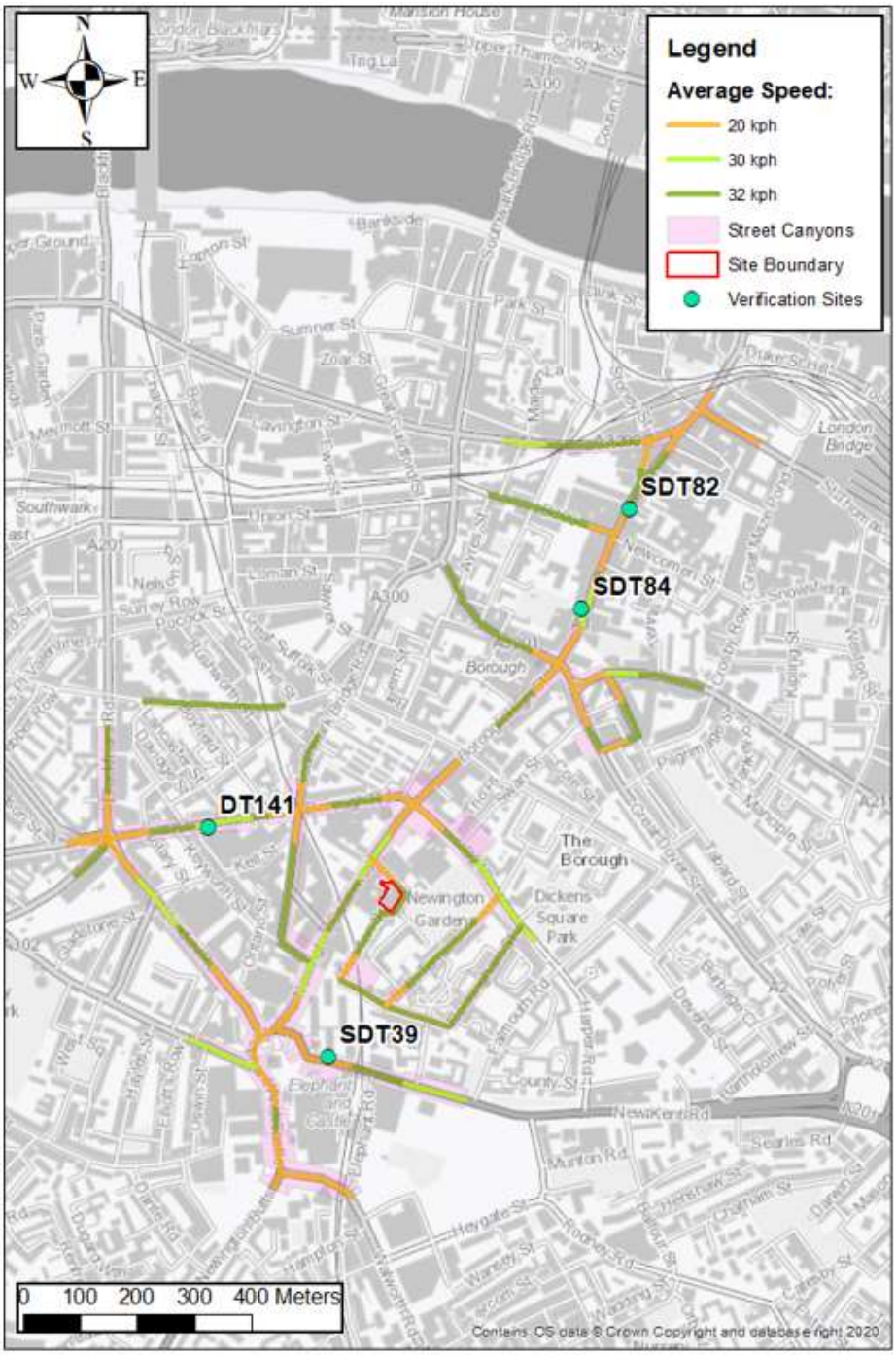

Figure F.1: Modelled Road Network inc. Average Speeds and Street Canyons

(road widths not to scale)

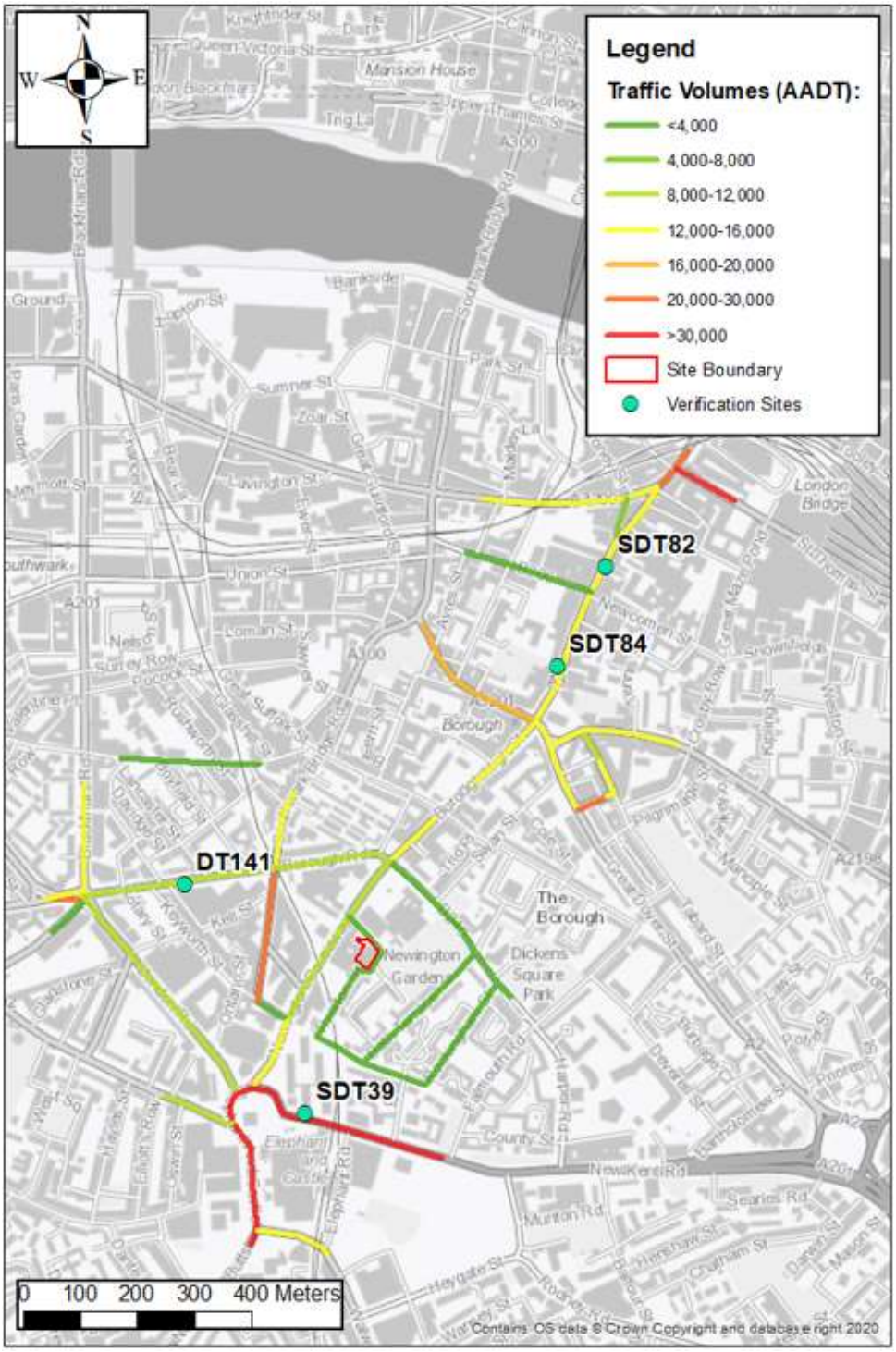

Figure F.2: Modelled Road Network inc. 2019 Traffic Volumes (AADT)

(road widths not to scale)

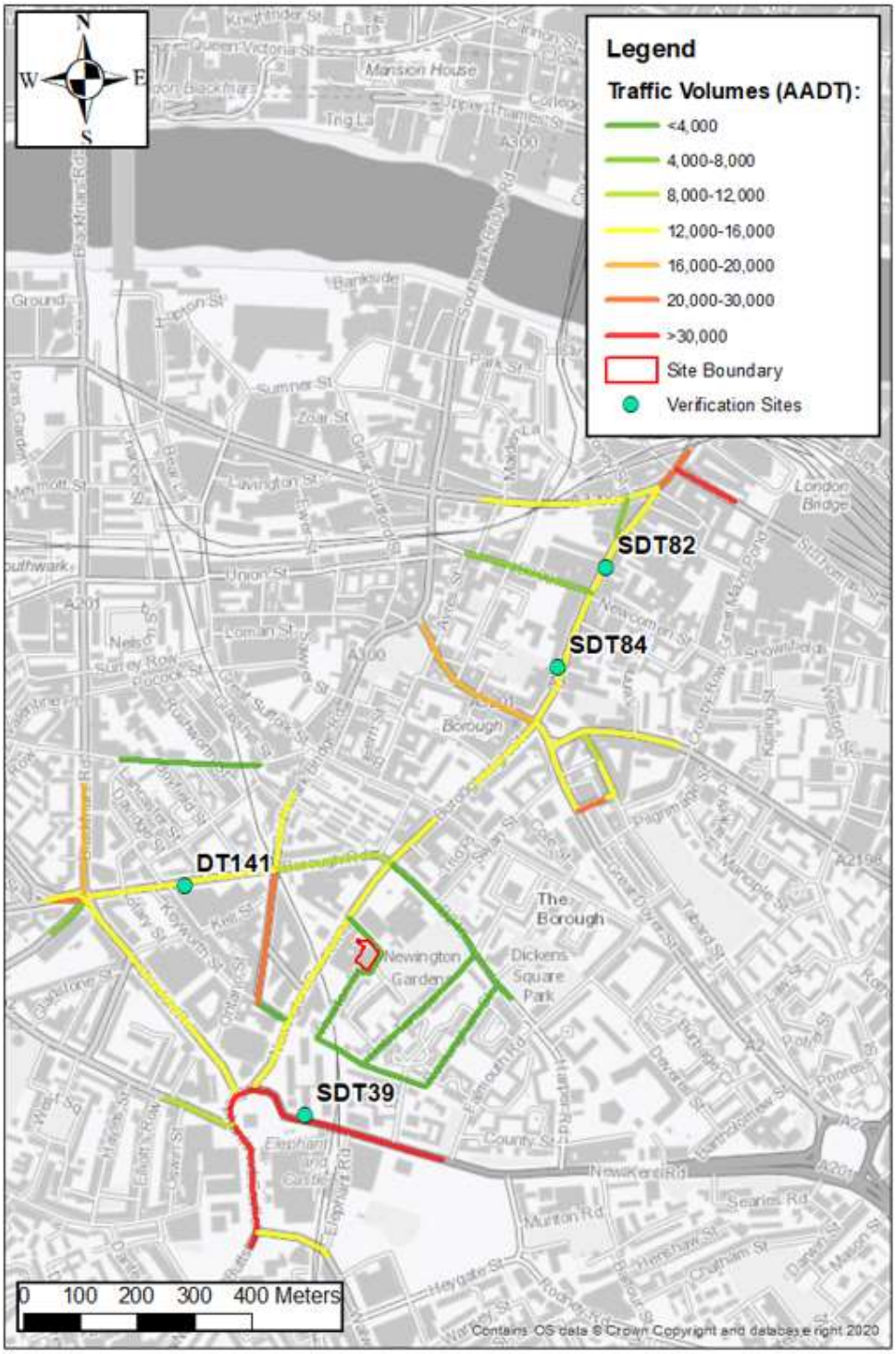

Figure F.3: Modelled Road Network inc. 2024 Traffic Volumes (AADT)

(road widths not to scale)

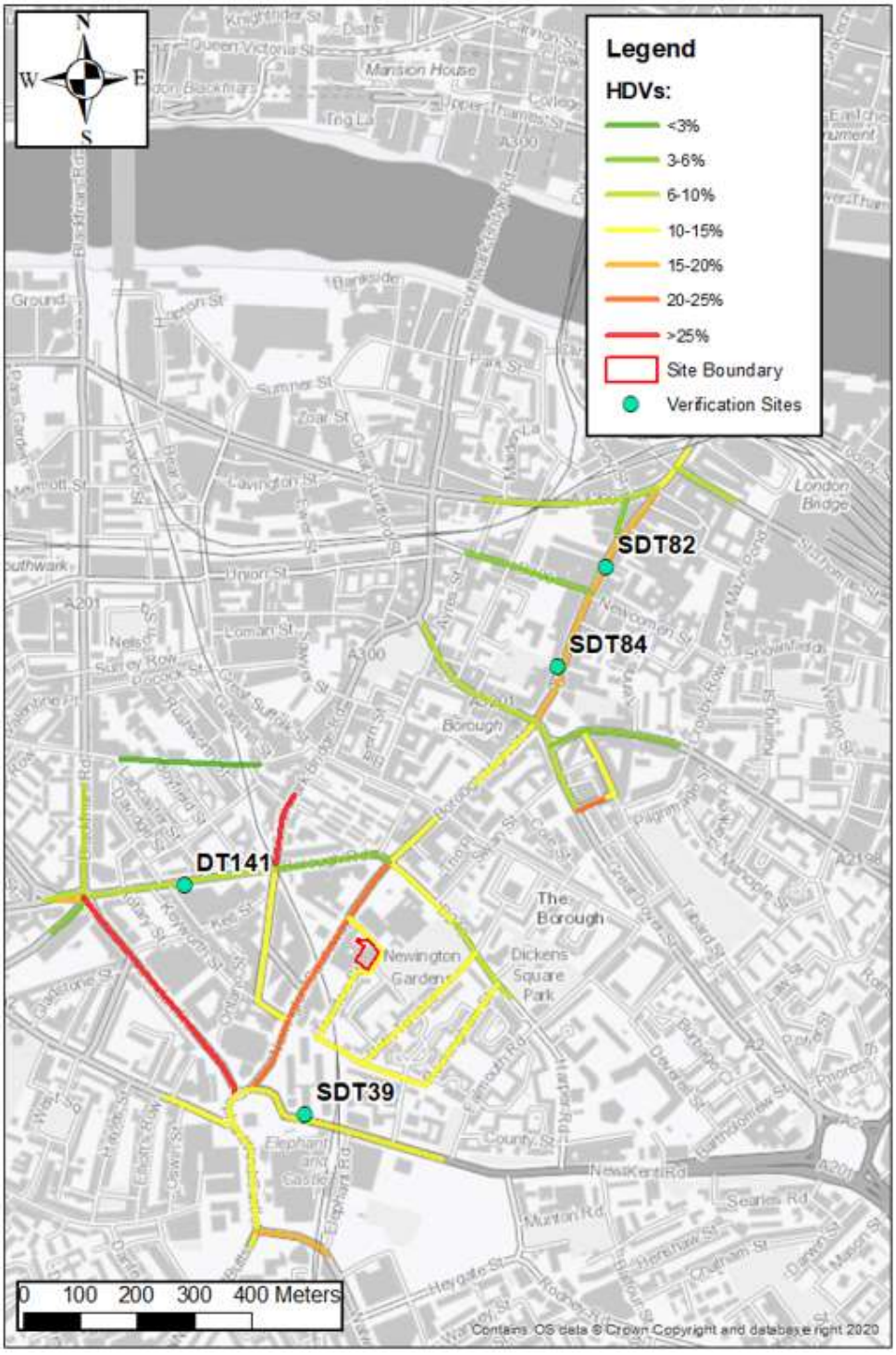

Figure F.4: Modelled Road Network inc. %HDVs

(road widths not to scale)