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BELLWAY HOMES LIMITED

YARNTON WAY, BELVEDERE

AIR QUALITY ASSESSMENT

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1.0 INTRODUCTION

Proposed Development

1.1 Ardent Consulting Engineers Ltd. (ACE) have been commissioned by Bellway Homes Limited to carry out an Air Quality Assessment (AQA) in support of a detailed planning application for a proposed mixed-use residential-led development located at Yarnton Way, Belvedere within the London Borough of Bexley (LBB).

1.2 The development proposals are described as follows:

"Redevelopment of the site to provide residential units including affordable housing (Use Class C3) and commercial floorspace (Class E) in new buildings ranging between 3 to 5 storeys in height, together with associated car parking and cycle storage, landscaping including new areas of public open space and a reptile retention zone, associated infrastructure including new junctions off Yarnton Way, drainage and land raising".

Scope

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

1.4 The main air pollutants of concern related the construction phase are dust and particulate matter (PM_{10}) from on-site construction activities and as a result of material tracked out by construction vehicles, and emissions of nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$) from construction vehicles which may impact on existing sensitive human receptors. There is also the potential for impacts on nearby designated ecological sites as a result of emissions of nitrogen oxides (NO_X), NO_2 and ammonia (NH_3) from construction vehicles.

1.5 The main air pollutants of concern related to the operational phase are emissions of NO_2, PM_{10} and $PM_{2.5}$ associated with operational traffic which may impact on existing sensitive human receptors. There is also a potential for impacts on existing designated ecological sites as a result of emissions of NO_X, NO_2 and NH_3 from operational vehicles.

1.6 In terms of the suitability of the Site for its proposed end-use, the main air pollutants of concern are concentrations of NO_2, PM_{10} and $PM_{2.5}$ within the Site as a result of emissions from the local road and rail network and background pollutant concentrations.

1.7 The proposed energy strategy is anticipated to be all-electric which will not produce any on-site emissions. Therefore, the proposed energy strategy does not have the potential to result in significant effects.

1.8 An assessment has been carried out to determine whether the proposed development is 'air quality neutral' in terms of transport and building emissions.

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

Consultation

1.10 Consultation has been carried out between ACE and LBB's Environmental Health Manager via email correspondence in July 2023 in order to discuss and agree the scope and methodology of this AQA.

2.0 LEGISLATION, POLICY AND GUIDANCE

National Air Quality Legislation and Strategy; Human Health

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

2.4 The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 (UK Government, 2023) sets out new concentration and exposure reduction targets for $PM_{2.5}$, to be achieved by 2040. The new concentration target is an annual mean concentration of 10 µg/m^3. The new exposure reduction target is a minimum of 35% reduction in population exposure, as compared with the average population exposure in a three year baseline period (2016-2018). As these new targets are not applicable until 2040, this AQA predominantly focusses on the currently applicable objectives (as set out in **Table 2-1**).

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

Pollutant	Time Period	Objective
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
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]
$PM_{2.5}$	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 (Defra, 2022). 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 Technical Guidance 2019 (LLAQM.TG(19)) (Mayor of London, 2019) provides guidance to local authorities in London as to where objectives apply. These are summarised in **Table 2-2**.

[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.

Table 2-2: Relevant Exposure

Averaging Period	Relevant Locations	NAQOs should apply	NAQOs don't usually apply
Annual mean	Where individuals are exposed for a cumulative period of 6 month in a year	Facades of residential properties, schools, hospitals and gardens of residences	Facades of offices, hotels and shops or kerbside sites
24-hour mean	Where individuals are expected to be exposed for 24-hours or longer	As above, with the addition of hotels	Kerbside sites and areas where the public is unlikely to spend significant time
1-hour mean	Where individuals are expected to spend one hour or longer	As above, with the addition of parts of car parks, bus stations, railway stations etc. which are not fully enclosed, and any outdoor locations where members of the public might reasonably be expected to spend one hour or longer	Locations not publicly accessible or where occupation is not regular

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

2.7 The National Air Quality Plan (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 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 supporting 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 µg/m^3 by 50% by 2025.

National Air Quality Legislation; Ecology

2.11 Poor air quality can have a negative impact on ecological habitats as well as human health. The Conservation of Habitats and Species Regulations (Statutory Instrument, 2017) was put in place in order to protect ecological sites following the publication of European Directive 92/43/EEC (European Economic Community (EEC), 1992) regarding the designation of Special Areas of Conservation (SACs) and 2009/147/EC (European Community, 2009) regarding the designation of Special Protection Areas (SPAs). These regulations require that the competent authority (the planning authority in this case) consider whether a development will have a likely significant effect on an SAC or SPA (known as 'European Sites'). Should this be considered to be likely then an 'appropriate assessment' is required to identify whether the new development will indeed have a significant adverse effect on the ecological site(s).

2.12 The Wildlife and Countryside Act (UK Governmant, 1981) sets out the requirement for the identification of areas of land that are considered to be of 'special interest' (due to flora, fauna and / or geological or physiographical features) as Sites of Special Scientific Interest (SSSIs), and the Countryside and Rights of Way (CROW) Act (HM Government, 2000) sets out the specific protections afforded to SSSI, stating that where a development is 'likely to damage' a SSSI then the appropriate conservation body must be consulted.

2.13 The Environment Act (UK Government, 1995) and the Natural Environment and Rural Communities Act (HM Government, 2006) set out a general requirement for conservation of biodiversity.

Critical Levels

2.14 Critical levels have been set for a number of gaseous pollutants. These are the concentrations of pollutants below which there is no known harmful effects on vegetation or ecosystems. These levels have been set by UK government and are considered to be relevant objectives for all internationally designated sites such as SACs and SPAs, as well as for nationally designated sites such as SSSIs and locally designated sites such as Local Nature Reserves (LNRs) Sites of Importance for Nature Conservation (SINCs). The relevant critical levels are set out in **Table 2-3**.

Table 2-3: Ecological Critical Levels

Pollutant	Time Period	Objective
Nitrogen Oxides (expressed as NO_2)	Annual Mean	30 µg/m³
Ammonia (NH_3)	Annual Mean	3 µg/m³ (unless lichens or bryophytes are present, then 1 µg/m³)

Critical Loads

2.15 Critical loads represent the amount of pollutant deposited to a given ecosystem over a year, below which it is understood that there is no harmful effect to the ecosystem. Critical loads have been identified for a number of different types of ecosystem, based on their sensitivity to adverse effects. Critical loads for the deposition of nitrogen have been set for the protection from eutrophication, whilst

critical loads for the purpose of protection against acidification have been set for deposition of both nitric acid and sulphuric acid, together termed as acid deposition. Critical loads for sensitive ecological sites vary throughout the UK.

Planning Policy

National Planning Policy

2.16 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.

2.17 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. Furthermore these should contribute to compliance with relevant limit values or objectives and should be consistent with any local AQAP.

2.18 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."*

2.19 The NPPF also states that:

"*Planning policies and decisions should contribute to and enhance the natural and local environment by:*

- *Protecting and enhancing…sites of biodiversity or geological values…*
- *minimising impacts on…biodiversity…"*

2.20 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, the 'Air Quality' PPG (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."

2.21 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.

2.22 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

The London Plan

2.23 In London, a London Plan has been developed (Mayor of London, 2021). This includes a number of references to air quality, however, these are all incorporated into policy SI1: Air Quality, which states:

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; and

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:

a) development proposals must be at least Air Quality Neutral;

b) 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;

c) 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; and

d) 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.

C. 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:

a) how proposals have considered ways to maximise benefits to local air quality; and

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

D. 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.

E. 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.

The London Environment Strategy

2.24 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."*

2.25 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

LBB's Local Plan

2.26 The Bexley Local Plan was adopted in April 2023 (LBB, 2023). The Plan contains strategic, non-strategic and site allocations policies, and is intended to be read in conjunction with the London Plan (Mayor of London, 2021). The Bexley Local Plan includes the following relevant policies:

- Policy SP8 'Green infrastructure including designated Green Belt' states that:

  "…Future development must support the delivery of a high-quality, well-connected and sustainable network of open spaces. In particular, this will be achieved by:

  …

  r. seeking opportunities to support the functions and drivers for green infrastructure, such as using good urban design to reduce air pollution, integrating green infrastructure into development where there are opportunities to mitigate poor air quality on a local scale";

- Policy SP10 'Bexley's transport network' notes that:

  "… The Council seeks to ensure a much improved and expanded role for sustainable transport through the following actions:

  …

  j. effectively maintaining and efficiently managing the existing highway network to reduce congestion and unnecessary delays, improve the environment, in particular air quality, and promote safety, health and wellbeing…";

LBB's AQAP

2.27 Under LLAQM (Mayor of London, 2019), LBB are required to regularly review and assess air quality within the Borough and determine whether or not the air quality objectives are likely to be achieved.

2.28 In March 2007, the entire Borough was declared by LBB as an AQMA as a result of exceedances of the annual mean NO_2 objective and the annual and 24-hour mean PM_{10} objective.

2.29 LBB's measures to tackle poor air quality in the borough are include within the Council's Annual Status Report (ASR) (LBB, 2022). The revised LBB AQAP considers actions in different sectors including cleaner transport, encouraging walking and cycling, localised solutions, public health awareness and publicity and air quality neutral policies.

Assessment Guidance

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

Local Air Quality Management Technical Guidance (LAQM.TG(22))

2.31 The LAQM guidance (Defra, 2022) was published for use by local authorities for review and assessment work, but also 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.

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

2.32 The LLAQM.TG(19) guidance (Mayor of London, 2019) was published for use by London local authorities for review and assessment work and 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

2.33 The Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) have published joint guidance on the assessment of air quality impacts for planning purposes (EPUK & IAQM, 2017). This includes information on when an air quality assessment is required, what should be included in an assessment and the assessment of significance.

The Control of Dust and Emissions During Construction and Demolition Supplementary Planning Guidance (SPG)

2.34 The Greater London Authority (GLA) have produced SPG (GLA, 2014) which 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 overall residual effect to be 'not significant'.

Guidance on the Assessment of Dust from Demolition and Construction

2.35 The IAQM have produced guidance which includes a methodology for identifying the risk magnitude of potential dust sources associated with demolition, construction, earthworks and trackout (IAQM, 2014). This is then used to identify the level of mitigation necessary in order for the overall residual effect to be 'not significant'. 'The Control of Dust and Emissions During Construction and Demolition' SPG (GLA, 2014) published by the GLA is based on this guidance, however, the original IAQM document is more detailed and, therefore, has been used to provide additional information where necessary.

A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites

2.36 The IAQM guidance, 'Assessment of Air Quality Impacts on Designated Nature Conservation Sites', (IAQM, 2020) sets out the appropriate approach for this element of assessment. Due to the complexity of ecological impacts, an air quality professional alone can only identify whether emissions are unlikely to have a significant impact when compared against the relevant critical load / level. Where it cannot be ascertained that emissions are below this level, the combined input of both an air quality professional and an ecologist is required; the former to identify any changes to concentrations of deposition and the latter

to consider the overall effect taking into consideration the location and sensitivity of any given habitat.

London Plan Guidance; Air Quality Neutral

2.37 In February 2023, the *'London Plan Guidance; Air Quality Neutral'* (GLA, 2023) was published by the GLA. This guidance sets out the methodology for considering the 'air quality neutrality' of new developments, including details of the 'air quality neutral' benchmarks (see **Appendix B**) and recommendations regarding mitigation and offsetting.

3.0 METHODOLOGY

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

Baseline Air Quality

3.2 Information regarding the 'current'[5] and future[6] baseline air quality has been obtained by collating the results of monitoring carried out by LBB and the Royal Borough of Greenwich (RBG), referring to identified AQMAs, Air Quality Focus Areas (AQFAs), considering any exceedances of the EU Limit Values that are identified by Defra's Pollution Climate Mapping (PCM) model (Defra, 2020a) or measured by any nearby Automatic Urban and Rural Network (AURN) monitoring site(s) and considering predicted background concentrations, which have been defined based on the national pollution maps published by Defra (Defra, 2020b). In addition, baseline concentrations have been modelled using the ADMS-Roads model, following the approach set out in **Paragraphs 3.15** to **3.22**.

Construction Dust Impacts

3.3 There is a potential for dust and PM_{10} from on-site activities and off-site trackout during the construction phase to have an impact on sensitive human and ecological receptors within the study area.

3.4 The suspension of dust and PM_{10} 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

[5] The 'current' baseline year for the purposes of this assessment has been taken to be 2021 as this is the most recent year for which representative local monitoring data are available.

[6] The future baseline year has been taken to be 2025 as this is the earliest year that any part of the proposed development is anticipated to be occupied.

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 construction dust impacts has been carried out following the GLA's SPG on 'The Control of Dust and Emissions During Construction and Demolition (GLA, 2014), 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) for site activities during the construction phase;
- Assess the risk of dust impacts for each site activity type (demolition, earthworks, construction and trackout) – this includes identifying the emissions magnitude for each activity type, the sensitivity of the area and then combining these factors to identify risk;
- Identify mitigation measures, based on assessed risk, sufficient to ensure off-site effects are 'not significant'; and
- Assess impacts with mitigation in place. This should normally result in residual effects which are 'not significant'.

3.9 The IAQM guidance makes it clear that no assessment of the significance of effects 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 IAQM guidance also states that the residual effect, taking into account the proposed mitigation, will usually be 'not significant'.

Construction Road Traffic Impacts

Human Health & Ecology

3.10 The potential impacts on existing sensitive human and ecological receptors as a result of construction traffic generated by the proposed development have been qualitatively assessed, taking into consideration the likely volumes, composition and routing, the anticipated duration of the construction phase and any anticipated mitigation measures that are likely to be applied.

3.11 Where it is not possible to screen out significant effects from road sources, detailed modelling (and / or an additional assessment in conjunction with an ecologist, if relevant) is then generally required.

Operational Road Traffic Impacts

Human Health

3.12 The EPUK/IAQM 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 is likely to 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 >500 AADT (or >100 AADT within an AQMA) may be considered to fall below the screening criteria where the increase is spread over a number of different road links.

3.14 Where it is not possible to screen out significant effects from road sources, detailed modelling is then generally required.

Detailed Assessment

3.15 Annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been predicted at a range of locations representing existing sensitive locations in the local area, including worst-case locations. Concentrations and changes in concentrations have then been compared against appropriate assessment criteria in order to determine significance.

3.16 Relevant sensitive locations are those where members of the public will be regularly present over the averaging period of the relevant air quality objective(s). For the modelled pollutants considered by this assessment (i.e. NO_2, PM_{10} and $PM_{2.5}$) sensitive locations include the façades of existing residential properties and schools (sensitive to the annual mean NO_2, PM_{10} and $PM_{2.5}$ objectives, the 24-hour PM_{10} objective and the 1-hour NO_2 objective), as well as the facades of existing hotels (sensitive to the 24-hour mean PM_{10} objective and the 1-hour mean NO_2 objective). When identifying receptors, particular attention has been paid to locations close to local roads, junctions and roundabouts where slow and congested traffic may increase emissions, locations which may be impacted by more than one road link and locations close to road links where the greatest volumes of development traffic will travel.

3.17 Based on the criteria above, 16 no. existing receptors have been identified for assessment, comprising 11 no. residential properties, 4 no. educational facilities and 1 no. hotel. The receptor locations have been chosen to represent worst-case locations where impacts are likely to be greatest. The locations of these receptors are presented in **Table 3-1** and **Figure 3-1** to **Figure 3-2**.

3.18 In addition, concentrations have been modelled within RBG at the GN3 automatic monitor and GW34 diffusion tube monitor for use in model verification. Further details of model verification are provided in **Appendix D**.

Table 3-1: Receptor Locations

Receptor	Description	Coordinate		Height (m)[a]	Approx. No. Properties Represented
		X	Y		
R1	Residential property adjacent to Yarnton Way	549363	179438	1.5	~12
R2	Residential property adjacent to Yarnton Way	549475	179467	1.5	~5
R3	Residential property adjacent to Yarnton Way	548652	179374	1.5	~10
R4	Lime Row Childcare Nursery fronting onto Yarnton Way	548598	179370	0.2 [b]	1
R5	Yarnton Way Nursery adjacent to Yarnton Way	548426	179493	0.2 [b]	1
R6	Residential property fronting onto Yarnton Way	548365	179436	1.5	~6
R7	Harris Garrard Academy adjacent to Yarnton Way	548174	179598	1 [c]	1
R8	Residential property fronting onto Yarnton Way	547501	179606	1.5	~6
R9	Residential property fronting onto the Yarnton Way and Harrow Manorway Roundabout	547375	179634	1.5	~1
R10	Residential property adjacent to Harrow Manorway	547326	179517	0 [d]	~5
R11	Residential property fronting onto Harrow Manorway	547321	179666	1.5	~5
R12	Residential property adjacent to Harrow Manorway Flyover Roundabout	547334	180056	1.5, 4.5, 7.5	~12
R13	Residential property fronting onto Harrow Manorway Flyover Roundabout	547205	180179	1.5, 5.5, 9.5	~14
R14	Residential property fronting onto Picardy Manorway	549755	179856	1.5	1

Receptor	Description	Coordinate		Height (m)[a]	Approx. No. Properties Represented
		X	Y		
R15	Residential property adjacent to Bronze Age Way	551075	178226	1.5	~3
R16	London South East Colleges: Bexley adjacent to Bronze Age Way	551244	178081	1.5	1

[a] Receptors have been modelled at multiple heights of to represent ground floor, 1st floor and 2nd floor level exposure.
[b] Receptors R3 and R4 have been modelled at a height of 0.2 m to represent the average breathing height of infants at ground floor level.
[c] Receptor R7 has been modelled at a height of 1 m to represent the average breathing height of primary school students at ground floor level.
[d] Receptor R7 has been modelled at a height of 0 m to take into consideration the road height in respect to the residential property location.

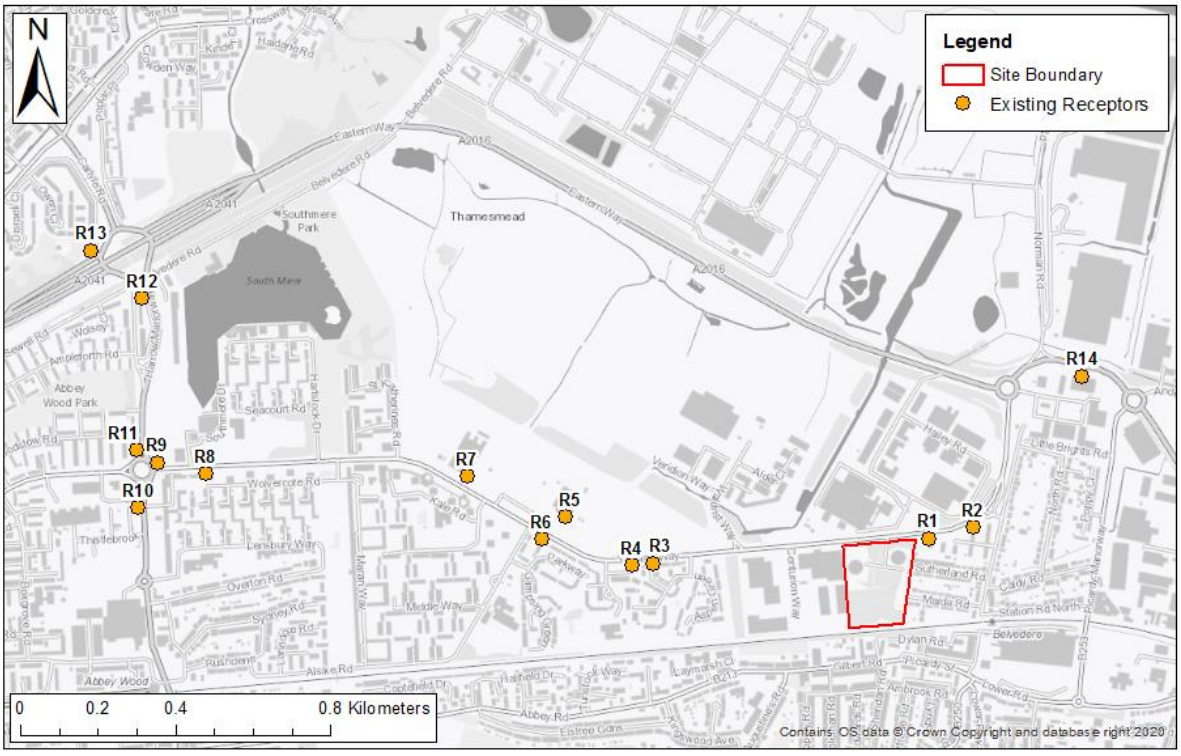

Figure 3-1: Existing Receptors; Yarnton Way, Harrow Manorway and Picardy Manorway

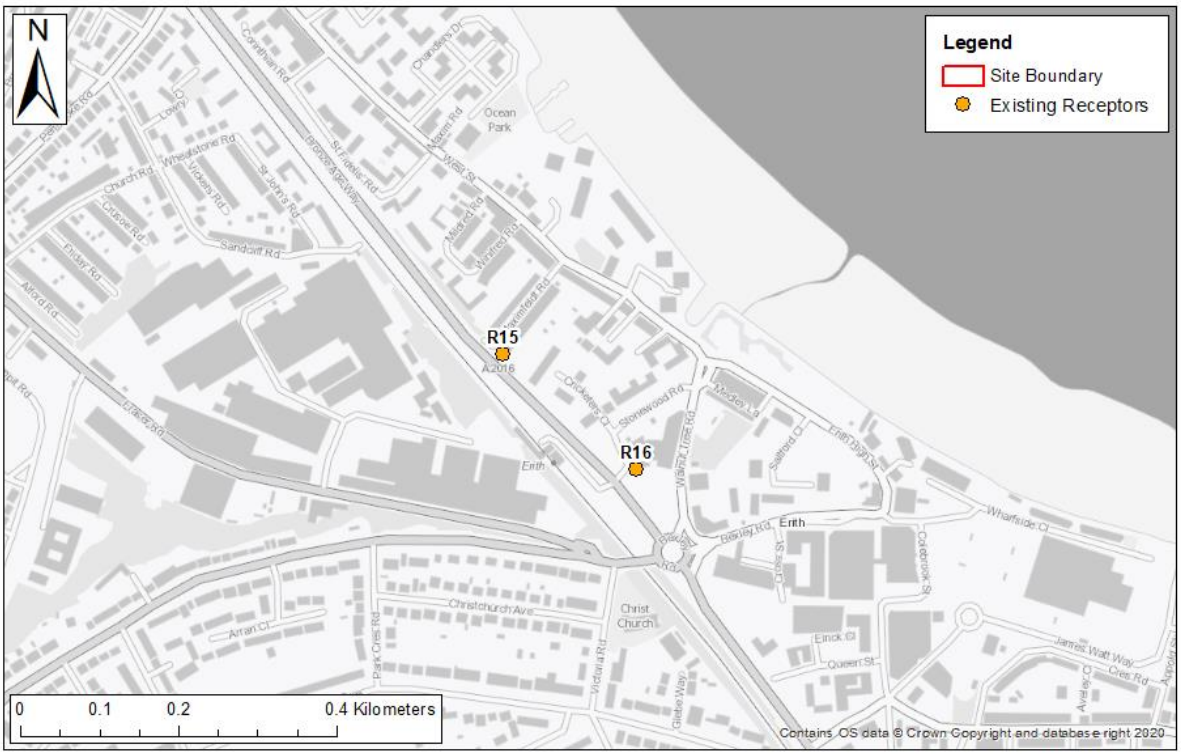

Figure 3-2: Existing Receptors; Bronze Age Way towards Erith Roundabout

3.19 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ at the identified receptors have been modelled using the ADMS-Roads dispersion model (v5.0.1). This model requires a number of inputs including traffic flow (in AADT format), composition (i.e. proportion of HDVs) and average speed data, as well as road characteristics such as width, gradient and street canyon dimensions, as applicable.

3.20 Traffic flow and composition data have been obtained from the London Atmospheric Emission Inventory (LAEI) database for 2019 (GLA, 2022), the DfT database (DfT, 2023) and the project's transport consultants (ACE). Where necessary, data have been adjusted to represent later years utilising Trip End Model Presentation Program (TEMPro) growth factors provided by the project's transport consultant (ACE). A summary of traffic data and the assumptions used in this assessment are provided in **Appendix E**.

3.21 The emissions associated with the traffic have been calculated using the Emissions Factor Toolkit (EFT) v11.0 (Defra, 2021). 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 for each of the road links modelled for the 'current'[5] and future[6] years, along with road type, vehicle fleet composition and speed. Whilst NO_X emissions rates are related to exhaust only, emissions rates for PM_{10} and $PM_{2.5}$ also include increments for road, tyre and break wear.

3.22 The model also requires meteorological data and inputs. The model has been run utilising 2021 data from the London City meteorological station which is considered suitable for the study area. **Appendix D** provides additional information on the meteorological inputs.

Air Quality Impacts Significance Criteria

3.23 As there is no official guidance in the UK on how to assess the significance of the air quality impacts of a new development, the approach developed by the EPUK/IAQM (EPUK & IAQM, 2017) has been followed in this assessment. This approach considers the predicted change in air quality as a result of the development on existing receptors, taking into account the absolute concentrations in comparison to the objectives (set out in **Table 2-1**). This guidance sets out three stages of assessment:

1) Determine the magnitude of change at each receptor as a percentage of the objective / Limit Value;

2) Describe the impact at each receptor, taking into account the sensitivity of the receptor to changes in concentration (based on the average concentration in the assessment year); and

3) Assess the overall significance.

3.24 The first two steps are set out **Table 3-2**.

Table 3-2: Impact Descriptors for Individual Receptors [a]

Concentration [b]	% Change [c]			
	1[d]	2-5	6-10	>10
≤75% % [e]	Negligible	Negligible	Slight	Moderate
>75% - ≤95% [f]	Negligible	Slight	Moderate	Moderate
>95%-≤102% [g]	Slight	Moderate	Moderate	Substantial
>102%-<110% [h]	Moderate	Moderate	Substantial	Substantial
≥110% [i]	Moderate	Substantial	Substantial	Substantial

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

[b] Long term average concentration at receptor in assessment year.

[c] In relation to Objective / Limit Value.

[d] % change rounded to nearest whole number. Where the change is 0 (i.e. <0.5) the impact will be Negligible.

[e] NO_2 or PM_{10} annual mean ≤30µg/m^3; $PM_{2.5}$ annual mean ≤18.75µg/m^3; PM_{10} daily mean ≤24µg/m^3 annual mean.

[f] NO_2 or PM_{10} annual mean >30-≤38µg/m^3; $PM_{2.5}$ annual mean >18.75-≤23.75µg/m^3; PM_{10} daily mean >24-≤30.4µg/m^3 annual mean.

[g] NO_2 or PM_{10} annual mean >38-≤40.8µg/m^3; $PM_{2.5}$ annual mean >23.75-≤25.5µg/m^3; PM_{10} daily mean >30.4-≤32.64µg/m^3 annual mean.

[h] NO_2 or PM_{10} annual mean >40.8-≤44µg/m^3; $PM_{2.5}$ annual mean >25.5-≤27.5µg/m^3; PM_{10} daily mean >32.64-≤35.2µg/m^3 annual mean.

[i] NO_2 or PM_{10} annual mean >44µg/m^3; $PM_{2.5}$ annual mean >27.5µg/m^3; PM_{10} daily mean >35.2µg/m^3 annual mean.

3.25 The assessment of overall significance (step 3) is made based on professional judgement, taking into account factors such as:

- The number of properties affected by different levels of impacts;
- The magnitude of any changes and descriptors (as identified in stages 1 and 2);
- Whether a new exceedance of an objective or limit value is predicted to arise, or an existing exceedance is removed, or an existing exceedance is substantially increased or reduced;
- The level of uncertainty, including the extent to which worst case assumptions have been made; and
- The extent of any exceedance of an objective or limit value.

3.26 When considered at individual receptors, moderate or substantial impacts at individual receptors may be considered significant and negligible or slight impacts not significant. Consideration of the overall effect on air quality needs to incorporate consideration of impacts as a whole, including the extent to which receptors represent sensitive locations and whether this wider impact is significant or not.

Ecology

3.27 Based on the IAQM guidance (IAQM, 2020) there is a potential for 'significant' effects on ecology as a result of transport emissions in cases where sensitive designated ecological sites are located within 200 m of a road where a development alone, or in combination with other committed developments, will increase traffic flows by >1,000 total AADT and / or >200 HDV AADT.

3.28 In cases where committed development traffic is not available and / or the screening criteria referenced by the IAQM guidance is exceeded, then an alternative screening criteria of >50 total AADT and / or >10 HDV AADT for proposed development traffic only is commonly used.

3.29 Where it is not possible to screen out significant effects from road sources, detailed modelling and / or additional assessment in conjunction with an ecologist is then generally required.

Site Suitability

Screening Assessment

3.30 The potential for exceedances of the relevant objectives at sensitive locations within the proposed development has been screened qualitatively, taking into consideration the location of the Site in relation to nearby emission sources (e.g. local roads), the layout of the proposed development and baseline air quality conditions within the Site and in the surrounding area.

3.31 The potential for significant effects as a result of emissions associated with moving locomotives using the nearby railway line has been assessed using the screening criteria outlined within LAQM.TG(22) (Defra, 2022). 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.

3.32 Where it is not possible to screen out the potential for significant effects, detailed assessment is then generally required.

Detailed Assessment

3.33 Annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ associated with background and road vehicle emissions have been predicted at sensitive locations introduced by the proposed development, including worst-case locations. Predicted concentrations have then been compared against the relevant national objectives (see **Table 2-1** and **Table 2-2**) in order to determine significance.

3.34 Relevant sensitive locations are those where members of the public will be regularly present over the averaging period of the air quality objective(s). For pollutants of interest in this assessment (i.e. NO_2, PM_{10} and $PM_{2.5}$) sensitive locations considered include the façades of proposed residential properties (sensitive to 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) and the facades of proposed commercial areas (sensitive to the 1-hour mean NO_2 objective). When identifying receptors, particular attention has been paid to locations close to local roads.

3.35 Based on the criteria above, 6 no. proposed receptors have been identified for assessment 5 no. of which represent worst-case locations where pollutant concentrations are likely to be high, and 1 no. receptor represents a location where pollutant concentrations are likely to be lower. The locations of these receptors are shown in **Table 3-3** and **Figure 3-3** and **Figure 3-4**.

3.36 In addition, concentrations of NO_2 have been modelled at the RBG GN3 automatic and GW34 diffusion tube monitoring sites, as described in **Paragraph 3.18**, for

use in model verification. Further details of model verification are provided in **Appendix D**.

Table 3-3: Proposed Receptor Locations

Receptor	Description	Coordinates		Height (m) [a]	Approx. No. properties represented
		X	Y		
P1	Façade of residential property fronting onto Yarnton Way	549147	179415	1.5, 4.5	1
P2	Façade of commercial space and residential property fronting onto Yarnton Way	549201	179421	1.5 [b], 4.5	1
P3	Façade of residential property fronting onto Yarnton Way	549241	179425	4.5	1
P4	Façade of residential property fronting onto Yarnton Way	549263	179427	4.5	n/a
P5	Façade of residential property fronting onto Yarnton Way	549311	179431	4.5	n/a
P6	Façade of residential property set back from Yarnton Way	549227	179388	1.5	186

[a] Receptors have been modelled at a height of 1.5 m and 4.5 m to represent ground and 1st floor level exposure respectively.

[b] Only the 1-hour NO_2 objective is applicable at this receptor, however NO_2, PM_{10} and $PM_{2.5}$ concentrations have been predicted for comparison to the annual mean objectives as part of a conservative assessment.

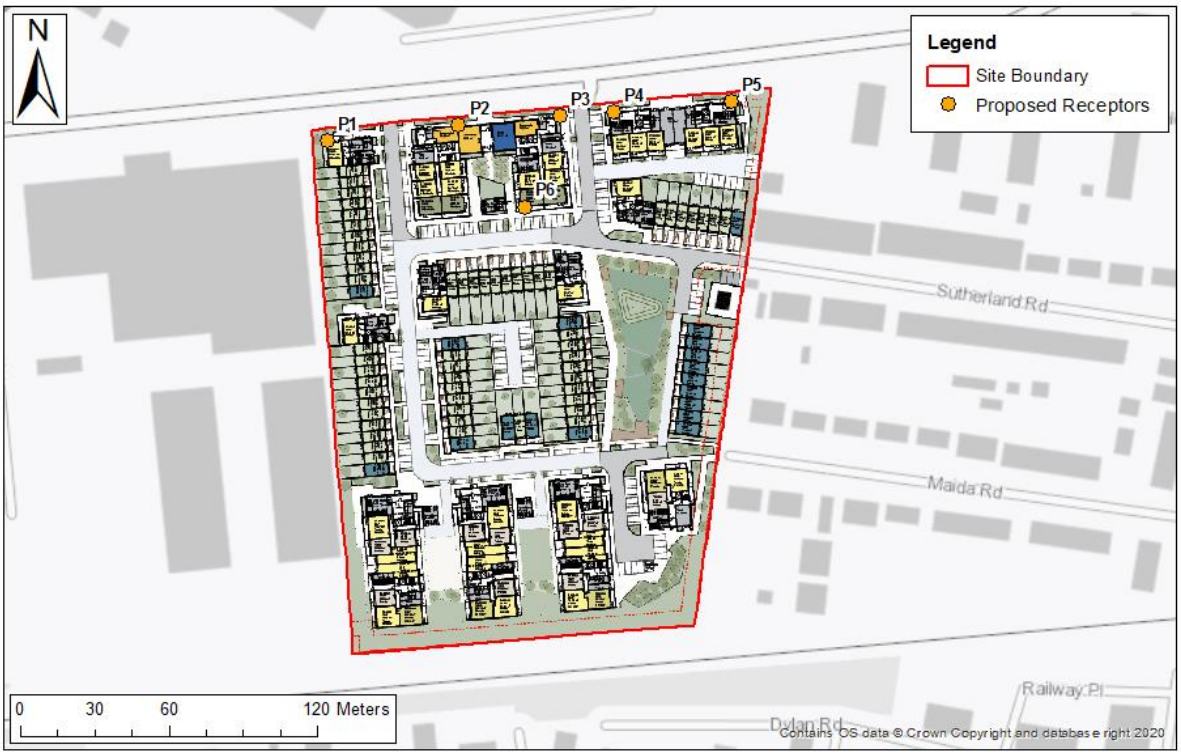

Figure 3-3: Proposed Receptor Locations; Ground Floor

Figure contains data taken from Stockwool (drawing ref.: 3499-STO-SW-ZZ-PL-A-90100)

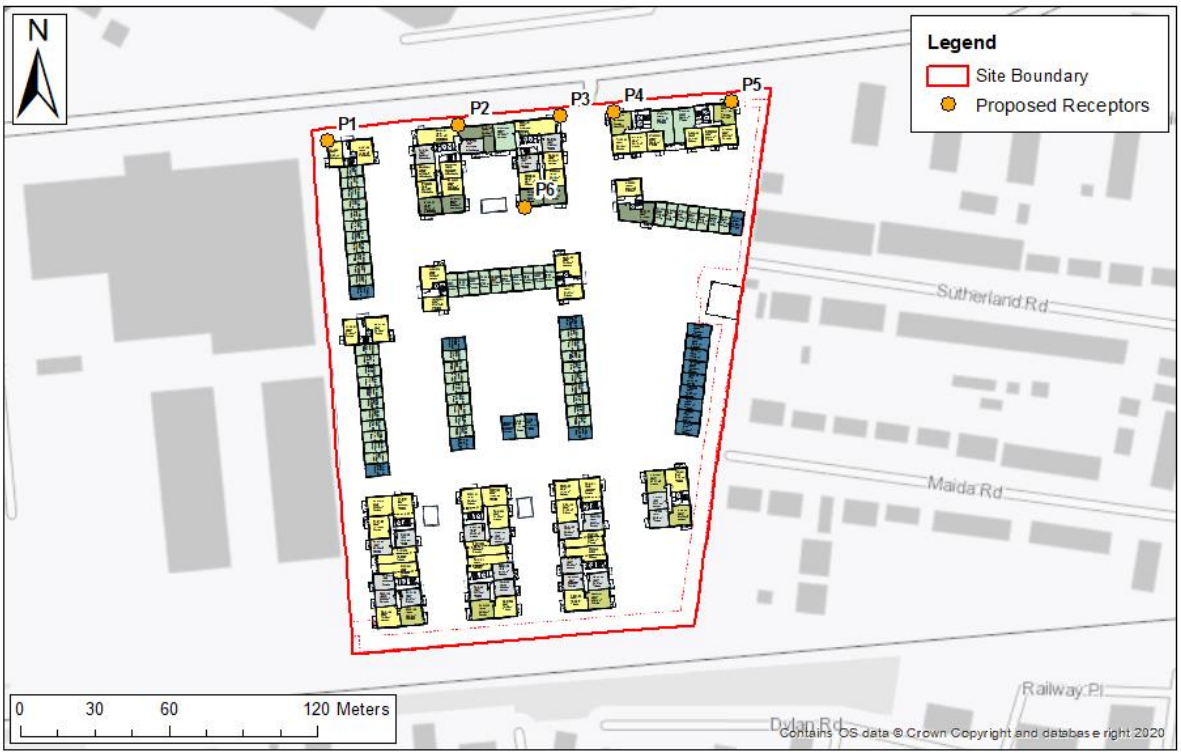

Figure 3-4: Proposed Receptor Locations; 1st Floor

Figure contains data taken from Stockwool (drawing ref.: 3499-STO-SW-ZZ-PL-A-90101)

3.37 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ at the identified receptors have been modelled using the ADMS-Roads dispersion model (v5.0.1) and input data including traffic data provided by the LAEI and ACE, emissions data from Defra's EFT v11.0 (Defra, 2021) and meteorological data from the London City meteorological station (as described in **Paragraphs 3.19** to **3.22**).

Air Quality Impacts Significance Criteria

3.38 In the absence of official guidance in the UK on how to assess the significance of the air quality impacts on a new development, this assessment has been limited to a comparison of predicted pollutant concentrations within the proposed development, against the relevant objectives (see **Table 2-1** and **Table 2-2**).

Assumptions and Limitations

3.39 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.

3.40 The model relies on meteorological data for 2021 which may not represent conditions in the future, particularly when taking into consideration additional uncertainties introduced as a result of climate change.

3.41 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, more recent evidence (Air Quality Consultants Ltd., 2020) suggests that the current emissions factor predictions are likely to 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 adjustment beyond appropriate verification.

3.42 As emissions are expected to reduce over time, impacts have been assessed using emissions predicted for 2025 (i.e. the earliest year that any part of the development is anticipated to be occupied). Since traffic in the UK is generally

expected to increase over time, in order to take a worst-case approach, traffic data relating to 2028 has been used (i.e. when the proposed development is anticipated to be complete). Furthermore, background pollutant concentrations for 2021 have been obtained from local background sites BX1, BX2 and BQ7[7] and have not been projected to the future[6] year. These assumptions will contribute to an appropriately conservative assessment.

3.43 It should be noted that some of the traffic data (i.e. LAEI derived data, the TEMPro growth factors, EFT emissions factors, etc.) used within this assessment 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, travel restrictions etc.). The current understanding of how trends have changed due to the Covid-19 pandemic is that UK traffic has generally stabilised or reduced due to increases in homeworking and online shopping. It is therefore considered likely that assumptions based on pre-Covid-19 conditions will be appropriately conservative.

Air Quality Neutral

3.44 The approach set out within the '*London Plan Guidance; Air Quality Neutral*' (GLA, 2023) has been followed in order to assess whether the proposed development is 'air quality neutral'.

[7] As agreed with LBB's Environmental Health Manager.

4.0 BASELINE CONDITIONS

Site Context and Study Area

4.1 The Site is set within urban surroundings, predominantly consisting of residential properties and commercial/industrial premises. The Site is bound to the north by Yarnton Way, to the east by residential properties, to the north and west by industrial and warehouse units and to the south by a railway line.

4.2 There are several designated ecological sites in close proximity to the Site, including the 'Southmere Park & Yarnton Way / Viridion Way', 'Erith Marshes', 'Belvedere Dykes', 'Lesnes Abbey Woods and Bostall Woods' SINCs, the 'Lesnes Abbey Woods' and 'Crossness' LNRs and the 'Abbey Wood' SSSI.

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

- For the construction dust risk assessment, the study area is the area up to 350 m from the Site boundary and up to 50 m of the route(s) used by construction vehicles on the public highway (up to 500 m from the Site exit(s)). This is based on the IAQM guidance (IAQM, 2014) which is more precautionary in this instance than the GLA SPG (GLA, 2014);
- For the assessment of the effect of traffic generated by the proposed development on human health, the study area incorporates all main roads (and adjacent sensitive human receptors) along which such traffic may travel;
- For the assessment of the effect of traffic generated by the proposed development on ecology, the study area incorporates all main roads located within 200 m of designated ecological sites along which such traffic may travel, as well as parts of the designated ecological site(s) located within 200 m of the road(s). This is based on the IAQM guidance (IAQM, 2020); and
- For the assessment of Site suitability, the study area has been identified as the area within the boundary of the Site and sources which will influence this area.

EU Limit Values and Clean Air Zones

4.4 The Site is located within the Low Emissions Zone (LEZ) which currently charges Heavy Goods Vehicles (HGVs), Light Goods Vehicles (LGVs), buses / minibuses and coaches that do not meet Euro VI (NO_X and particulate matter (PM)) standards, and vans, minibuses and specialist diesel vehicles that do not meet Euro 3 PM standards. The Site is not located within the current Ultra-Low Emission Zone (ULEZ) but will be located within the planned expansion of the ULEZ from 29th August 2023. The Ultra-Low Emission Zone (ULEZ) charges cars, motorcycles, vans and other specialist vehicles (up to and including 3.5 tonnes) and minibuses (up to and including 5 tonnes) that do not meet the required ULEZ emissions standards when driving within the zone. The ULEZ standards are Euro III (NO_X), Euro IV (NO_X) and Euro VI (NO_X and PM) standards.

4.5 The 'London Bexley' AURN suburban background site is located approximately 3.6 km to the southeast of the Site. This site measured no exceedances of the NO_2, PM_{10} and $PM_{2.5}$ EU Limit Values in 2021.

4.6 Defra's PCM model does not predict any exceedances of the NO_2 annual mean EU Limit Value on roads in close proximity to the Site in 2021 or 2025. No exceedances of the PM_{10} and $PM_{2.5}$ EU Limit Values were predicted on roads in close proximity to the Site in 2020[8] or 2025.

LLAQM

4.7 LBB has assessed air quality within its area as part of its responsibilities under LLAQM. LBB declared a whole-borough AQMA ('Bexley AQMA') in 2007 as a result of exceedances of the annual mean NO_2 objective and the annual and 24-hour mean PM_{10} objective. The Site is located within this AQMA.

AQFAs

4.8 The GLA has declared 187 AQFAs within Greater London. AQFAs are locations that exceed the annual mean NO_2 Limit Value as well as being locations with high levels of human exposure to NO_2. The closest AQFA is located approximately

[8] 2021 data are not available for PM, and so data for 2020 have been considered instead.

2.4 km to the southeast (i.e. 'Erith Queens Road Rdbt to Northend Rdbt' AQFA) of the Site.

Monitoring

4.9 LBB carried out NO_2 monitoring at four automatic sites in 2021. The neighbouring RBG carried out NO_2 monitoring at 10 no. automatic and 42 no. diffusion tube monitoring sites in 2021. The closest locations to the Site are identified in **Figure 4-1** and measured concentrations for 2016 to 2021[9] are shown in **Table 4-1** to **Table 4-2**.

4.10 No exceedances of the annual mean NO_2 objective were measured at any reported monitoring site between 2016 and 2021. Furthermore, no exceedances of the 1-hour mean NO_2 objective were measured at the automatic monitoring sites between 2016 and 2021, and annual mean NO_2 concentrations at all reported monitoring sites did not exceed 60 µg/m^3 between 2016 and 2021, suggesting that exceedances of the 1-hour mean NO_2 objective were not likely during this period at these monitoring sites.

4.11 Overall there is a trend of decreasing measured NO_2 concentrations at all monitoring sites between 2016 and 2021.

[9] 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.

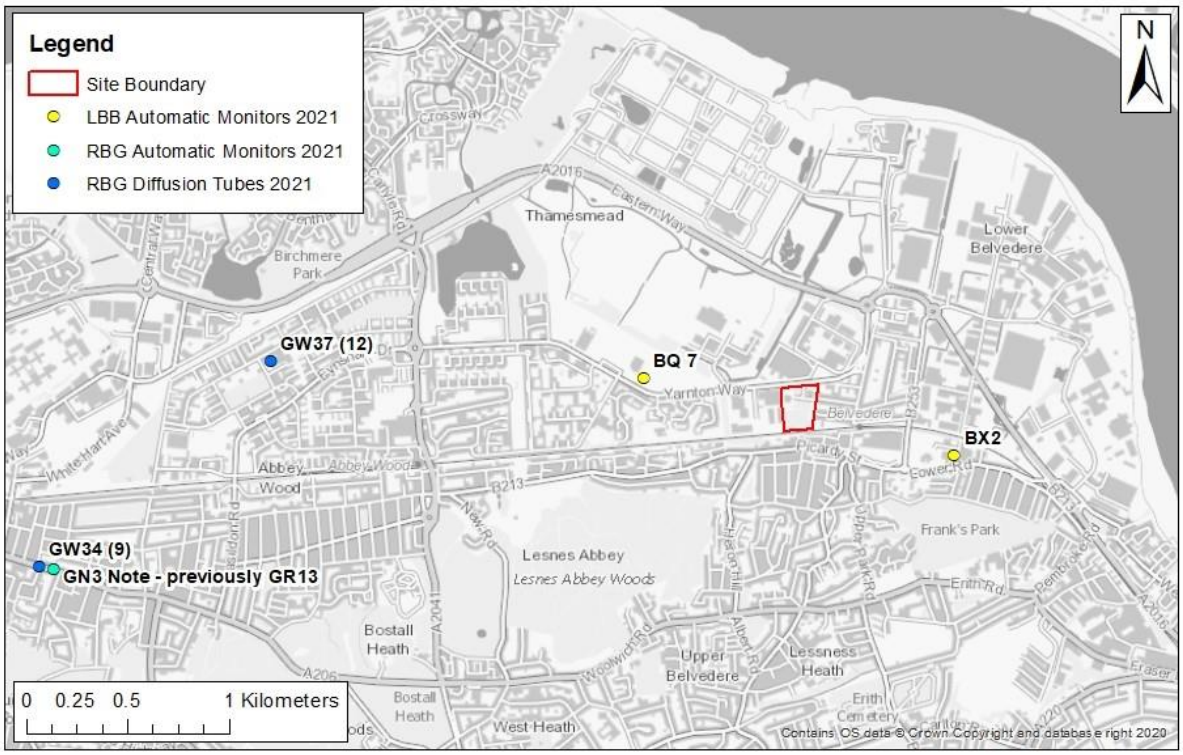

Figure 4-1: Local Monitoring Locations

Table 4-1: Measured Annual Mean NO_2 Concentrations (µg/m³)

Site ID	Site Name	Site Type	2016	2017	2018	2019	2020	2021
Automatic Sites								
BX2	Belvedere Primary School	Urban Background	28	28	28	28	18	16
BQ7	Bexley Business Academy	Urban Background	24	21	21	21	16	17
GN3	Plumstead High St	Roadside	36	34	33	34	30	25
Diffusion Tube Sites								
GW34	Bannockburn School	Roadside	39	37	34	35	30	28
GW37	De Lucy School	Background	23	23	21	22	18	18
Objective			**40**					

Data taken from LBB's 2021 ASR (LBB, 2022) and from RBG's 2021 ASR (RBG, 2022).

Table 4-2: Measured Exceedances of the Hourly Mean NO_2 Objective

Site ID	Site Name	Site Type	Number of Hours >200 µg/m³					
			2016	2017	2018	2019	2020	2021
BX2	Belvedere Primary School	Urban Background	0	0	0	0	0	0
BQ7	Bexley Business Academy	Urban Background	0	0	0	0	0	0
GN3	Plumstead High St	Roadside	0	0	0	0	0	0
Objective			**18**					

Data taken from LBB's 2021 ASR (LBB, 2022) and from RBG's 2021 ASR (RBG, 2022)

4.12 LBB also measured PM_{10} and concentrations at the BX2 and BQ7 automatic monitoring sites from 2016 to 2021[9] and RBG measured $PM_{2.5}$ concentrations at the GN3 automatic monitoring site from 2016 to 2021[9]. Results of these measurements are shown in **Table 4-3**.

4.13 Measured annual mean PM_{10} and $PM_{2.5}$ concentrations at these automatic monitoring sites are below the annual mean objectives from 2016 to 2021. Furthermore, no exceedances of the 24-hour mean objective for PM_{10} have been measured at the BX2 and BQ7 monitoring site during this time period.

Table 4-3: Measured PM_{10} and $PM_{2.5}$ Concentrations

Site ID	Site Name	Site Type	2016	2017	2018	2019	2020	2021
Annual Mean PM_{10} (µg/m³)								
BX2	Belvedere Primary School	Urban Background	14	17	19	19	18	16
BQ7	Bexley Business Academy	Urban Background	15	15	15	14	14	14
Objective			**40**					
PM_{10} Number of Days >50 µg/m³								
BX2	Belvedere Primary School	Urban Background	3	7	7	11	7	3
BQ7	Bexley Business Academy	Urban Background	5	3	1	4	3	1
Objective			**35**					
Annual Mean $PM_{2.5}$ (µg/m³)								
GN3	Plumstead High St	Roadside	14	12	13	13	9	9[a]
Objective			**20**					

Data taken from LBB's 2021 ASR (LBB, 2022), and from RBG's 2021 ASR (RBG, 2022).
[a] Data capture is 56%.

Predicted Background Concentrations

4.14 Predicted annual mean background concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been obtained from the local LBB monitoring sites[10] for 2021.

4.15 The average NO_2 and PM_{10} background concentrations measured at monitoring sites BX2 and BQ7 have been used for the Site area and receptors R1 to R14. The NO_2 and PM_{10} background concentrations measured at monitoring site BX1 have been used for receptors R15 and R16. Background $PM_{2.5}$ concentrations from BX1 have been used for all receptors[11].

4.16 The measured background NO_2, PM_{10} and $PM_{2.5}$ concentrations are all well below the relevant objectives within the Site and at all identified existing receptors in both 2021 and 2025.

[10] As agreed with LBB's Environmental Health Manager.

[11] Due to low $PM_{2.5}$ data capture for monitoring sites BX2 and BQ7.

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

Location		NO_2	PM_{10}	$PM_{2.5}$
2021	Site & Receptors R1 to R14	16	18	9
	Receptors R15 & R16	19	14	9
Objectives:		**40**	**40**	**20**

Predicted concentrations are rounded as appropriate taking into consideration the level of accuracy of the data source as well as the relevant objectives.

Predicted Baseline Concentrations

4.17 The ADMS-Roads model has been used to predict baseline NO_2, PM_{10} and $PM_{2.5}$ concentrations at each of the existing receptor locations identified in **Table 3-1** and **Figure 3-1** to **Figure 3-2** for both the 'current'[5] and future[6] baseline scenarios. The predicted concentrations are shown in **Table 4-5**.

Table 4-5: Predicted Annual Mean Baseline Concentrations (µg/m³)

Receptor	NO_2		PM_{10}		$PM_{2.5}$	
	2021	2025	2021	2025	2021	2025
R1	21	19	18	18	10	10
R2	20	19	18	18	9	9
R3	20	19	18	18	10	10
R4	22	20	18	18	10	10
R5	18	17	17	17	9	9
R6	23	20	18	18	10	10
R7	19	18	18	18	9	9
R8	20	19	18	18	10	9
R9	30	26	19	19	10	10
R10	23	21	18	18	10	10
R11	32	28	19	19	10	10
R12 (1.5m)	18	17	18	18	9	9
R12 (4.5m)	18	18	18	18	9	9
R12 (7.5m)	19	18	18	18	9	9
R13 (1.5m)	19	18	18	18	9	9
R13 (5.5m)	19	18	18	18	9	9
R13 (9.5m)	19	18	18	18	9	9
R14	21	20	18	18	10	10
R15	27	24	19	20	10	10
R16	26	24	19	19	10	10
Objectives	**40**		**40**		**20**	

Predicted concentrations are rounded as appropriate taking into consideration the level of accuracy of the model and data sources as well as the relevant objectives.

4.18 Predicted annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations are below the relevant annual mean objectives at all existing receptors in both 2021 and 2025. Furthermore, predicted annual mean concentrations of NO_2 and PM_{10} are below

60 µg/m^3 and 32 µg/m^3 respectively at all receptors in both 2021 and 2025, indicating that exceedances of the short-term NO_2 and PM_{10} objectives during this time period are not likely.

4.19 The new annual mean $PM_{2.5}$ target introduced by The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 is not applicable until 2040. However, it is noted that the baseline $PM_{2.5}$ concentrations already meet or are slightly below the future target of 10 µg/m^3 at all identified receptors.

5.0 PREDICTED IMPACTS

Construction Dust Impacts

Screening Assessment

5.1 The primary potential effects during the construction phase relate to annoyance and loss of amenity caused by dust soiling, health impacts relating to PM_{10} and ecological impacts due to dust deposition. Based on the screening criteria set out by the GLA and the IAQM, it is considered necessary to carry out a construction dust risk assessment as there are sensitive human receptors located within 350 m of the Site boundary and within 50 m of the roads along which dust may be tracked out by construction vehicles.

5.2 There are designated ecological sites located within 50 m of roads along which dust may be tracked and, therefore, the assessment of dust deposition on ecological sites has been considered as part of this construction dust risk assessment. There are no ecological sites within 50 m of the Site boundary.

Further Assessment

Dust Emission Magnitude

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

5.4 Proposals include the demolition of the two existing gas tanks, with an estimated total building volume of <20,000 m^3. The dust emission magnitude associated with demolition activities is therefore considered to be 'small'.

5.5 Proposed earthworks activities could extend up to 34,600 m^2 (the approximate area of the Site). The soil composition at the Site is deep with a peaty clay texture and has a fluvial clays, silts, sand and gravel subsoil with grains being argillaceous[12] to arenaceous[13] in size (UK Soil Observatory, 2023). As such the soil composition is considered to have the potential to be slightly dusty. Based on the

[12] Typical particle size of between 0.06 to 2.0 mm.

[13] Typical particle size of > 2.0 mm.

above, the dust emission magnitude associated with the earthwork activities is considered to be 'large'.

5.6 The proposed development will involve the construction of approximately 392 no. new residential dwellings with an estimated total building volume of between 25,000 and 100,000 m^3. The dust emission magnitude associated with construction activities is therefore considered to be 'medium'.

5.7 The peak number of HDV movements exiting the Site which may track material onto roads is unknown, however, given the size and nature of the construction activities at the Site, peak outward movements are expected to be between 10 and 50 HDVs per day. Based on the above, the dust emission magnitude associated with trackout activities is considered to be 'medium'.

Area Sensitivity

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

5.9 Residential properties are considered to be of 'high' sensitivity to dust soiling impacts. There between 1 and 10 no. residential properties located within 20 m of the Site boundary. The sensitivity of the area surrounding the Site to dust soiling impacts is therefore considered to be 'medium'.

5.10 Residential properties are considered to be of 'high' sensitivity to dust soiling impacts. The guidance states that trackout can occur on roads up to 500 m from 'large' sized sites (i.e. the proposed development Site). Construction vehicle routing is not known however construction vehicles are anticipated to travel either eastbound or westbound along Yarnton Way and therefore the assumption has been made that dust and mud may be tracked up to 500 m along these sections of road from the Site exit. There are estimated to be between 10 and 100 no. 'high' sensitivity receptors within 20 m of roads which may be subject to trackout. The sensitivity to dust soiling impacts relating to trackout is therefore considered to be 'high'.

5.11 Residential properties and schools are also considered to be of 'high' sensitivity in terms of human health impacts. For the purposes of the construction dust risk assessment, the assumption has been made that annual mean baseline concentrations of PM_{10} within the trackout area are comparable to the highest of

the modelled 'current'[5] baseline concentrations at the identified receptors along the anticipated trackout routes (i.e. 18 µg/m^3; see **Table 4-4**). Taking into account the assumed baseline PM_{10} concentrations and the number of sensitive properties located in close proximity of the Site boundary (see **Paragraph 5.9**) and roads where trackout may occur (see in **Paragraph 5.10**), the sensitivity of the surrounding area to human health impacts is therefore considered to be 'low' for both on-site and trackout activities.

5.12 There are 2 no. SINCs (i.e. 'Erith Marshes' and 'Southmere Park & Yarnton Way / Viridion Way' SINCs) located within 20 m of roads along which construction traffic may travel. Locally designated sites (including SINCs) with potentially dust-sensitive features[14] are generally considered to be of 'low' sensitivity. Taking into account the location of the SINCs and their sensitivities, the overall sensitivity of the area surrounding roads along which material may be tracked out by construction vehicles is considered to be 'low'. There are no designated ecological sites located within 50 m of the Site boundaries.

Risk of Impacts

5.13 The risk of 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	Low	Medium	Medium	Medium
Human Health	Negligible	Low	Low	Low
Ecology	n/a	n/a	n/a	Low

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

[14] As it is not known whether any dust-sensitive features are located within 20 m of roads along which material may be tracked by development-generated vehicles, the worst-case assumption has been made that dust-sensitive features are present.

5.15 The IAQM recommends that no judgement of the significance of 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 effects will be 'not significant'.

Construction Road Traffic Impacts

Human Health & Ecology

5.16 The volume of construction traffic generated by the proposed development is not available, however there is likely to be significant fluctuation in the numbers of vehicle movements associated with development throughout the construction period. When these vehicle movements are averaged over a year they will be significantly lower than peak movements.

5.17 Volumes of construction traffic generated by the proposed development are anticipated to be lower than volumes of operational traffic, as is typically the case for developments of this size and nature. This being the case, it is reasonable to expect that impacts associated with emissions from construction vehicles will be less adverse than those described in **Paragraphs 5.20** to **5.27**.

5.18 It should also be taken into consideration that any impacts associated with the construction phase will be temporary in nature, with the construction phase anticipated to have a maximum duration of up to 4 no. years. Furthermore, it is anticipated that a Construction Environmental Management Plan (CEMP) is likely to be developed and will include measures to minimise emissions associated with construction vehicles, thus further reducing any potential impacts.

5.19 On the basis of the above, it is judged that the overall effects of construction traffic on nearby existing sensitive human and ecological receptors are likely to be 'not significant'.

Operational Road Traffic Impacts

Human Health

5.20 The proposed development will generate additional traffic during the operational phase which will result in an increase of >100 AADT within the Bexley AQMA along Yarnton Way, Harrow Manorway, Eastern Way, Picardy Manorway and Bronze Age Way. Volumes of operational traffic will fall below the relevant screening criteria (see **Paragraphs 3.12** and **3.13**) along all other roads within the study area.

5.21 As such, it is not possible to screen out impacts along the stretches of road referenced within **Paragraph 5.20** based on the EPUK/IAQM screening criteria (see **Paragraphs 3.12** and **3.13**) and a detailed assessment has therefore been undertaken.

5.22 Annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been predicted at existing receptors in 2025, both with and without the proposed development in place. The identified receptors are described in **Table 3-1** and shown in **Figure 3-1** to **Figure 3-2**. Predicted concentrations, the percentage change relevant to the applicable objective and the impact at each receptor are shown in **Table 5-2**, **Table 5-3** and **Table 5-4**.

Table 5-2: Predicted Annual Mean Concentrations of NO_2 (µg/m^3), % Change and Impact at each Receptor

Receptor	2025 Without Development	2025 With Development	Change (%)	Impact
R1	19	19	0	Negligible
R2	19	19	0	Negligible
R3	19	19	0	Negligible
R4	20	20	0	Negligible
R5	17	17	0	Negligible
R6	20	21	0	Negligible
R7	18	18	0	Negligible
R8	19	19	0	Negligible
R9	26	26	0	Negligible
R10	21	21	0	Negligible
R11	28	28	0	Negligible
R12 (1.5m)	17	17	0	Negligible
R12 (4.5m)	18	18	0	Negligible
R12 (7.5m)	18	18	0	Negligible
R13 (1.5m)	18	18	0	Negligible
R13 (5.5m)	18	18	0	Negligible
R13 (9.5m)	18	18	0	Negligible
R14	20	20	0	Negligible
R15	24	24	0	Negligible
R16	24	24	0	Negligible
Objective	**40**		**-**	

Predicted concentrations are rounded as appropriate taking into consideration the level of accuracy of the data source as well as the relevant objectives.

Table 5-3: Predicted Annual Mean Concentrations of PM_{10} ($\mu g/m^3$), % Change and Impact at each Receptor

Receptor	2025 Without Development	2025 With Development	Change (%)	Impact
R1	18	18	0	Negligible
R2	18	18	0	Negligible
R3	18	18	0	Negligible
R4	18	18	0	Negligible
R5	17	17	0	Negligible
R6	18	18	0	Negligible
R7	18	18	0	Negligible
R8	18	18	0	Negligible
R9	19	19	0	Negligible
R10	18	18	0	Negligible
R11	19	19	0	Negligible
R12 (1.5m)	18	18	0	Negligible
R12 (4.5m)	18	18	0	Negligible
R12 (7.5m)	18	18	0	Negligible
R13 (1.5m)	18	18	0	Negligible
R13 (5.5m)	18	18	0	Negligible
R13 (9.5m)	18	18	0	Negligible
R14	18	18	0	Negligible
R15	20	20	0	Negligible
R16	19	19	0	Negligible
Objective	**40**		**-**	

Predicted concentrations are rounded as appropriate taking into consideration the level of accuracy of the data source as well as the relevant objectives.

Table 5-4: Predicted Annual Mean Concentrations of $PM_{2.5}$ (µg/m³), % Change and Impact at each Receptor

Receptor	2025 Without Development	2025 With Development	Change (%)	Impact
R1	10	10	0	Negligible
R2	9	9	0	Negligible
R3	10	10	0	Negligible
R4	10	10	0	Negligible
R5	9	9	0	Negligible
R6	10	10	0	Negligible
R7	9	9	0	Negligible
R8	9	10	0	Negligible
R9	10	10	0	Negligible
R10	10	10	0	Negligible
R11	10	10	0	Negligible
R12 (1.5m)	9	9	0	Negligible
R12 (4.5m)	9	9	0	Negligible
R12 (7.5m)	9	9	0	Negligible
R13 (1.5m)	9	9	0	Negligible
R13 (5.5m)	9	9	0	Negligible
R13 (9.5m)	9	9	0	Negligible
R14	10	10	0	Negligible
R15	10	10	0	Negligible
R16	10	10	0	Negligible
Objective	**40**		**-**	

Predicted concentrations are rounded as appropriate taking into consideration the level of accuracy of the data source as well as the relevant objectives.

5.23 The predicted annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations in 2025, both without and with the proposed development in place, are well below the relevant objectives at all existing receptors. Furthermore, predicted annual mean NO_2 concentrations are below 60 µg/m³ and annual mean PM_{10} concentrations are below 32 µg/m³ respectively, indicating that exceedances of the short-term objectives for NO_2 and PM_{10} are not likely.

5.24 The predicted changes in annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ (when rounded to the nearest whole number) are 0% at all existing receptors; using the criteria set out in **Table 3-2**, these impacts are described as being 'negligible' at all receptors.

5.25 The new annual mean $PM_{2.5}$ target introduced by The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 is not applicable until 2040.

However, it is noted that the predicted $PM_{2.5}$ concentrations already meet the future target of 10 µg/m^3 at all identified receptors in both the 'without scheme' and 'with scheme' scenarios in 2025.

5.26 The predicted changes in annual mean $PM_{2.5}$ concentrations (when rounded to the nearest whole number) are 0% at all existing receptors, when considering the future $PM_{2.5}$ target of 10 µg/m^3. Using the criteria set out in **Table 3-2**, these impacts are described as being 'negligible' at all receptors.

5.27 The overall effect on existing receptors has been considered, taking into account the following factors:

- The impacts at individual modelled receptors;
- The number of properties represented by each modelled receptor;
- The assumptions and limitations of the model, including any conservative / worst-case assumptions;
- The predicted concentrations and how close these are to the relevant objectives; and
- The potential for any change to impact on an existing AQMA and / or to result in the declaration, or extension, of an AQMA.

5.28 Based on the above, the overall effect of operational traffic generated by the proposed development on local air quality is considered to be 'not significant'.

Ecology

5.29 There are several locally designated ecological sites located in close proximity to the Site. The 'Southmere Park & Yarnton Way / Viridion Way', 'Erith Marshes', 'Belvedere Dykes', 'Crossway Park and Tump 52', 'Lesnes Abbey Woods and Bostall Woods' SINCs, the 'Lesnes Abbey Woods' and 'Crossness' LNRs are each located within 200 m of roads, along which operational traffic is anticipated to travel. The 'Abbey Woods' SSSI is located more than 200 m from roads where operational traffic in anticipated to travel. As such, no further assessment is required for this site.

5.30 The proposed development and nearby committed developments are anticipated to generate a 619 total AADT (4 HDV AADT) along Yarnton Way east of the Site access, 570 total AADT (including 4 HDV AADT) along Yarnton Way west of the Site access, 388 total AADT (including 3 AADT) along Picardy Manorway and 469 total AADT (including 4 HDV AADT) along Harrow Manorway that may travel within 200 m of the aforementioned sites[15]. As such, the combined traffic generation is anticipated to be below the screening criteria outlined in Paragraph 3.27 and, therefore, the overall effect of development-generated operational traffic on nearby designated ecological receptors can be screened out as being 'not significant'.

5.31 Furthermore, it should be noted that LNRs and SINCs are local designations. For locally designated ecological sites, the EA policy for its permitting process is such that if either the short-term or long-term process contribution (PC) is less than 100% of the critical level or load, they do not require further assessment to support a permit application. As such, it is considered that the PCs generated by cumulative flows in the area would need to exceed 100% of the relevant critical levels and loads in order to result in a 'significant' effect; this would require a comparatively large, combined PC.

5.32 On the basis of the above, it is judged that the overall effect of operational traffic on all nearby designated ecological sites will be 'not significant'.

[15] Traffic data have been provided by the project's transport consultant ACE.

Site Suitability

Screening Assessment

5.33 The proposed development will introduce new areas of sensitive exposure which are sensitive to the long-term and short-term NO_2, PM_{10} and $PM_{2.5}$ objectives (i.e. the proposed residences). The proposed receptors are located in close proximity to nearby emissions sources (i.e. Yarnton Way) within the 'Bexley AQMA'. As such, it is not possible to screen out the potential for significant effects on introduced sensitive locations within the proposed development and, therefore, a detailed assessment has been undertaken.

5.34 Sensitive locations within the proposed development are situated within 30 m of the nearby railway lines. However, these lines are not identified by the LAQM.TG(22) (Defra, 2022) as having heavy traffic of diesel passenger trains and annual mean background concentrations of NO_2 within the Site are predicted to be <25 µg/m^3 by the earliest proposed year of operation (i.e. 2025) (see **Table 4-4**). As such, according to the screening criteria set out in LAQM.TG(22) (see **Paragraph 3.31**), it is possible to screen out the potential risk of exceeding the annual mean NO_2 objective as a result of emissions associated with moving locomotives.

Detailed Assessment

5.35 Predicted annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ in 2025 at modelled receptor locations (as identified in **Table 3-3** and **Figure 3-3**) are presented in **Table 5-5**.

Table 5-5: Predicted Annual Mean Concentrations Within the Proposed Development in 2025 (µg/m³)

Receptor	NO_2	PM_{10}	$PM_{2.5}$
P1 (1.5m)	18	18	9
P1 (4.5m)	18	18	9
P2 (1.5m)	19	18	9
P2 (4.5m)	18	18	9
P3 (4.5m)	18	18	9
P4 (4.5m)	18	18	9
P5 (4.5m)	18	18	9
P6 (1.5m)	17	17	9
Objectives	**40**	**40**	**20**

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

5.36 Predicted annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ in 2025 are well below the annual mean objectives at all proposed receptors. Furthermore, predicted annual mean concentrations of NO_2 and PM_{10} fall below 60 µg/m³ and 32 µg/m³ respectively at all receptors, indicating that exceedances of the short-term NO_2 and PM_{10} objectives are not likely to occur at these locations.

5.37 The new annual mean $PM_{2.5}$ target introduced by The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 is not applicable until 2040. However, it is noted that the predicted $PM_{2.5}$ concentrations already meet the future target of 10 µg/m³ at all proposed receptors in 2025.

5.38 Based on the predicted concentrations of pollutants in relation to the relevant objectives, it is considered that future residents of the proposed development will experience good air quality and, therefore, that the Site is suitable for the proposed end-use.

Air Quality Neutral Calculations

5.39 Air quality neutral calculations have been carried out based on the methodologies and input data set out in '*London Plan Guidance; Air Quality Neutral*' (GLA, 2023).

Building Emissions

5.40 The proposed long-term energy strategy will be all electric and will, therefore, not have any associated on-site building emissions. On this basis, the proposed development will be better than 'air quality neutral' in terms of building emissions.

Transport Emissions

5.41 The air quality neutral calculations and comparison of transport emissions and transport emissions benchmarks (TEBs) for the proposed development are described in **Table 5-6** to **Table 5-8**.

5.42 The proposed development trips rate is above the calculated TEB. Therefore, the proposed development is considered to be worse than 'air quality neutral' in terms of transport emissions.

Table 5-6: Proposed Development TEBs

Land Use	No. Dwellings / GIA (m^2)	Standard Benchmark Trip Rate (trips / dwelling or GIA (m^2) /annum)	TEB (trips / annum) [a]
Residential	392	447	175,224
Retail (convenience)[b]	205	274	56,170
Assembly and Leisure [c]	93	47.2	4,390

[a] Calculations are based on unrounded numbers and only rounded numbers are presented.
[b] 'Retail (convenience)' has been assumed for the commercial land uses of the development.
[c] 'Assembly and Leisure' has been assumed for residents' gym land use of the development.

Table 5-7: Proposed Development Trip Rates

Trip Rate (trips / day)	Trip Rate (trips / annum) [a]
738	269,555

a Calculations are based on unrounded numbers and only rounded numbers are presented.

Table 5-8: Comparison of Proposed Development Trips Rates and BEBs

TEB (trips / annum)	Proposed Development Trip Rates (trips / annum)	Comparison (trips / annum)
235,784	269,555	+33,771

Calculations are based on unrounded numbers and only rounded numbers are presented.

6.0 MITIGATION

Embedded Mitigation

6.1 The proposed development includes the following mitigation measures:

- A travel plan has been developed (information provided by the project's transport consultants) that promotes walking and cycling, the use of public transport and car sharing and ensures the car parking management;
- Extensive cycle parking will be provided on-site in accordance with the London Plan; and
- Electric vehicle charging points will be provided.

Construction Dust

6.2 The following standard mitigation measures have been identified as being appropriate for a 'medium' risk site, although where measures relate to demolition only, measures relating to a 'low' risk site will be sufficient. This is based on the recommendations within the SPG on '*The Control of Dust and Emissions during Construction and Demolition'* (GLA, 2014).

6.3 An Air Quality and Dust Management Plan (AQDMP) should be submitted to LBB prior to works commencing on the Site.

Site Management

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site;
- Develop and implement a Dust Management Plan (DMP);
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager;
- Display the head or regional office contact information;
- Record and respond to all dust and air quality pollutant emission complaints;

- Make the 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 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; and
- 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.

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;
- 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 actives 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;
- Carry out regular dust soiling checks of buildings within 100 m of site boundary and cleaning to be provided if necessary;
- Agree monitoring locations with the Local Authority;

- Where possible, commence baseline monitoring at least three months before phase begins; and
- Put in place real-time dust and air quality pollutant monitors across the site and ensure they are checked regularly.

Operating vehicle/machinery and sustainable travel

- Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone and the London non-road mobile machinery (NRMM) standards;
- Ensure all NRMM comply with the standards set out within the SPG;
- 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 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);
- 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 suppression/mitigation, using non-potable water where possible and appropriate;

- Use enclosed chutes and conveyors and covered skips;
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate; 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

- Reuse and recycle waste to reduce dust from waste materials; and
- Avoid bonfires and burning of 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 prevent escape of material and overfilling during delivery; and
- For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.

Trackout

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, 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 haul routes and any subsequent action in a site log book;
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned;
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable;
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable);
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits;
- Access gates to be located at least 10 m from receptors where possible; and

- Apply dust suppressants to locations where a large volume of vehicles enter and exit the construction site.

Road Traffic Impacts

6.4 The overall effects, without mitigation, of construction and operational traffic generated by the proposed development on existing human and ecological receptors in the study area will be 'not significant'. Furthermore, any construction phase impacts will be temporary in nature and are expected to be mitigated to some extent by measures outlined within a CEMP. Therefore, no further mitigation measures are considered to be necessary.

Site Suitability

6.5 Future[6] baseline concentrations of pollutants at sensitive locations within the proposed development Site are predicted to be well below the relevant objectives. Therefore, air quality for future residents is considered to be good and no mitigation is recommended as being necessary.

Air Quality Neutral

6.6 The proposed development is considered to be better than 'air quality neutral' in terms of building emissions but worse than 'air quality neutral' in terms of transport emissions. Therefore, there is a potential for additional mitigation to be required by LBB in order to reduce and / or offset the operational transport emissions.

6.7 It should be taken into consideration that the proposed development already includes embedded mitigation measures as part of its design which aim to reduce the use of private vehicles (see **Paragraph 6.1**).

6.8 The proposed development is better than 'air quality neutral' in terms of building emissions associated, therefore, no mitigation measures will be require in response to this element of the energy strategy.

7.0 CONCLUSIONS

7.1 The potential air quality impacts associated with the proposed residential development on Yarnton Way in LBB have been assessed.

7.2 There is the potential for dust and PM_{10} impacts during the construction phase. However, with the proposed mitigation measures in place, the overall residual effect will be 'not significant'.

7.3 Taking into consideration anticipated volumes of construction traffic, the maximum duration of the construction phase and the likely implementation of a CEMP, it is judged that the overall effects of emissions from construction traffic on existing sensitive human and ecological receptors are likely to be 'not significant'.

7.4 The impacts of operational traffic generation associated with the proposed development on nearby existing sensitive human receptors has been considered. Modelling of pollutant concentrations has been undertaken at worst-case locations and the predicted changes in concentrations as a result of operational traffic are 'negligible' at all receptors and do not result in any exceedances of the national air quality objectives. As such, the overall effect of operational traffic on nearby existing sensitive human receptors will be 'not significant'.

7.5 The overall effect of operational traffic on sensitive ecological receptors can be screened out as being 'not significant' on the basis that traffic volumes generated by the proposed development fall below the relevant screening criteria.

7.6 The impact of local air quality on future residents of the proposed development has been considered, with modelling of pollutant concentrations having been undertaken at worst-case sensitive locations within the proposed development. Concentrations of pollutants within the proposed development are predicted to be well below the relevant objectives. As such, it is judged that future residents of the proposed development will experience good air quality and that the Site is suitable for its proposed end-use without mitigation.

7.7 The development is considered to be worse than 'air quality neutral' in terms of transport emissions. Therefore, there is a potential for additional mitigation to be required by LBB in order to reduce and / or offset the operational transport emissions. The proposed development is better than 'air quality neutral' in terms of building emissions associated with the proposed permanent energy strategy.

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
AQDMP	Air Quality Dust Management Plan
AQFA	Air Quality Focus Area
AQMA	Air Quality Management Area
ASR	Annual Status Report
AURN	Automatic Urban and Rural Network
BEB	Building Emission Benchmark
BST	British Summer Time
CAZ	Central Activity Zone
CEMP	Construction Environmental Management Plan
CROW Act	Countryside and Rights of Way Act
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
Diffusion Tube	A passive sampler used for collecting NO_2 in the air
DMP	Dust Management Plan
EC	European Commission
EEA	European Environment Agency
EEC	European Economic Community
EFT	Emission Factor Toolkit
EMEP	European Monitoring and Evaluation Program
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
LBB	London Borough of Bexley
LDV	Light Duty Vehicle; a vehicle with a gross vehicle weight equal to or less than 3.5 tonnes, includes Light Goods Vehicles, cars and motorbikes
LEZ	Low Emission Zone
LGV	Light Goods Vehicle
LLAQM	London Local Air Quality Management
LNR	Local Nature Reserve
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

Abbreviations	Meaning
	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
PCM	Pollution Climate Mapping
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
SAC	Special Area of Conservation
SINC	Site of Importance for Nature Conservation
SPA	Special Protection Area
SPG	Supporting Planning Guidance
SSSI	Site of Special Scientific Interest
TEB	Transport Emission Benchmark
TEMPro	Trip End Model Presentation Programme
TfL	Transport for London
ULEV	Ultra-Low Emission Vehicle
ULEZ	Ultra-Low Emission Zone

Appendix B Air Quality Neutral Benchmarks

B1 'London Plan Guidance; Air Quality Neutral'

Building Emissions

B1.1 **Table B.1** shows the benchmark emissions rates set out within the 'London Plan Guidance; Air Quality Neutral' (GLA, 2023) based on the type of the type of technology used for various types of development class[16]. Benchmark emissions rates are based on achievable emission rates for the type of technology used.

Table B.1: Benchmark Emissions Rates (g NO_X/m^2/annum)

Land Use	Individual Gas Boilers	Gas Boiler Network	CHP + Gas Boiler Network	Heat Pumps + Gas Boiler Network
Residential	3.5	5.7	7.8	5.7
Retail	0.53	0.97	4.31	0.97
Restaurant / bars	1.76	3.23	14.34	3.23
Offices	1.43	2.62	11.68	2.62
Industrial	1.07	1.95	8.73	1.95
Storage and distribution	0.55	1.01	4.50	1.01
Hotel	9.47	15.42	38.16	15.42
Care homes and hospitals	9.15	14.90	36.86	14.90
Schools, nurseries, doctor's surgeries, other non-residential institutions	0.90	1.66	7.39	1.66
Assembly and leisure	2.62	4.84	21.53	4.84

[16] Separate use classes for commercial uses, including retail and offices, have now been replaced by use class E. If these separate uses are specified in the development proposal, they should be used for this assessment. Where the separate use is not specified, or where use class E has been specified, the benchmark for retail should be used (GLA, 2023).

Transport Emissions

B1.2 **Table B.2** shows the benchmark trips rates set out within the 'London Plan Guidance; Air Quality Neutral' (GLA, 2023) based on the number of residences / GIA for various types of development class[17]. Benchmark trip rates are based on data from TRAVL (Trip Rate Assessment Valid for London) and are defined for different land uses and different areas of London.

Table B.2: Benchmark Trip Rates (annual trips/dwelling or m²) [a]

Land Use	Central Activities Zone	Inner London	Outer London
Residential	68	114	447
Office / Light Industrial	2	1	16
Retail (Superstore)	39	73	216
Retail (Convenience)	18	139	274
Restaurant / Café	64	137	170
Drinking establishment	0.8	8	-
Hot food takeaway	-	32.4	590
Industrial	-	5.6	6.5
Storage and distribution	-	5.5	6.5
Hotel	1	1.4	6.9
Care home / hospital	-	1.1	19.5
Schools, nurseries, doctor's surgeries, other non-residential institutions	0.1	30.3	44.4
Assembly and leisure	3.6	10.5	47.2

[a] Annual trips / dwelling is applicable to proposed residential land use. Annual trips / m^2 is applicable to all other land uses.

[17] Separate use classes for commercial uses, including retail and offices, have now been replaced by use class E. If these separate uses are specified in the development proposal, they should be used for this assessment. Where the separate use is not specified, or where use class E has been specified, the benchmark for office / light industrial should be used (GLA, 2023).

Appendix C London SPG Dust Assessment Approach

C1 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.

C2 Step 2: Assess the risk of dust impacts

C2.1 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** and **Table C.3**.

C2.2 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.4**, **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	Medium	Medium
Medium	High	Medium	Low
Low	Low	Low	Negligible

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

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

Table C.7: Risk of Impacts – Trackout

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

C3 Step 3: Site-specific Mitigation

C3.1 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

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

Mitigation Measure	Low Risk	Medium Risk	High Risk
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 windowsills 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
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

Mitigation Measure	Low Risk	Medium Risk	High Risk
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
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

Mitigation Measure	Low Risk	Medium Risk	High Risk
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
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

Mitigation Measure	Low Risk	Medium Risk	High Risk
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

(H = Highly Recommended, D = Desirable and N = Not Recommended).

C4 Step 4: Determine Significant Effects

C4.1 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 a lack of water) and therefore, an assessment should always be made based on the characteristics of each site and the surrounding area.

C5 Step 5: Dust Assessment Report

C5.1 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

Model Version	ADMS-Roads v5.0.1, January 2022
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 E**.
British Summer Time (BST)	Adjustment for BST was made within the model, based on the following dates and times: BST begins – 01:00 on 28/03/2021 BST ends – 02:00 on 31/10/2021
Emission Factor Toolkit (EFT)	v11.0, November 2021 **(Defra, 2021)**
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: 2021.
Meteorological Data	2021 hourly meteorological data from London City met station has been used in the model. The wind rose is shown in **Figure D.1**.
Latitude	51.3°
Surface Roughness	A value of 1 for 'Cities, woodlands' was used to represent the modelled area. A value of 0.613 was used to represent the meteorological station site.

Minimum Monin-Obukhov Length	A value of 30 for 'Cities and large towns' was used to represent the modelled area. A value of 24.368 was used to represent the meteorological station site.
Surface Albedo	A value of 0.23 (default) was used to represent the modelled area. A value of 0.182 was used to represent the meteorological station site.
NO_X to NO_2 Conversion	NO_X to NO_2 Calculator v8.1 **(Defra, 2020c)**
Background Maps	2018 reference year background maps **(Defra, 2020b)**

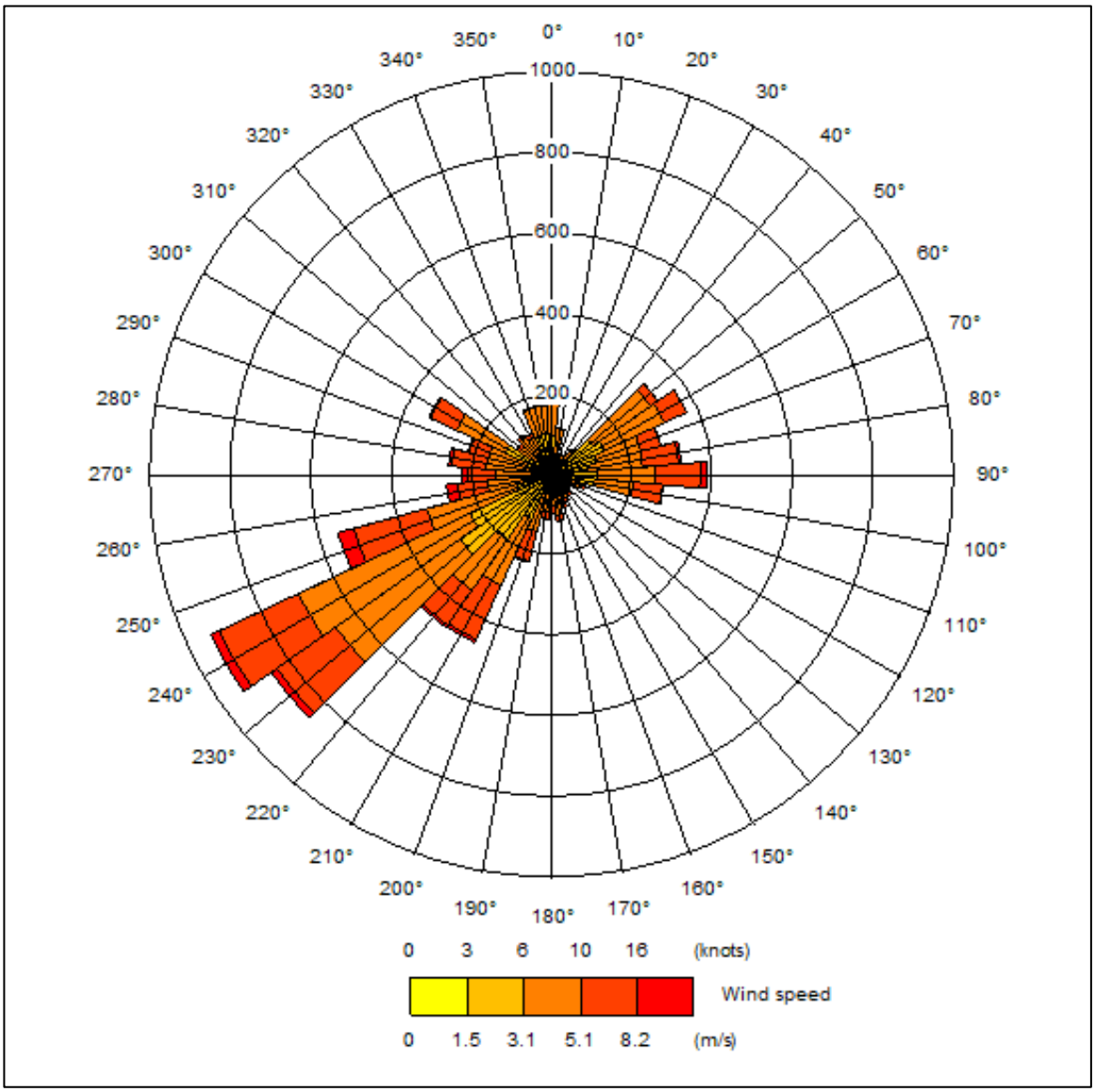

Figure D.1: 2021 London City Wind Rose

D2 Verification

NO_2

D2.1 Most NO_2 is produced in the atmosphere by a reaction between nitric oxide (NO) and ozone. 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 2021 at the RBG's GN3 automatic and GW34 diffusion tube monitoring site. Concentrations have been modelled at a height of 2.5 m at both sites.

D2.2 The choice of appropriate monitoring site for verification has been based on:

- Appropriateness of site (roadside rather than background sites, presence of additional emission sources etc.);
- Distance from study area; and
- Availability of traffic data for modelling.

D2.3 Annual mean background NO_2 concentrations at the GN3 and GW34 monitoring site used for verification purposes have been obtained from national maps provided by Defra **(Defra, 2020b)**. The mapped backgrounds were compared against concentrations recorded at local background monitoring site(s). Details of the calibration are shown in **Paragraphs D3.1** to **D3.3**.

D2.4 The calibrated backgrounds are presented in **Table D.1** below. Predicted annual mean concentrations have then been used for further verification calculations (including within the NO_X to NO_2 calculator).

Table D.1: Predicted 2021 Annual Mean Background Concentrations (µg/m³)

Monitoring Site	NO_X	NO_2
GN3	26	18
GW34	26	18

Predicted concentrations are rounded as appropriate taking into consideration the level of accuracy of the data source.

D2.5 The model output of road-NO_X has been compared with the 'measured' road-NO_X, which was calculated from the measured NO_2 concentrations within the NO_X from NO_2 calculator.

D2.6 A primary adjustment factor was determined as the slope of the best fit line between the 'measured' road contribution and the modelled road contribution, forced through zero (**Figure D.2**). This factor was then applied to the modelled road-NO_X concentrations. The total NO_2 concentrations were then determined by combining the adjusted modelled road-NO_X with the predicted background NO_2 concentration within the NO_X to NO_2 calculator. A secondary adjustment factor was then calculated as the slope of best fit between the

measured NO_2 and primary adjusted, modelled NO_2, forced through zero (**Figure D.3**).

D2.7 The following primary and secondary adjustment factors have been calculated and applied to all modelled data:

Primary NO_X adjustment factor: 1.9264

Secondary NO_2 adjustment factor: 0.9994

D2.8 The results imply that overall, the model was under-predicting the road-NO_X contribution. This is a common experience with this and most other models. The secondary NO_2 adjustment is minor.

D2.9 The Root Mean Square Error (RMSE) has been calculated as 0.1 µg/m^3 (0.25 %) which is within the guideline variance recommended within LAQM.TG(22) **(Defra, 2022)**.

D2.10 **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. Both GN3 and GW34 lie within ±10% of the 1:1 line.

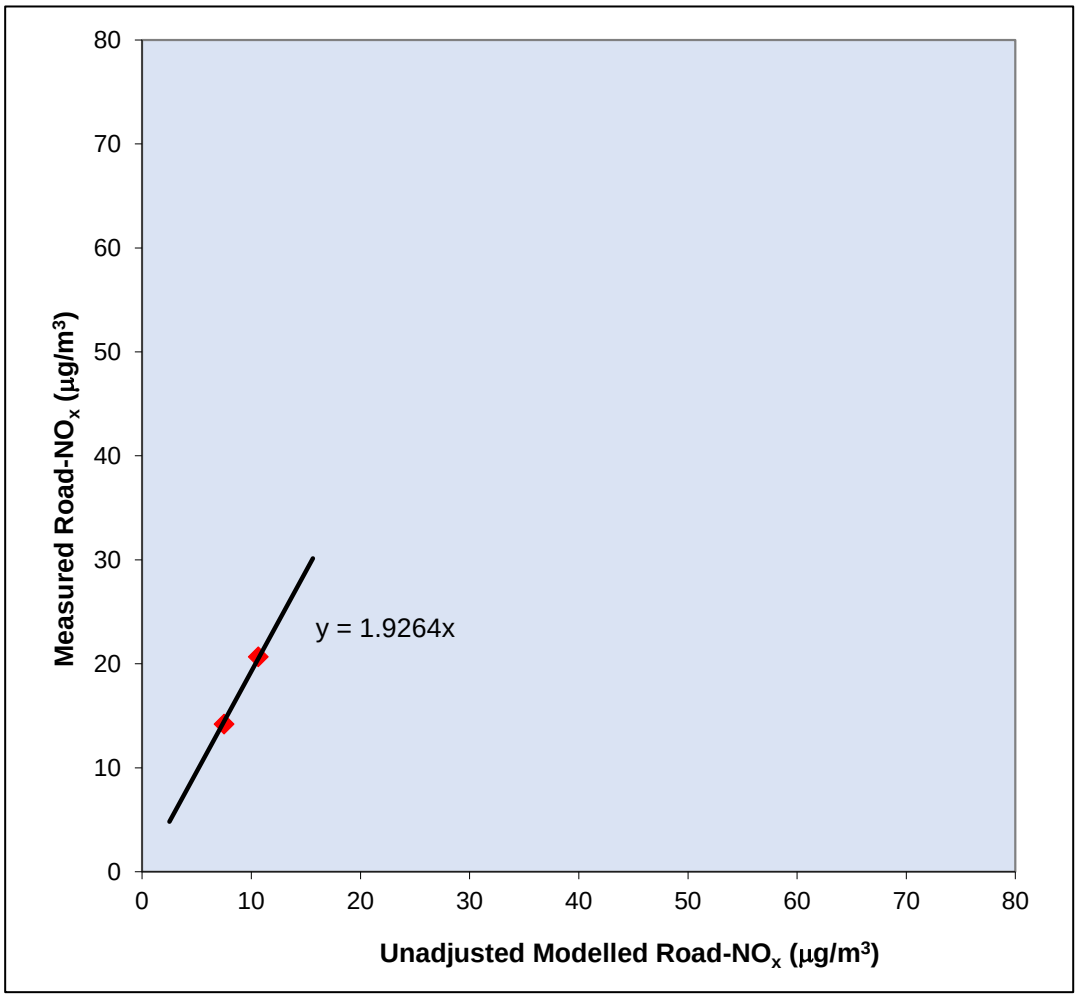

Figure D.2: Measured road-NOx / Modelled road-NOx concentrations

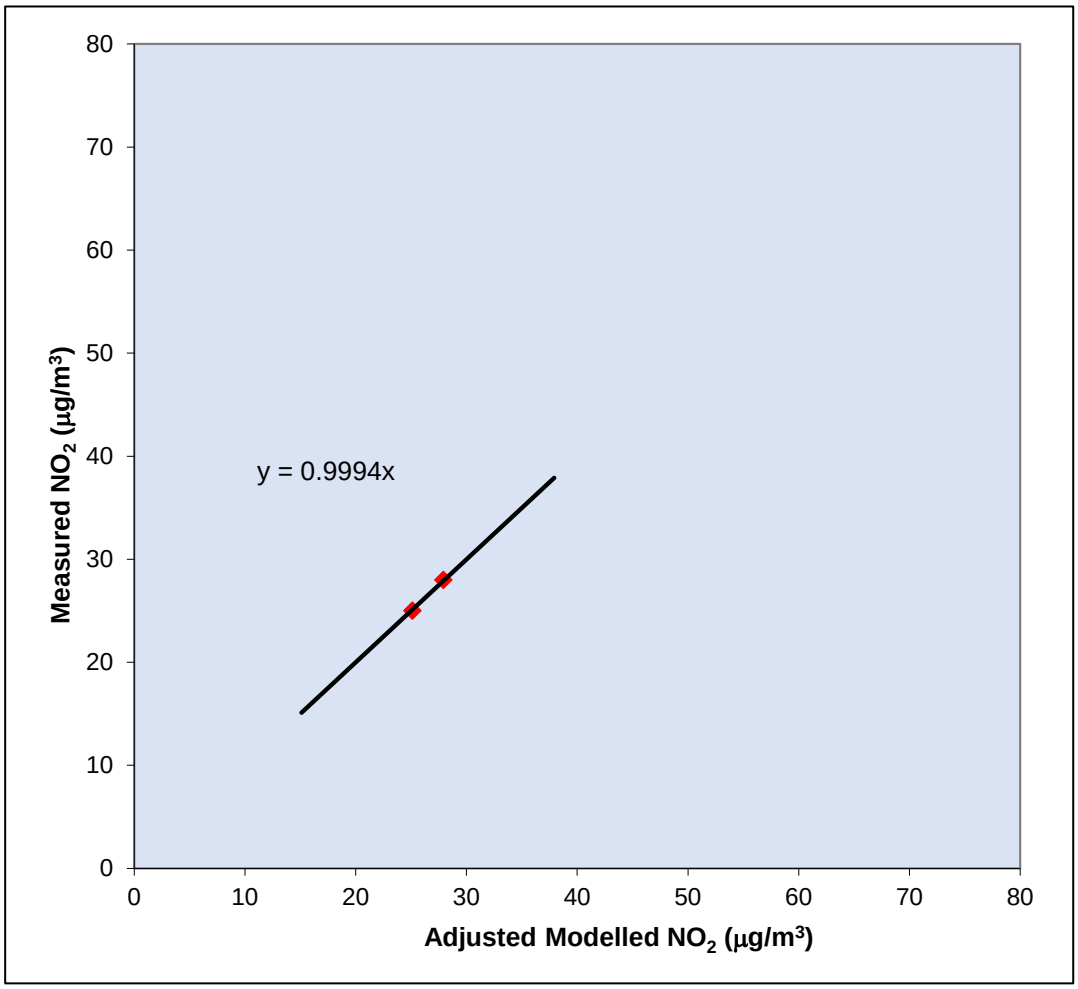

Figure D.3: Measured NO_2 / Primary Adjusted modelled NO_2 concentrations

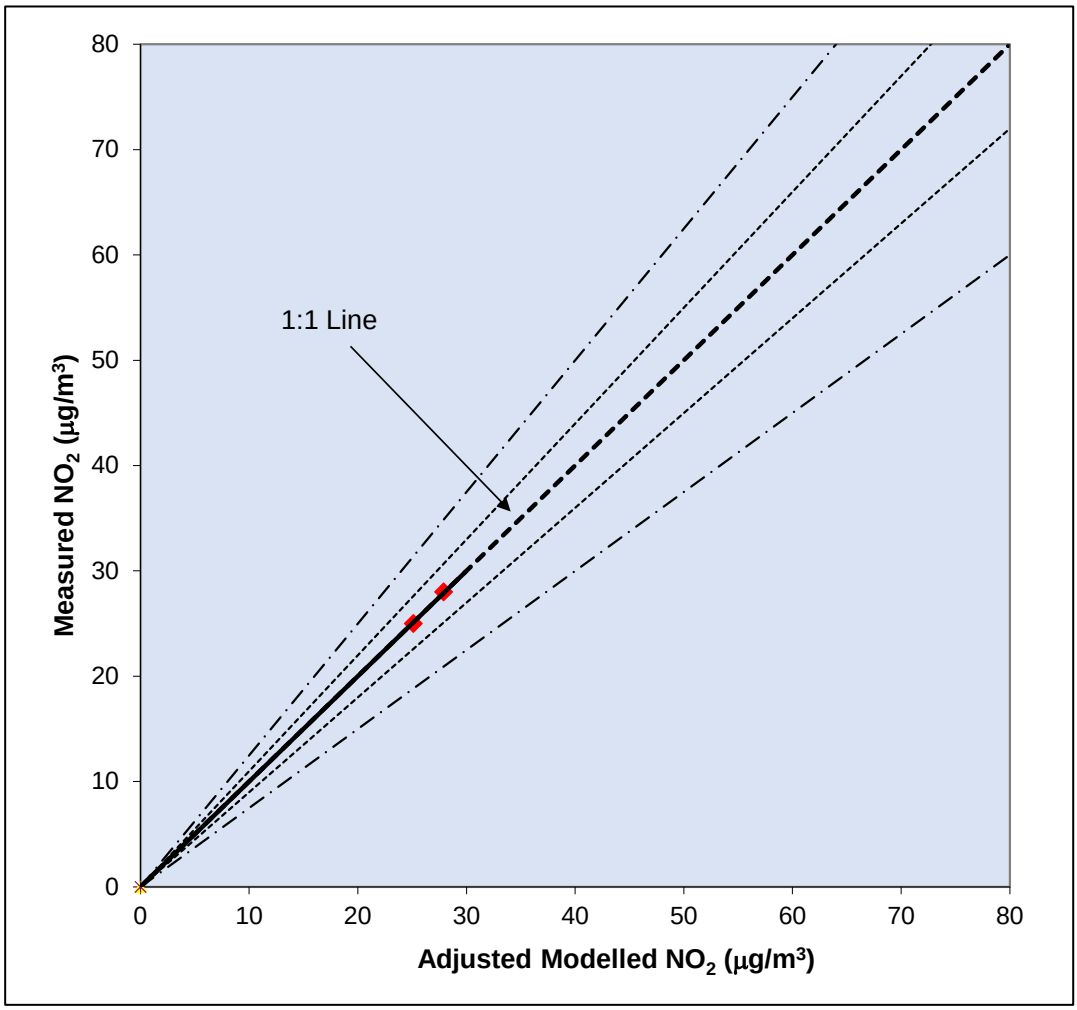

Figure D.4: Measured NO_2 / Fully Adjusted modelled NO_2 concentrations

PM_{10} and $PM_{2.5}$

D2.11 There are no suitable PM_{10} and $PM_{2.5}$ located in close proximity to the proposed development Site. Therefore, the primary adjustment factor calculated for road-NO_X concentrations has been applied to the modelled road-PM_{10} and road-$PM_{2.5}$ concentrations.

D3 Background Calibration

D3.1 To ensure that background concentrations used for the verification purposes in this assessment reflect real-world conditions as accurately as possible, a calibration exercise has been carried out, utilising NO_2 data measured in 2021 at the RBG's GW37 diffusion tube monitoring site (see **Figure 4-1** and **Table 4-1**).

D3.2 Measured annual mean NO_2 concentrations have been compared against Defra background annual mean NO_2 concentration **(Defra, 2020b)** at the same location in order to provide a NO_2 calibration factor. Background input data and the calculated calibration factor are presented in **Table D.2**.

Table D.2: Background Calibration

	NO_2
Monitor	GW37
Measured Concentration (µg/m^3)	18
Data Capture (%)	83
Mapped Concentration (µg/m^3)	19
Calibration Factor	0.94 [a]

Concentrations are rounded as appropriate taking into consideration the level of accuracy of the data sources.
[a] Based on unrounded number.

D3.3 The calibration factors suggest that mapped NO_2 backgrounds for the area are higher than measured NO_2 backgrounds in the area, and mapped NO_2 background concentrations have, therefore, been calibrated by the calculated calibration factor for the purposes of this assessment.

Appendix E Traffic Data and Road Network

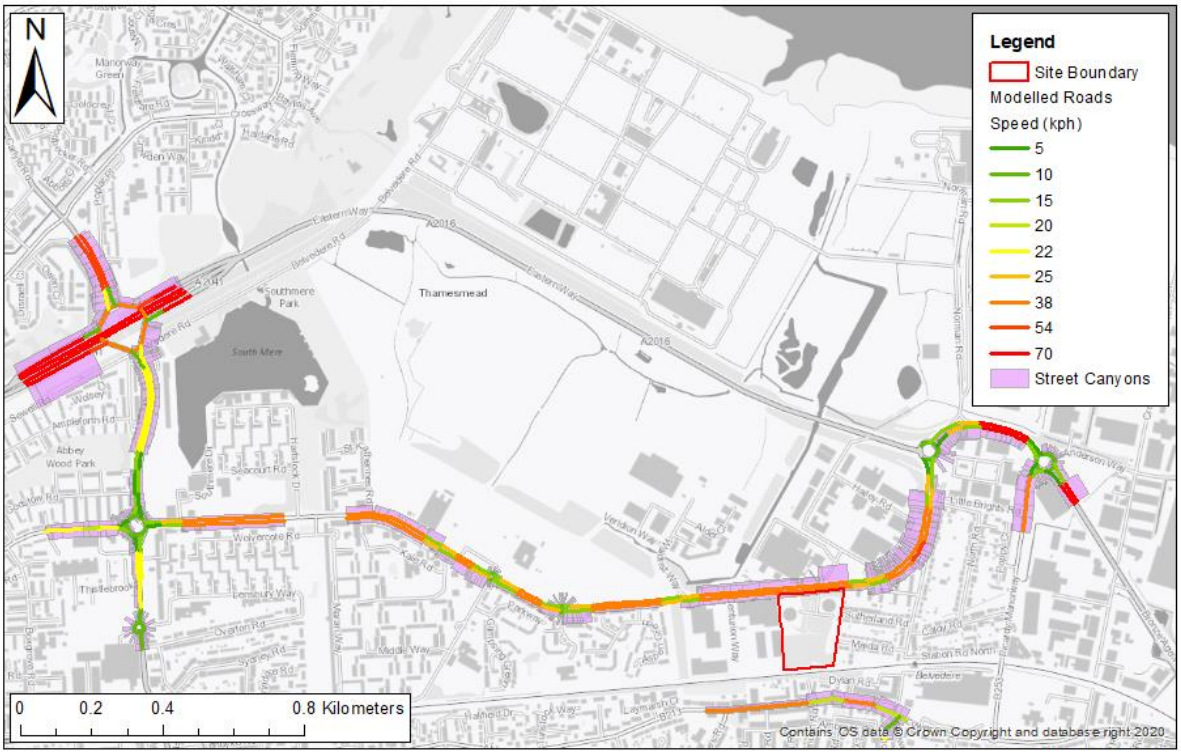

Figure E.1: Modelled Study Area Road Network (inc. Av. Speeds (kph) and Modelled Street Canyons); Yarnton Way, Harrow Manorway and Picardy Manorway

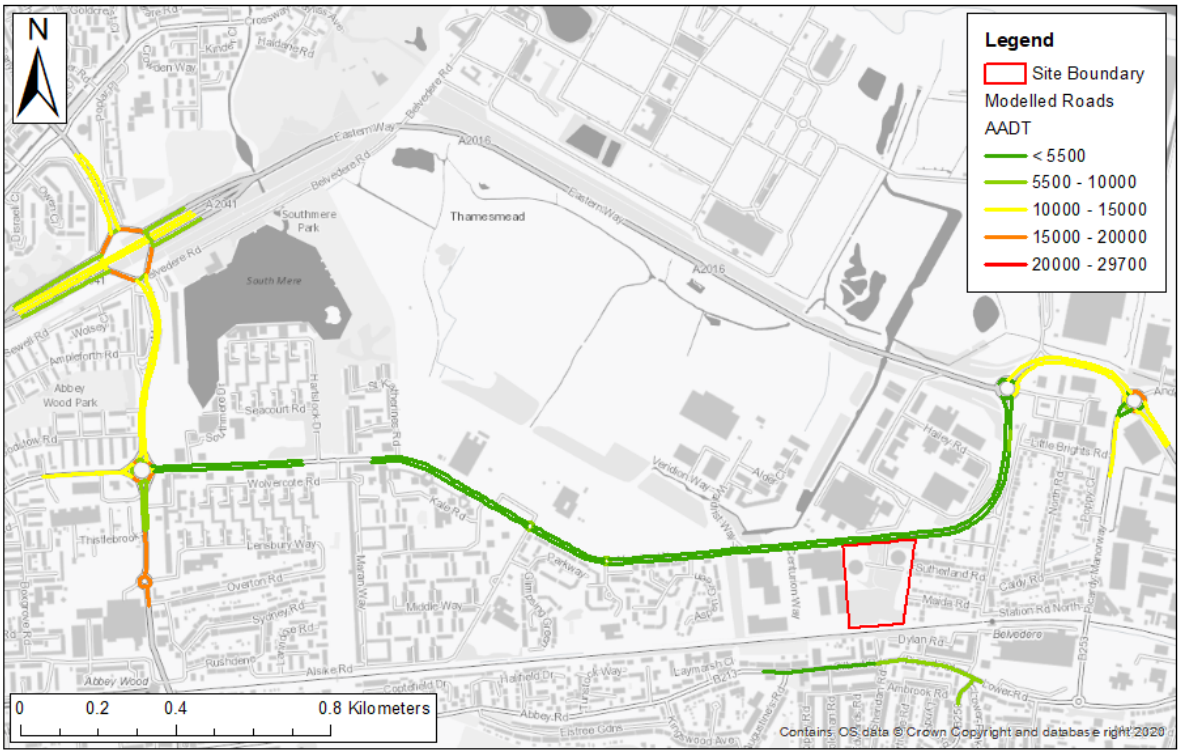

Figure E.2: Modelled Study Area – AADT (2028 'With Scheme' Scenario); Yarnton Way, Harrow Manorway and Picardy Manorway

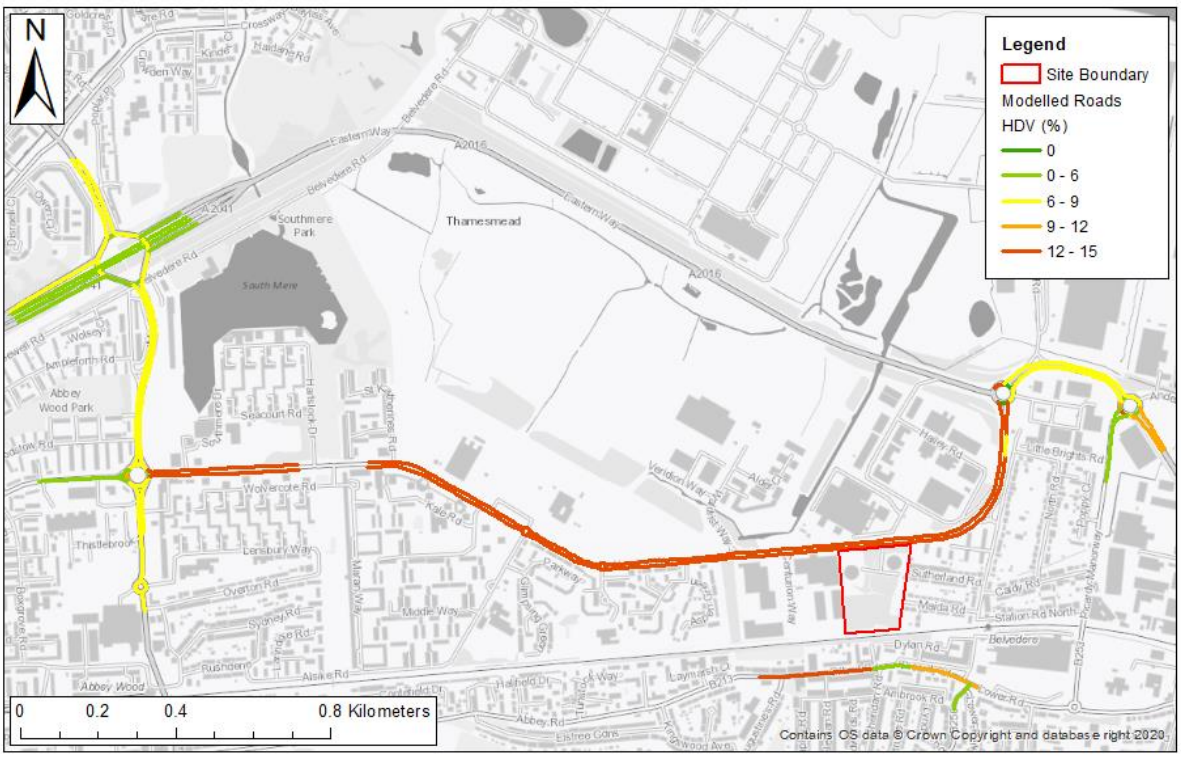

Figure E.3: Modelled Study Area - %HDV (2028 'With Scheme' Scenario); Yarnton Way, Harrow Manorway and Picardy Manorway

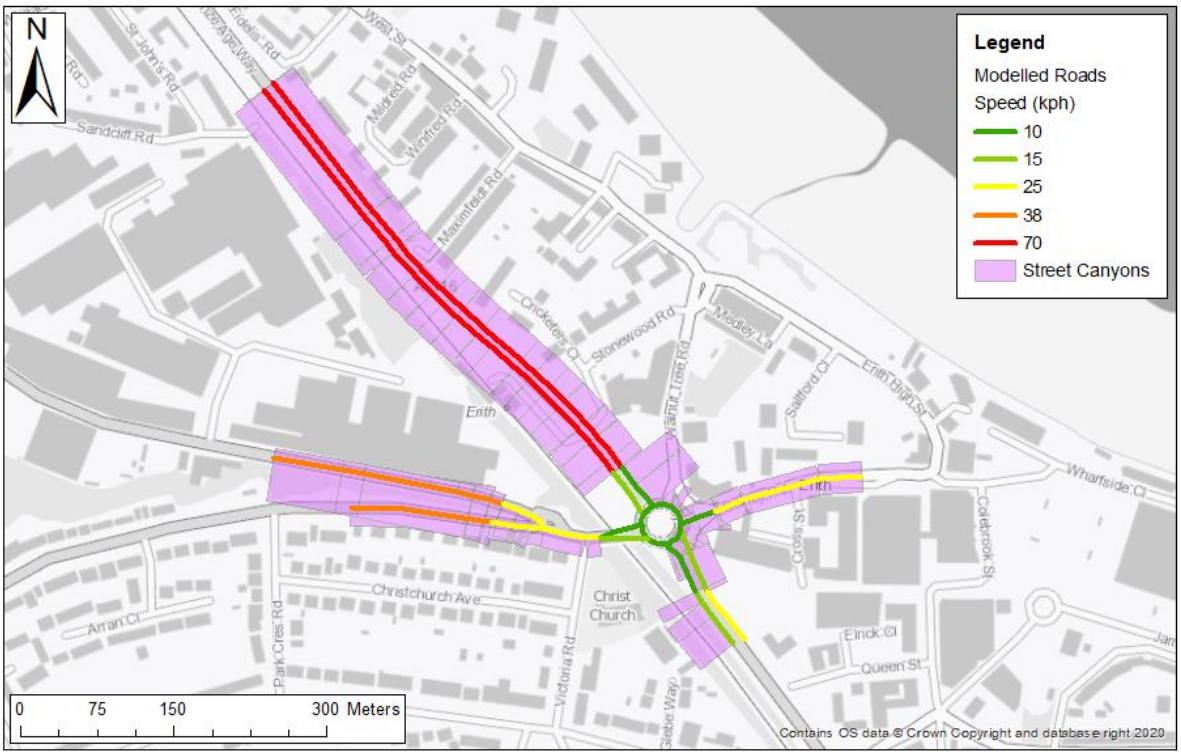

Figure E.4: Modelled Study Area Road Network (inc. Av. Speeds (kph) and Modelled Street Canyons); Bronze Age Way towards Erith Roundabout

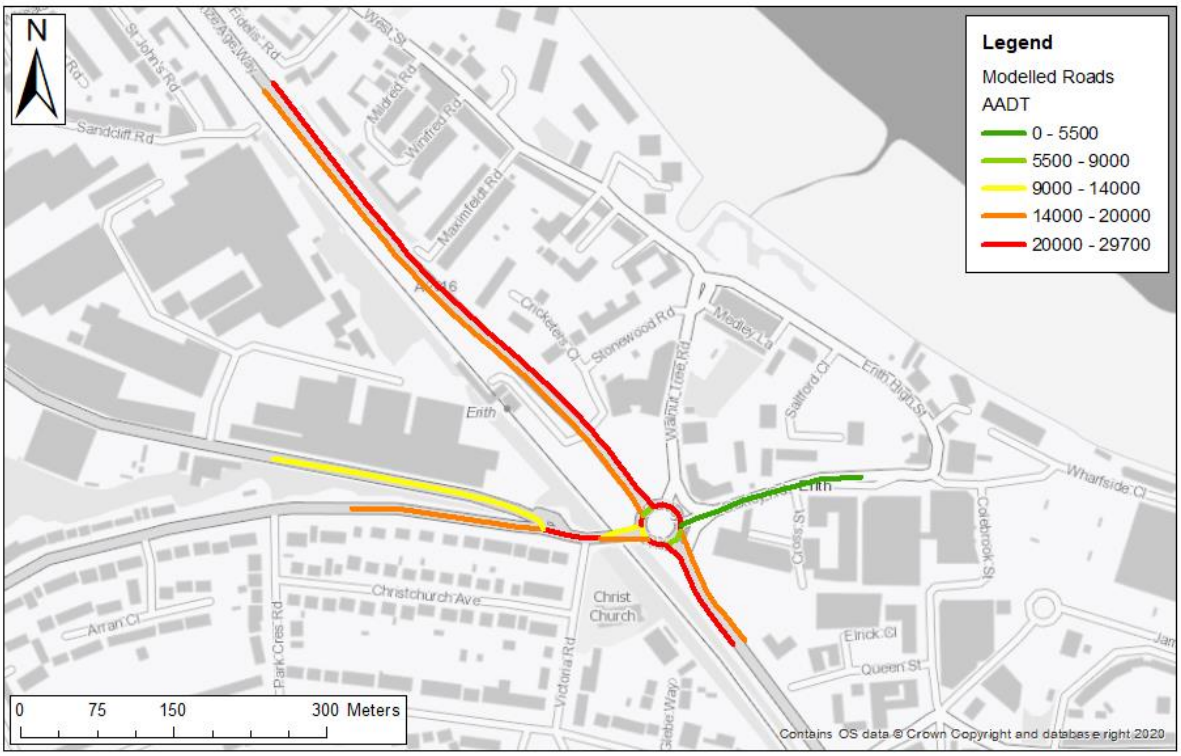

Figure E.5: Modelled Study Area – AADT (2028 'With Scheme' Scenario); Bronze Age Way towards Erith Roundabout

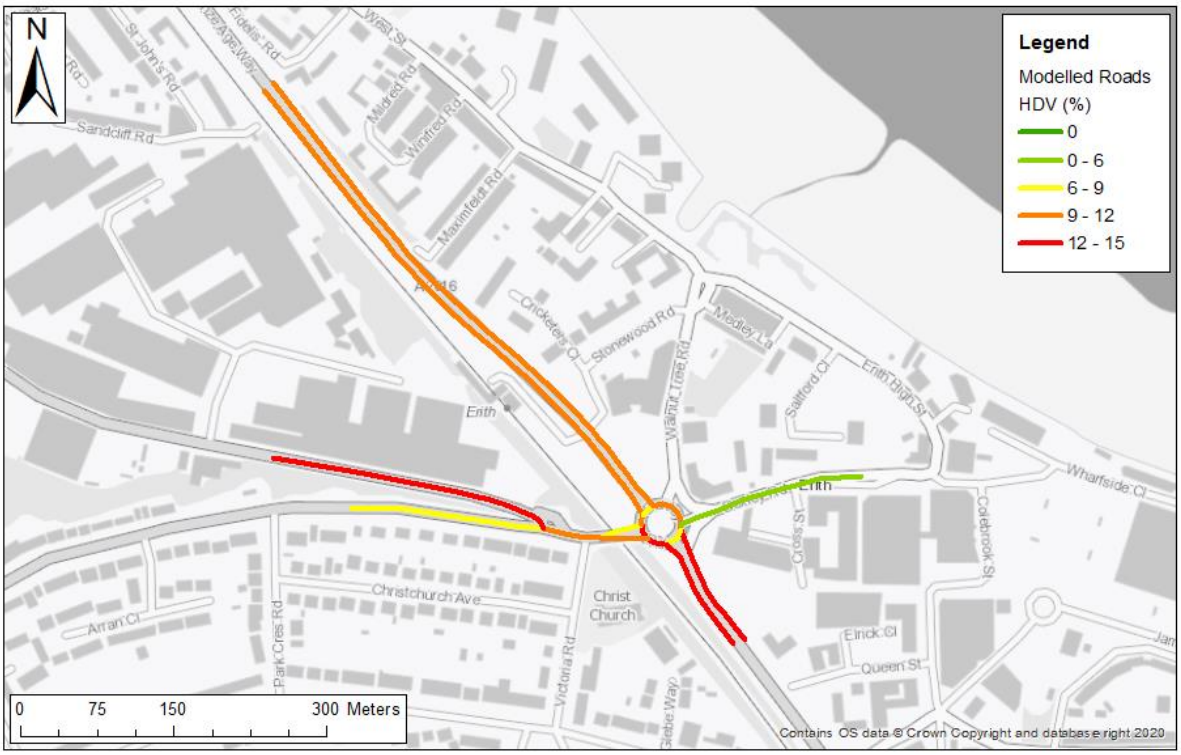

Figure E.6: Modelled Study Area - %HDV (2028 'With Scheme' Scenario); Bronze Age Way towards Erith Roundabout

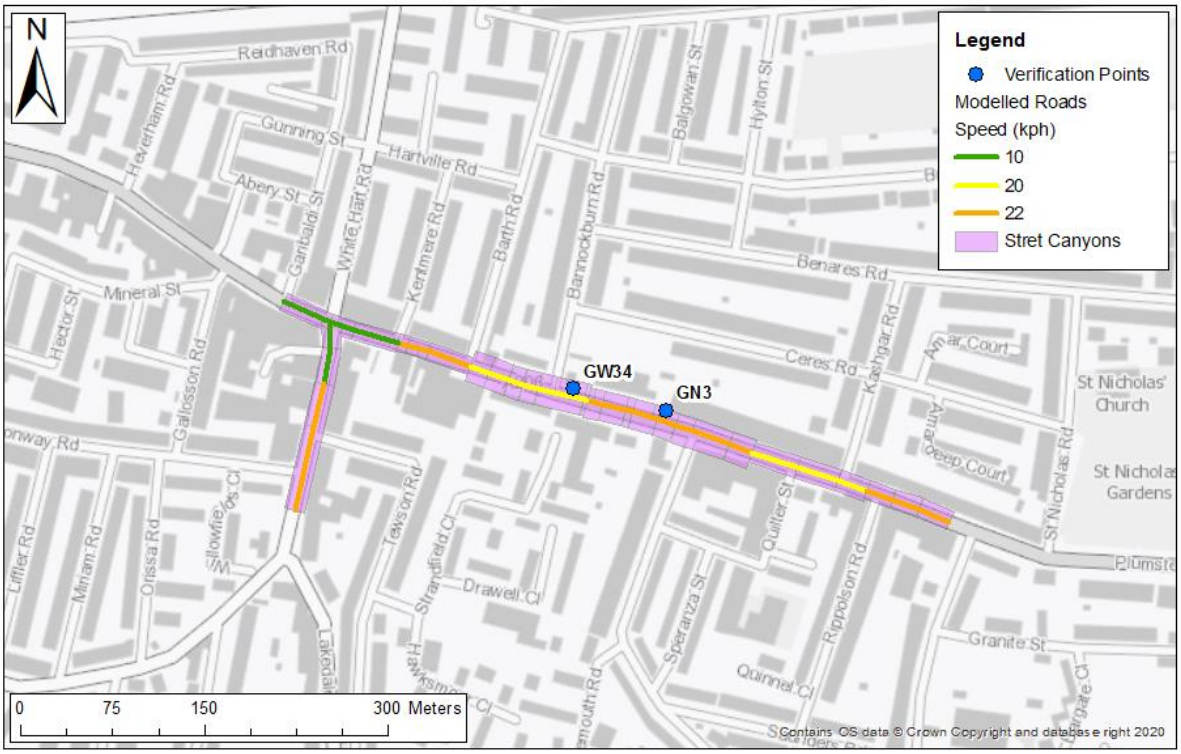

Figure E.7: Modelled Study Area Road Network (inc. Average Speeds (kph) and Modelled Street Canyons); Verification

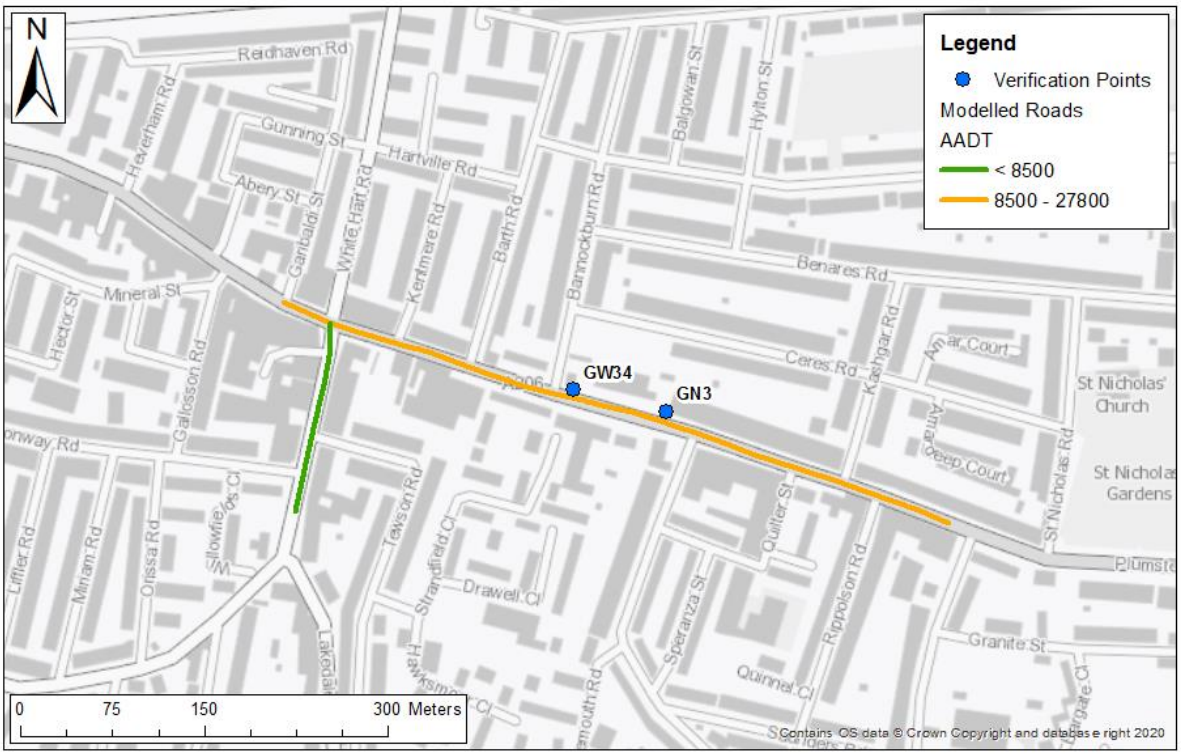

Figure E.8: Modelled Verification Area – AADT (2021); Verification

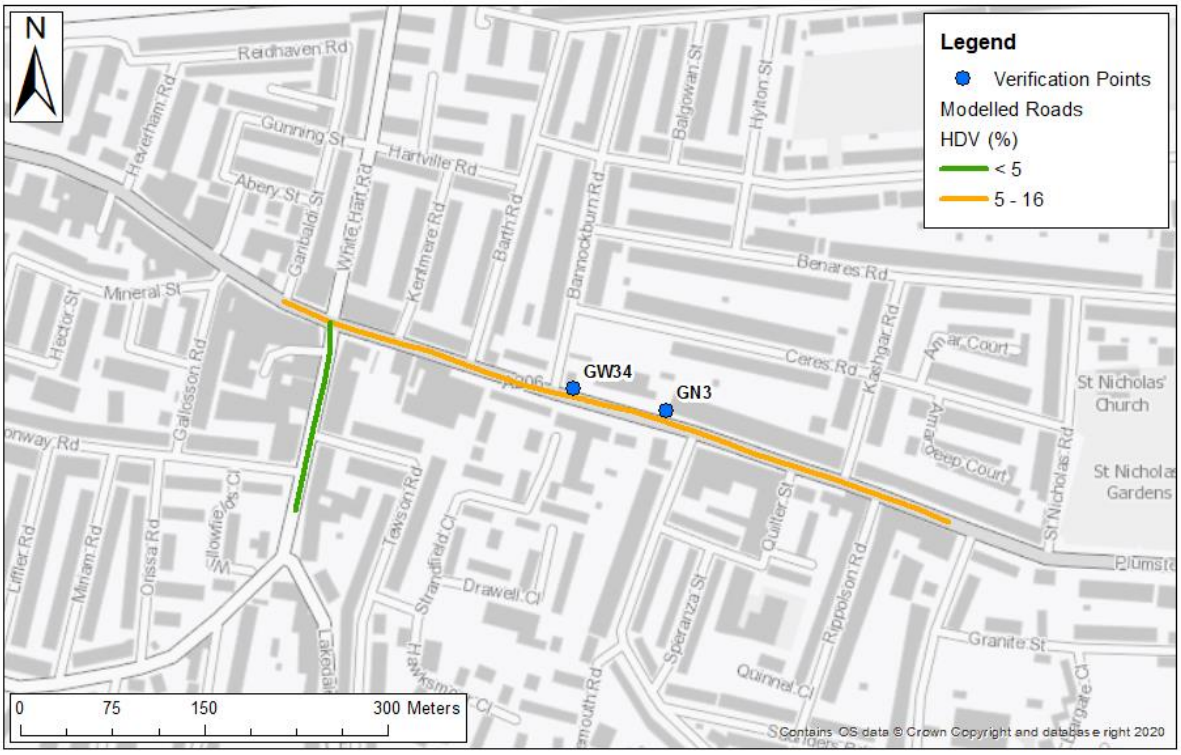

Figure E.9: Modelled Verification Area - %HDV (2021);Verification