AIR QUALITY IMPACT ASSESSMENT

AT: Former Nestle Factory

CLIENT: Britannia Row Productions Ltd

DATE: September 2023

STROMA PROJECT REF: PRO-099298

Please find below the link to the online feedback form:

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1 INTRODUCTION

1.1 Scope

Stroma Built Environment Ltd has been commissioned to undertake an air quality assessment based on the potential impacts of existing and future traffic levels on a proposed development at Nestle Avenue, Borough of Hillingdon, London. The pollutants modelled as part of this assessment are nitrogen oxides (NOx) and particulate matter (PM_{10} and $PM_{2.5}$).

The impacts of vehicle emissions have been assessed using the techniques detailed within the 'LA105 Air Quality' of the Design Manual for Roads and Bridges (DMRB)[1], the Local Air Quality Management Technical Guidance (LAQM.TG22)[2] and the London Local Air Quality Management Technical Guidance (LLAQM, TG19). The impact of road traffic emissions will be assessed using the ADMS-Roads air dispersion model. This model has been devised by Cambridge Environmental Research Consultants (CERC) and is described as a "*comprehensive tool for investigating air pollution problems due to small networks of roads*".

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

An assessment on the potential impact on local air quality from demolition and construction activities at the site has not been undertaken due to all building work being undertaken is contained within an already existing building.

An Air Quality Neutral assessment for transport emissions has been undertaken in accordance with the London Plan and revised February 2023 Air Quality Neutral guidance.

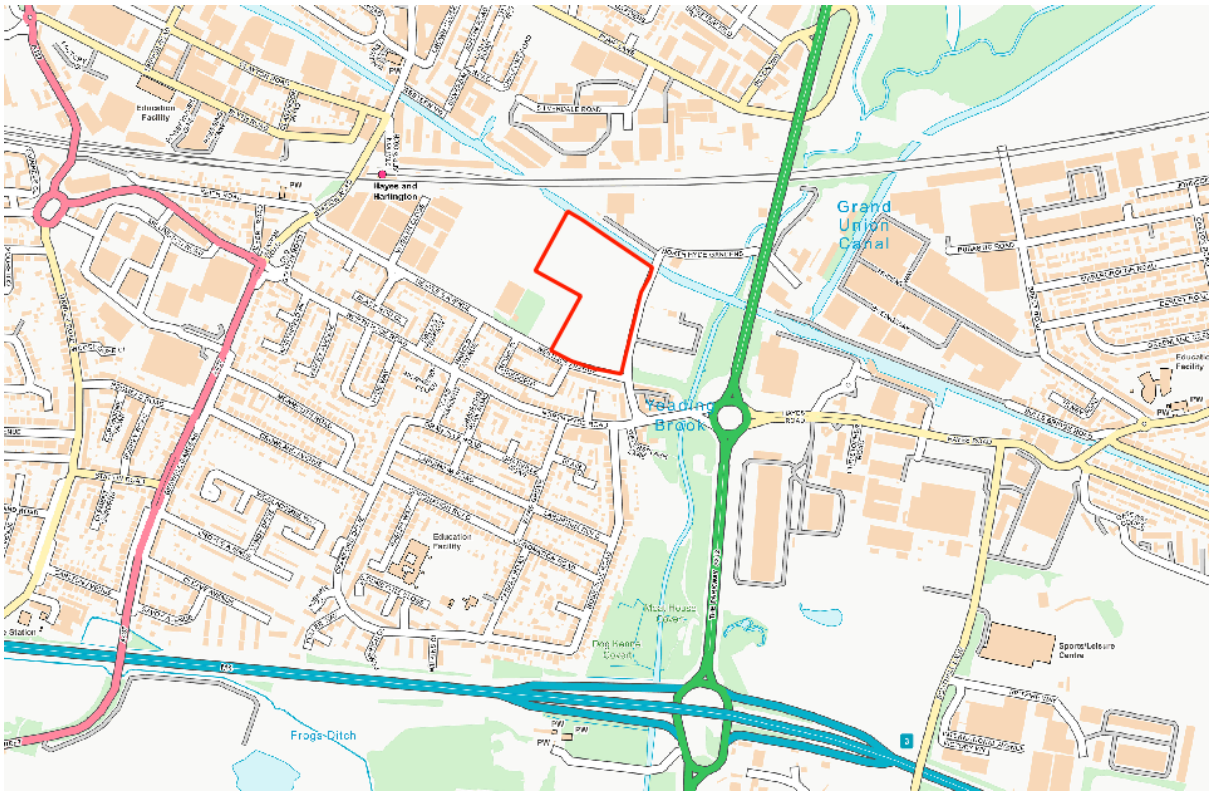
1.2 Site Description

The proposed development site is located at Nestle Avenue in the London Borough of Hillingdon. The proposed development is for a new mezzanine.

A location plan can be found in Figure 1.

[1] Design Manual for Roads and Bridges, Sustainability & Environment Appraisal LA 105 Air Quality
[2] Part IV of the Environment Act 2021, Local Air Quality Management Technical Guidance (TG22), Defra, August 2022

Figure 1 – Site Location Plan



2 POLLUTANTS & LEGISLATION

2.1 Pollutant Overview

In most urban areas of the UK, traffic generated pollutants have become the most common pollutants. These are nitrogen dioxide (NO_2), fine particulates (PM_{10}), carbon monoxide (CO), 1,3-butadiene and benzene, as well as carbon dioxide (CO_2). This air quality assessment focuses on NO_2 and PM_{10}, as these pollutants are least likely to meet their Air Quality Strategy objectives near roads. Table 1 provides an overview of NO_2 and PM_{10}.

Table 1 – Overview of NO_2 and PM_{10}

Pollutant	Properties	Anthropogenic Sources	Natural Sources	Potential Effects
Particles (PM_{10})	Tiny particulates of solid or liquid nature suspended in the air	Road transport; Power generation plants; Production processes e.g. windblown dust	Soil erosion; Volcanoes; Forest fires; Sea salt crystals	Asthma; Lung cancer; Cardiovascular problems
Nitrogen Dioxide (NO_2)	Reddish-brown coloured gas with a distinct odour	Road transport; Power generation plants; Fossil fuels – extraction & distribution; Petroleum refining	No natural sources, although nitric oxide (NO) can form in soils	Pulmonary edema; Various environmental impacts e.g. acid rain

2.2 Air Quality Strategy

The UK Government and the devolved administrations published the latest Air Quality Strategy for England on 28 April 2023[3]. The Strategy provides an over-arching strategic framework for air quality management in the UK.

With regards to this assessment, the Air Quality Strategy contains national air quality standards and objectives established by the Government to protect human health. The objectives for nitrogen dioxide and particulates (PM_{10} and $PM_{2.5}$) have been set, along with seven other pollutants (benzene, 1,3-butadiene, carbon monoxide, lead, PAHs, sulphur dioxide and ozone). Those which are limit values required by EU Daughter Directives on Air Quality have been transposed into UK law through the Air Quality Standards Regulations 2016 which came into force on 31st December 2016. Table 2 provides the UK Air Quality Objectives for NO_2 and PM_{10}. Table 2 provides the UK Air Quality Objectives for NO_2 and PM_{10}.

Table 2 – UK Air Quality Objectives for Nitrogen Dioxide and Particulate Matter

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

[3] Air Quality Strategy: framework for local authority, 28 April 2023

Objectives for $PM_{2.5}$ were also introduced by the UK Government and the Devolved Administrations in 2010. However, these are not included in Regulations as the Air Quality Strategy has adopted an "exposure reduction" approach for $PM_{2.5}$ in order to seek a more efficient way of achieving further reductions in the health effects of air pollution by providing a driver to improve air quality everywhere in the UK rather than just in a small number of localised hotspot areas.

2.3 London Local Air Quality Management (LLAQM)

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

2.3.1 London Borough of Hillingdon

The Council has declared an Air Quality Management Area (AQMA) for exceedances of the annual mean objective for Nitrogen Dioxide NO_2. As per the government website, the AQMA covers 'from the southern boundary north to the border defined by, the A40 corridor from the western borough boundary, east to the intersection with the Yeading Brook north until its intersection with the Chiltern-Marylebone railway line' and as such the proposed development lies within AQMA.

There are currently 160 Air Quality Focus areas which have been declared across the 33 London Boroughs. The proposed development lies within a focus area.

3 PLANNING POLICY & GUIDANCE

3.1 National Planning Policy & Guidance

3.1.1 National Planning Policy Framework

On a national level, air quality can be a material consideration in planning decisions. The National Planning Policy Framework (NPPF)[4] for England, revised and released on 20th July 2021, is considered a key part of the Governments reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth. The NPPF replaces the Planning Policy Statement 23 (PPS23) Planning and Pollution Control[5].

Paragraph 174 within the NPPF states that "planning policies and decisions should contribute to and enhance the natural and local environment" and that developments "should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans"

It goes on to state in paragraph 186 that "planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan".

3.1.2 Planning Practise Guidance (PPG)

As defined within section 2, the UK Government has legally binding limits for concentrations of outdoor air pollutants. Development of any size can influence air quality through the construction and in use phases. The PPG for air quality outlines the considerations for developments in relation to air quality and the scenarios to be considered where appropriate.

Furthermore the PPG outlines that any assessment needs to be "proportionate to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions". Once these considerations and assessments have been undertaken, mitigation which is specific to the locality should be agreed between the planning authority and developer "to ensure new development is appropriate for its location and unacceptable risks are prevented".

[4] National Planning Policy Framework, Secretary of State for Ministry of Housing, Communities and Local Government, February 2019

[5] Planning Policy Statement 23: Planning and Pollution Control, Office of the Deputy Prime Minister (ODPM), November 2004

3.1.3 Land-Use Planning & Development Control

In January 2017, Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) produced guidance to ensure that air quality is adequately considered in the land-use planning and development control processes[6].

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

[6] Land-Use Planning & Development Control: Planning for Air Quality. Guidance from Environmental Protection UK and the Institute of Air Quality Management for the consideration of air quality within the land-use planning and development control processes. EPUK & IAQM. January 2017

3.2 Regional Planning Policy

3.2.1 The Mayor's Air Quality Strategy

In December 2010, the Mayor's Air Quality Strategy[7] was released. The strategy sets out a framework for delivering improvements to London's air quality and includes measures aimed at reducing emissions from transport, homes, offices and new developments, as well as raising awareness of air quality issues and its impact on health. The Mayor of London Plan is also supported by detailed Supplementary Planning Guidance (SPGs) and has been used to inform the assessment.

3.2.2 The New London Plan

The New London Plan was adopted by the Greater London Authority in March 2021 with the aim of providing a strategic plan for London, setting out an integrated economic, environmental, transport and social framework for the development of London over the next 20–25 years. The Plan brings together the geographic and locational aspects of the Mayor's other strategies, including a range of environmental issues such as climate change (adaptation and mitigation), air quality, noise and waste.

Policy SI1 Improving Air Quality relates specifically to improving air quality and states the following:

"Poor air quality is a major issue for London which is failing to meet requirements under legislation. Poor air quality has direct impacts on the health, quality of life and life expectancy of Londoners. The impacts tend to be most heavily felt in some of London's most deprived neighbourhoods, and by people who are most vulnerable to the impacts. London's air quality should be significantly improved and exposure to poor air quality, especially for vulnerable people, should be reduced."

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

1. Development proposals should not:
    a. lead to further deterioration of existing poor air quality
    b. create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits
    c. create unacceptable risk of high levels of exposure to poor air quality.
2. In order to meet the requirements in Part 1, as a minimum:
    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
    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, which do not demonstrate that design measures have been used to minimise exposure should be refused.

[7] Clearing the Air: The Mayor's Air Quality Strategy. December 2010

3.2.3 Supplementary Planning Guidance (SPG)

Control of Dust and Emissions during Construction and Demolition SPG

The Greater London Authority (GLA) released the "Control of Dust and Emissions during Construction and Demolition" SPG in July 2014[8]. The guidance seeks to reduce emissions of dust and PM_{10} from construction and demolition activities in London. It also aims to manage emissions of nitrogen oxides (NOx) from construction and demolition machinery. The SPG:

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

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

Sustainable Design and Construction SPG

The Greater London Authority (GLA) released the "Sustainable Design and Construction" SPG in July 2014[9]. The SPG aims to support developers, local planning authorities and neighbourhoods to achieve sustainable development. It provides guidance on to how to achieve the London Plan objectives effectively, supporting the Mayor's aims for growth, including the delivery of housing and infrastructure.

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

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

[8] The Control of Dust and Emissions during Construction and Demolition SPG. Greater London Authority, July 2014

[9] Sustainable Design and Construction SPG. Greater London Authority, July 2014

4 ASSESSMENT METHODOLOGY

4.1 Operational Phase (Traffic Emissions)

4.1.1 Modelled Scenarios

A modelled baseline year of 2019 has been used as this corresponds with the latest year of monitoring undertaken by the Council. The future year has also been chosen (2024) representing the first full year with the proposed development in place. Three scenarios have been adopted as part of the assessment. These are as follows:

- **Scenario 1** – existing levels of air quality / model verification (2019); and
- **Scenario 2** – future impact of traffic emissions on the proposed development i.e. introduction of new exposure (2024)
- **Scenario 3** – 2024 Future Baseline + Proposed Development

Predicted concentrations will be compared to the Air Quality Strategy objectives. Background pollutant concentrations and vehicle emission rates for all modelled years are based on the latest data issued by Defra. These background concentrations and emission factors are discussed further in the following sections.

4.1.2 ADMS-Roads

Modelling the impact of traffic emissions on the proposed development will be undertaken using the latest version of the ADMS-Roads model[10]. ADMS-Roads is significantly more advanced than that of most other air dispersion models in that it incorporates the latest understanding of the boundary layer structure, and goes beyond the simplistic Pasquill-Gifford stability categories method with explicit calculation of important parameters. The model uses advanced algorithms for the height-dependence of wind speed, turbulence and stability to produce improved predictions.

4.1.3 Emission Factors

Defra and the Devolved Administrations have provided an updated Emission Factors Toolkit (Version 11.0) which incorporates updated NOx emissions factors and vehicle fleet information[11]. These emission factors have been integrated into the latest ADMS-Roads modelling software. However, in order to undertake a worst-case assessment emission factors for 2019 have been used for all modelled years.

4.1.4 Traffic Data

Baseline flows along the local roads are available from the LAEI. Baseline (2019) data from the DfT has been projected to 2024. Projection of traffic data has been undertaken using growth factors specific to the local authority, obtained from TEMPro[12]. The projected flow rates are provided in Table 3. It is assumed that the percentage HDV and speed will remain unchanged in future years. AADT figures for Nestle's Avenue and North Hyde Gardens has been assumed as no data was readily available.

Where a link approaches a junction a speed of 20 kmph has been modelled in order to represent queuing traffic at a junction. This is the approach recommended by LLAQM.

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[10] Model Version: 5.0.01. Interface Version 5.0.0.5313 (16/03/2020)
[11] https://laqm.defra.gov.uk/documents/EFT2020_v11.0.xlsb
[12] TEMPro (Trip End Model Presentation Program) version 7. Department for Transport

Table 3 – Annual Average Daily Traffic Flows, Percentage HDV and Speeds for Modelled Roads

Link Name	Baseline AADT 2019	Future Baseline AADT 2024	Future Baseline + Development 2024	HDV (%)	Speed (kmph)
The Parkway N	35,658	37,179	37,179	4.87	68
The Parkway S	33,206	34,622	34,622	4.95	64
North Hyde Road	17,982	18,749	18,809	4.92	24
Nestle's Avenue	1,000	1,043	1,043	0	48
North Hyde Gardens	500	521	641	0	48

4.2 Background Concentrations

Background NOx, NO_2 and PM_{10} concentrations have been obtained from Defra[13]. These 1 km x 1 km grid resolution maps are derived from a base year of 2018 (for NOx, NO_2, PM_{10} and $PM_{2.5}$ only), which are then projected to future years up to 2030. Background concentrations of NO_2, PM_{10} and $PM_{2.5}$ derived from Defra are provided in Table 4.

Table 4 – Background NOx, NO_2, PM_{10} and $PM_{2.5}$ Concentrations

Location	Pollutant	X	Y	2019
Proposed Development	NO_2	510500	179500	28.2
	NOx			44.8
	PM_{10}			17.4
	$PM_{2.5}$			11.6

In order to undertake a worst-case assessment, 2019 background concentrations have been assumed for all modelled scenarios.

4.3 Surface Roughness

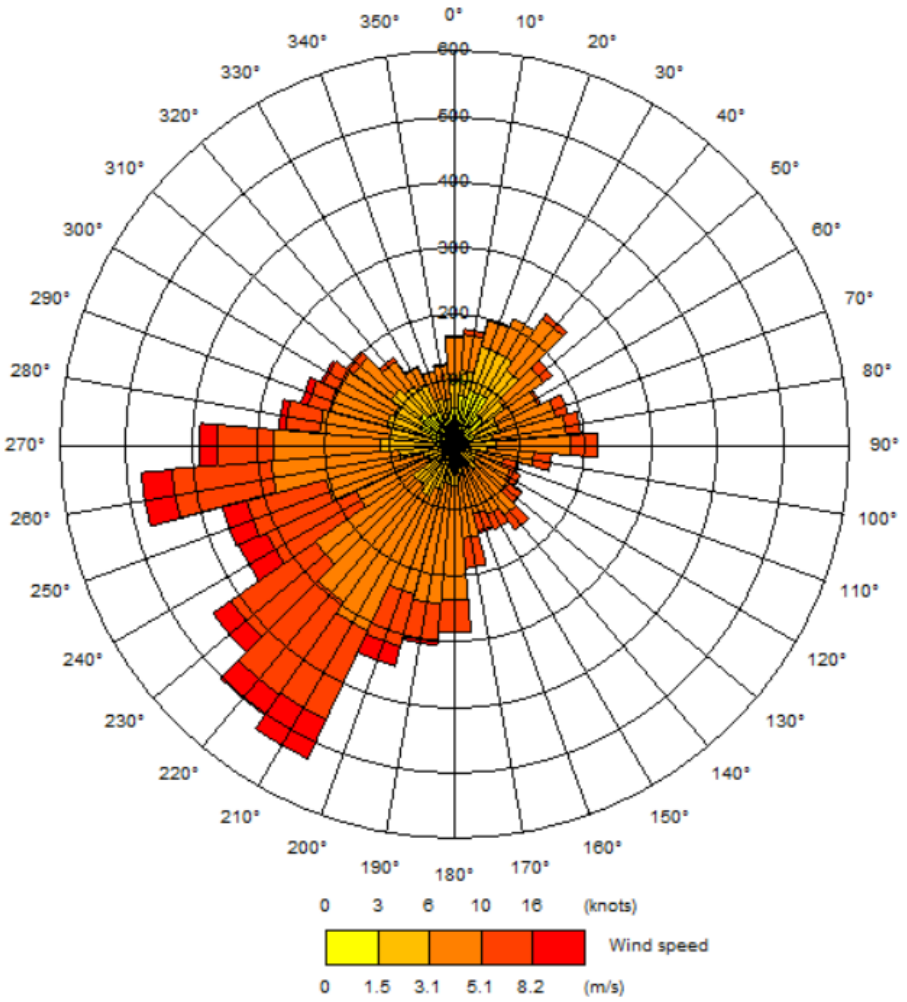
A surface roughness of 1.5 metres has been used in the model. This value is provided by ADMS-Roads as a typical roughness length for large urban areas. This value has been used across the modelled domain.

4.4 Meteorological Data

Hourly sequential meteorological data from the Heathrow Airport meteorological station has been used. Wind speed and direction data from the Heathrow Airport meteorological station has been plotted as a wind rose in Figure 2.

[13] https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018

Figure 2 – Wind Speed and Direction Data, Heathrow Airport (2019)



4.5 Model Output

4.5.1 NOx/NO_2 Relationship

Following recent evidence that shows the proportion of primary NO_2 in vehicle exhaust has increased[14]. As such, a new NOx to NO_2 calculator has been devised[15]. This new calculator has been used to determine NO_2 concentrations for this assessment, based on predicted NOx concentrations using ADMS-Roads. Converted NO_2 concentrations are initially compared to local monitoring data in order to verify the model output. If the model performance is considered unacceptable then the NOx concentrations are adjusted before conversion to NO_2.

4.5.2 Predicted Short Term Concentrations

As discussed in the introduction, it has not been possible to model the short-term impacts of NO_2 and PM_{10}. Research undertaken in 2003[16] has indicated that the hourly NO_2 objective is unlikely to be exceeded at a roadside location where the annual mean NO_2 concentration is less than 60 µg/m^3.

[14] Trends in Primary Nitrogen Dioxide in the UK, Air Quality Expert Group, 2007
[15] https://laqm.defra.gov.uk/documents/NOx_to_NO2_Calculator_v8.1.xlsm
[16] Analysis of Relationship between 1-Hour and Annual Mean Nitrogen Dioxide at UK Roadside and Kerbside Monitoring Sites, Laxen and Marner, 2003

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

- No. 24-hour mean exceedances = -18.5 + 0.00145 x annual mean^3 + (206/annual mean)

This relationship has been applied to the modelled annual mean concentrations in order to estimate the number of 24-hourly exceedances.

4.5.3 Model Verification

The monitoring sites listed in Table 5 has been used for the purposes of model verification. These are the closest monitoring sites to the proposed development.

Table 5 – Modelled Verification Locations

ID	Site Location	X	Y	Height (m)
HILL07	Harold Avenue	509918	179015	1.5
HILL18	Blyth Road	509108	179820	1.5
HILL26	R/O 130 Cleave Avenue	509499	178370	1.5
HILL28	Blyth Road	509328	179603	1.5

4.5.4 Receptor Locations

In order to assess the potential impact of the proposed development, the perimeter of the proposed development has been modelled. The location of these model points, together with their height above ground level is provided in Table 6 and represented in Figure 3. Existing receptors are shown in Figure 4.

Table 6 – Modelled Receptor Locations

Development Receptors			
Air Quality Assessment ID	**X**	**Y**	**Height (m)**
D1	510138	179050	1.5
D2	510223	179004	1.5
D3	510263	179051	1.5
D4	510170	179108	1.5
D5	510281	179106	1.5
D6	510330	179203	1.5
D7	510290	179214	1.5
D8	510243	179128	1.5
D9	510203	179270	1.5
D10	510150	179308	1.5
D11	510094	179206	1.5
D12	510152	179174	1.5
Existing Receptors			
E1	510063	179040	1.5
E2	510137	179002	1.5
E3	510196	178978	1.5
E4	510281	178956	1.5
E5	510288	178913	1.5

E6	510290	178880	1.5
E7	510214	178880	1.5
E8	510119	178900	1.5
E9	510042	178927	1.5
E10	509982	178959	1.5

Figure 3 – Ground floor modelled receptor locations

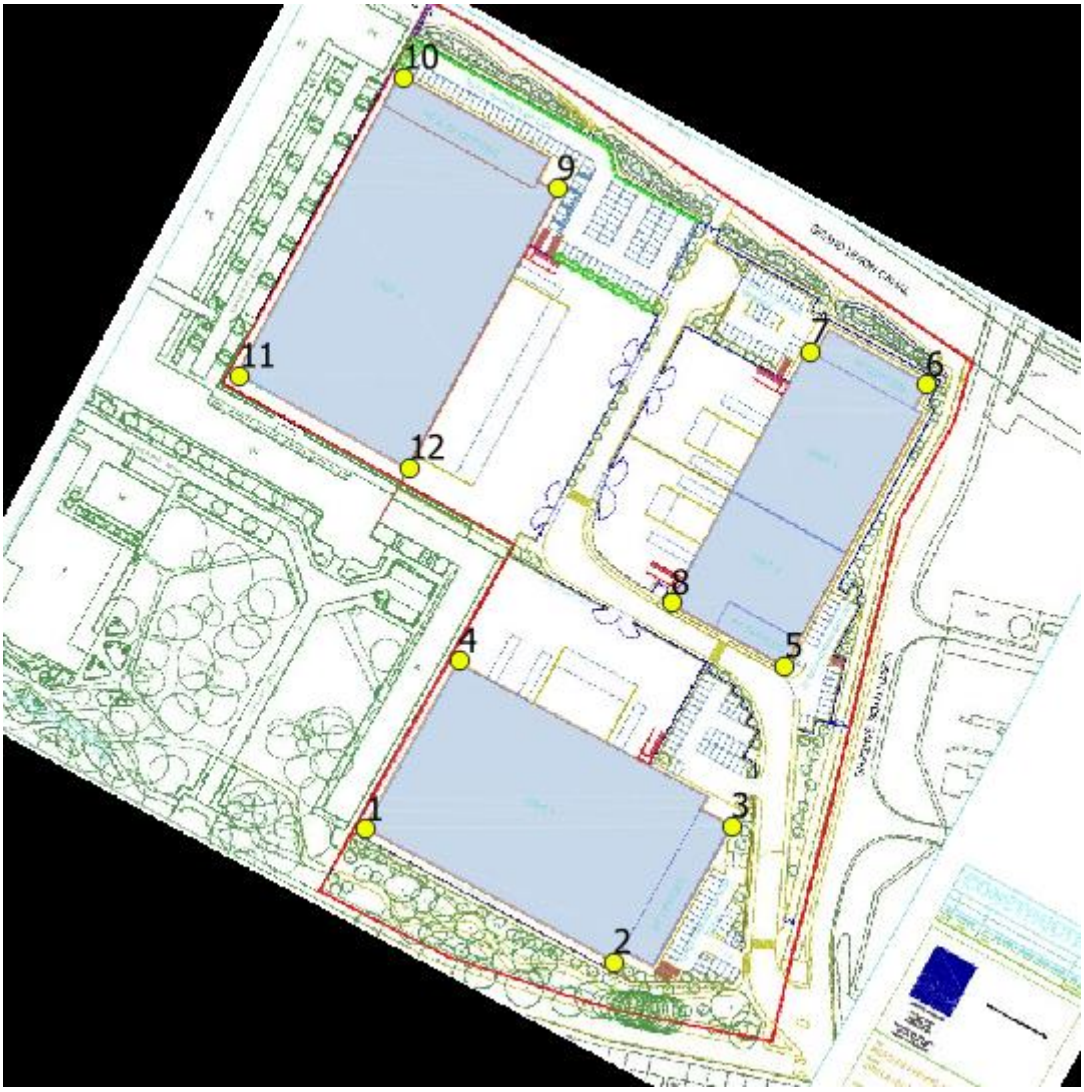
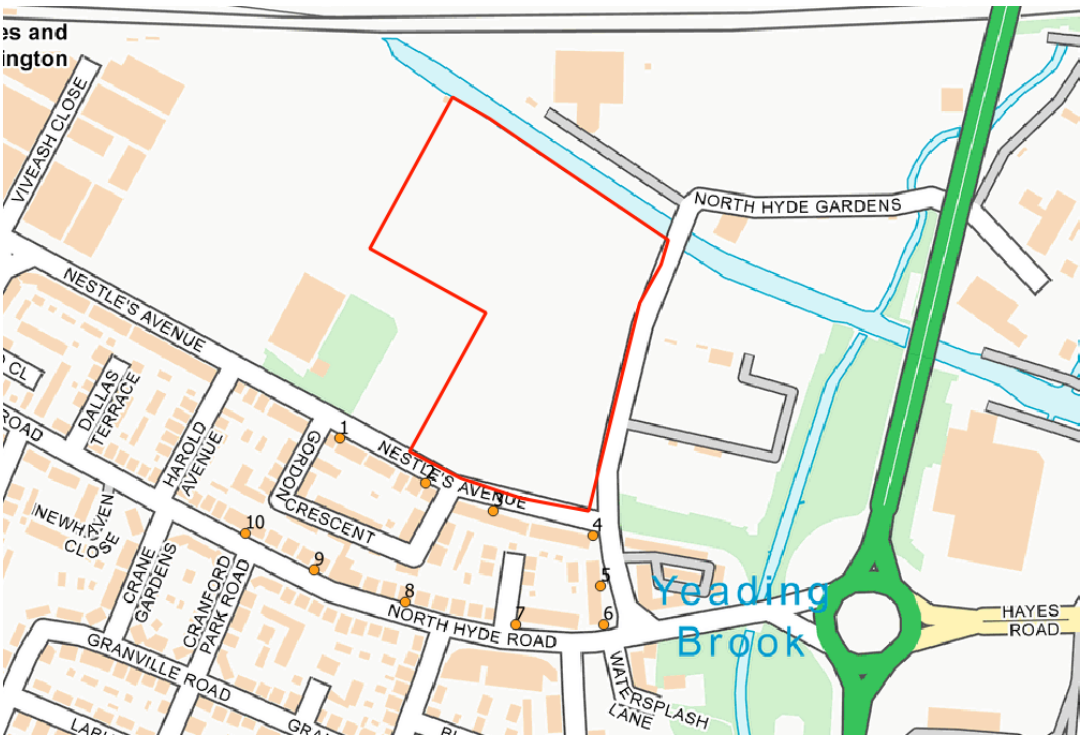


Figure 4 – Existing Receptor Locations



4.6 Ecological Receptors

The nearest ecological receptor lies approximately 2.5km to the south of the development. This is the Cranebank nature reserve but is deemed too far away to be adversely impacted by the development.

4.7 Significance Criteria

4.7.1 Operational Phase

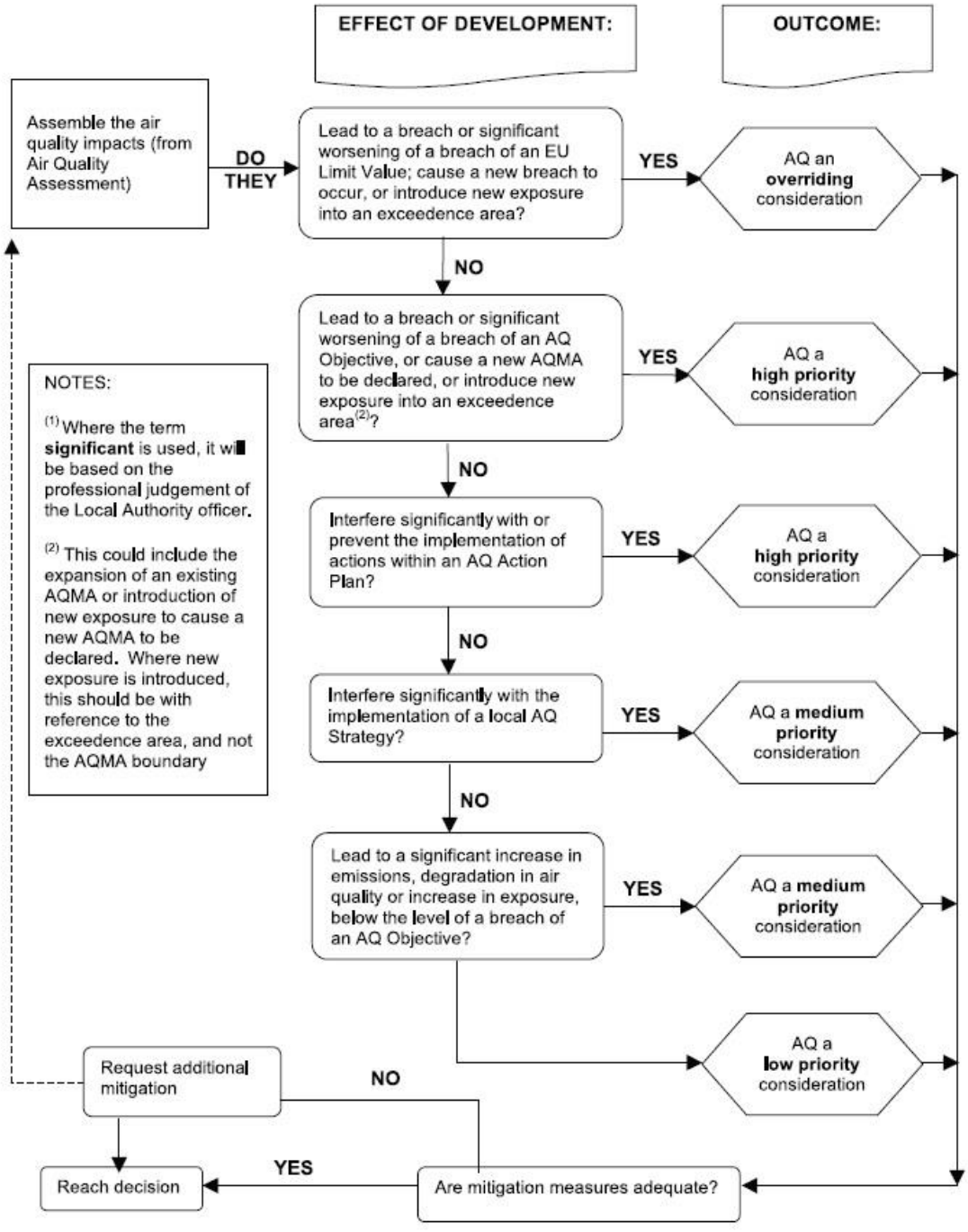
The guidance released by Environmental Protection UK (EPUK) provides steps for a Local Authority to follow in order to assess the significance of air quality impacts of a development proposal. This procedure, shown in Figure 5, will be applied to the modelled results.

The joint guidance released by EPUK and the IAQM provides impact descriptors for individual receptors. These descriptors are provided in Table 7.

Table 7 – Impact Descriptors for Individual Receptors

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

Figure 5 – Assessing the Significance of Air Quality Impacts of a Development Proposal



5 AIR QUALITY ASSESSMENT

5.1 Impact of Vehicle Emissions

5.1.1 Model Verification

Using the guidance provided within the London Local Air Quality Management Technical Guidance TG(19), the modelled output has been verified against the monitoring data obtained from the site listed in Table 8. The following tables provide a summary of the model verification process for NOx/NO_2 and PM_{10} concentrations.

Table 8 – Comparison of Modelled and Monitored NO_2 Concentrations (µg/m^3)

Verification Location	Modelled Concentration	Monitored Concentration	Difference [(modelled - monitored)/ monitored] x100
HILL07	31.1	36.9	-15.7%
HILL18	29.4	37.4	-21.3%
HILL26	44.4	42.2	5.2%
HILL28	29.7	31.7	-6.4%

As described in the Technical Guidance (LLAQM.TG19), in order to provide more confidence in the model predictions and the decisions based on these, the majority of results should be within ±25% (ideally ±10%) of the monitored concentrations. In order to improve the confidence in modelled concentrations across the modelled domain the model output has been adjusted. This is described further in the next section.

5.1.2 Model Adjustment

In order to undertake model adjustment, it is first necessary to derive the monitored and modelled road contributions of NOx (excluding background). The modelled road contribution NOx is taken directly from the ADMS-Roads output before it has been converted to NO_2 using the NOx to NO_2 calculator described in Section 4.6.1. The NOx to NO_2 calculator can also be used to derive monitored road contributions of NOx from NO_2 diffusion tube results. A summary of these calculations is provided in Table 9.

Table 9 – Monitored NOx and NO_2 concentrations

Verification Location	Monitored Total NO_2	Defra Background NO_2	Monitored road contribution NO_2 (total – background)	Monitored road contribution NOx (total – background)	Modelled road contribution NOx (excludes background)	Ratio of monitored road contribution NOx / modelled road contribution NOx
HILL07	36.9	26.8	10.1	22.0	9.1	2.43
HILL18	37.4	26.8	10.6	23.2	5.5	4.20
HILL26	42.2	29.8	12.4	27.7	33.1	0.84
HILL28	31.7	26.8	4.9	10.4	6.1	1.71

Once the monitored and modelled road contributions of NOx (excluding background) have been derived the contributions of NOx are compared and a ratio derived. In this case it is 1.051 and is used to adjust the modelled road contribution of NOx. This is shown in Table 10.

Figure 6 – Linear Regression of Modelled and Monitored NO_2

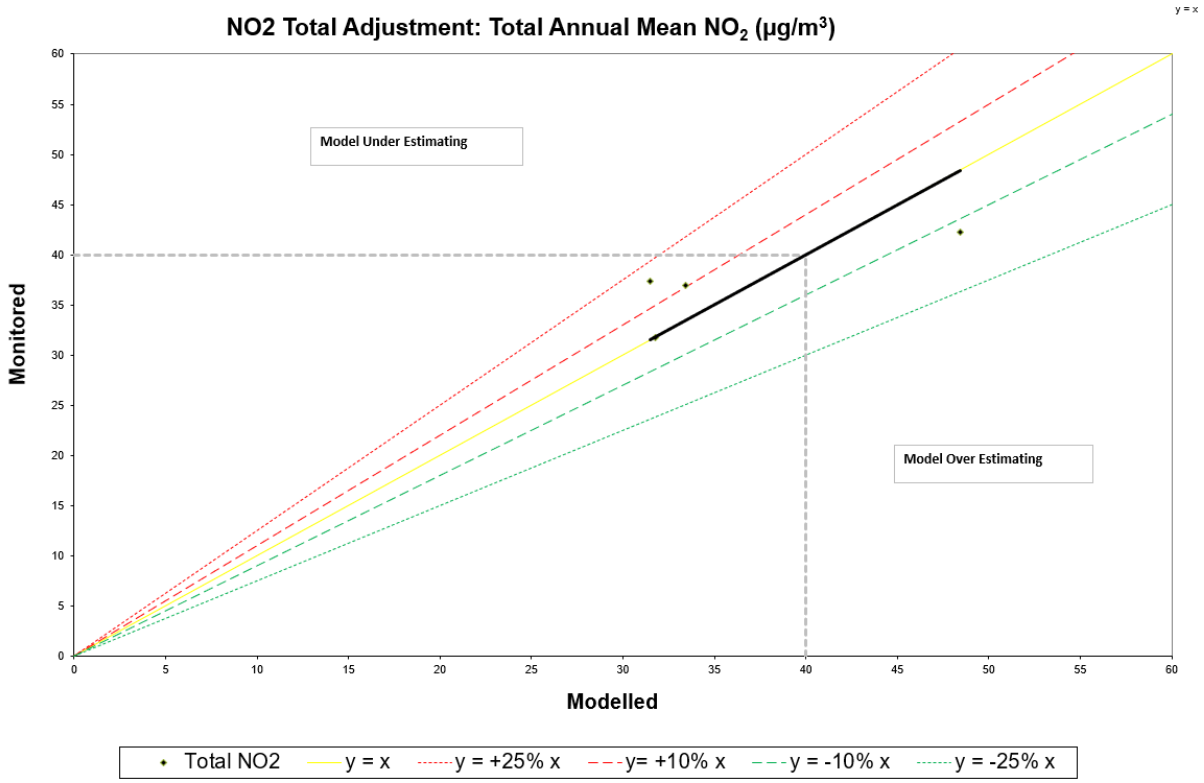


Table 10 – Adjustment of Modelled NOx Contributions

Verification Location	Adjustment factor for modelled road contribution	Adjusted modelled road contribution NOx	Modelled total NO_2 (based on empirical NOx/NO_2 relationship)	Monitored total NO_2	% Difference [(modelled – monitored) / monitored] x 100
HILL07	1.051	9.5	31.3	36.9	-15.2%
HILL18	1.051	5.8	29.6	37.4	-21.0%
HILL26	1.051	34.8	45.1	42.2	6.8%
HILL28	1.051	6.4	29.8	31.7	-5.9%

Following adjustment of the modelled NOx concentrations by a factor of 1.051 the total NO_2 concentration at the model verification location has been calculated using the method described in Section 4.6.1. The revised NO_2 concentration, shown in Table 10, indicates a more acceptable model performance when compared against the monitored NO_2 concentrations. As such, an adjustment factor of 1.051 has been applied to all modelled NOx concentrations across the model domain before conversion to NO_2.

5.1.3 Nitrogen Dioxide

Predicted annual mean concentrations for NO_2 at the proposed development in 2019 and 2024 are provided in Table 11. As mentioned in Section 4.6.1, NO_2 concentrations have been calculated from the predicted NOx concentrations using the latest NOx-NO_2 conversion spreadsheet available from the Air Quality Archive.

Table 11 – Comparison of Predicted Annual Mean NO_2 Concentrations (µg/m^3)

Ground floor receptors (1.5m)				
Receptor ID	**Baseline (2019)**	**Future Baseline (2024)**	**Future Baseline + Development (2024)**	**Above/ Below AQO**
D1	31.2	31.3	31.3	Below
D2	31.7	31.8	31.8	Below
D3	31.4	31.5	31.6	Below
D4	30.9	31.0	31.0	Below
D5	31.2	31.3	31.3	Below
D6	31.1	31.2	31.2	Below
D7	30.9	31.0	31.0	Below
D8	31.0	31.1	31.1	Below
D9	30.5	30.5	30.5	Below
D10	30.3	30.4	30.4	Below
D11	30.5	30.6	30.6	Below
D12	30.6	30.7	30.7	Below

The ADMS predictions for annual mean NO_2 concentrations in 2019 and 2024 indicate that the annual mean objective (40 µg/m^3) would be achieved at the modelled receptor locations on the ground floor. As the ground floor is the closest to the road emission sources, this would be the most polluted area of the development and as such, no further modelling at the development was undertaken.

Nitrogen dioxide also has an hourly objective of 200 µg/m^3 not to be exceeded more than 18 times in one year. However, the hourly mean concentration has not been calculated directly by ADMS Roads. This is as a result of an evaluation of continuous monitoring data from across the UK that revealed that the relationship between the annual mean and hourly mean NO_2 concentrations was very weak. Nonetheless, research undertaken in 2003[17] has indicated that the hourly NO_2 objective is unlikely to be exceeded at a roadside location where the annual mean NO_2 concentration is less than 60 µg/m^3. Given that predicted NO_2 concentration in 2019 and 2024 are below 60 µg/m^3 at the modelled receptor locations, the likelihood of the short-term objective for NO_2 being exceeded is low.

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

5.1.4 Particulate Matter (PM_{10})

Predicted annual mean concentrations for PM_{10} in 2019 and 2024 are provided in Table 12.

Table 12 – Predicted PM_{10} Concentrations, Annual Mean (µg/m^3)

Ground floor receptors (1.5m)				
Receptor ID	**Baseline (2019)**	**Future Baseline (2024)**	**Future Baseline + Development (2024)**	**Above/ Below AQO**
D1	17.9	17.9	17.9	Below
D2	18.0	18.0	18.0	Below
D3	17.9	17.9	17.9	Below
D4	17.8	17.8	17.8	Below
D5	17.9	17.9	17.9	Below
D6	17.8	17.8	17.8	Below
D7	17.8	17.8	17.8	Below
D8	17.8	17.8	17.8	Below
D9	17.7	17.7	17.7	Below
D10	17.7	17.7	17.7	Below
D11	17.7	17.8	17.8	Below
D12	17.8	17.8	17.8	Below

The ADMS predictions for annual mean PM_{10} concentrations in 2019 and 2024 indicate that the annual mean objective (40 µg/m^3) would be achieved at all the modelled receptor locations. In addition, the maximum number of days when PM_{10} concentrations are more than 50 µg/m^3 is 3, less than the 35 exceedances allowed in the regulations.

5.1.5 Particulate Matter ($PM_{2.5}$)

Predicted annual mean concentrations for $PM_{2.5}$ in 2019 and 2024 are provided in Table 13.

Table 13 – Predicted $PM_{2.5}$ Concentrations, Annual Mean (µg/m^3)

Ground floor receptors (1.5m)				
Receptor ID	**Baseline (2019)**	**Future Baseline (2024)**	**Future Baseline + Development (2024)**	**Above/ Below AQO**
D1	11.8	11.8	11.8	Below
D2	11.9	11.9	11.9	Below
D3	11.9	11.9	11.9	Below
D4	11.8	11.8	11.8	Below
D5	11.8	11.8	11.8	Below
D6	11.8	11.8	11.8	Below
D7	11.8	11.8	11.8	Below
D8	11.8	11.8	11.8	Below
D9	11.7	11.8	11.8	Below
D10	11.7	11.7	11.7	Below

D11	11.8	11.8	11.8	Below
D12	11.8	11.8	11.8	Below

The ADMS predictions for annual mean $PM_{2.5}$ concentrations in 2019 and 2024 indicate that the annual mean objective (25 µg/m^3) would be achieved at all the modelled receptor locations.

5.1.6 Significance of additional modelled receptors

As highlighted in Section 4.6.4 and represented in Table 6 and Figure 4, additional receptor locations have been modelled as part of the assessment. The nature of the receptors are residential buildings as well as shops with what appears to be residential dwellings upstairs.

Predictions for annual mean NO_2 and PM_{10} concentrations in 2024 at the additional receptor locations are provided in Table 14, Table 15 and Table 16.

Table 14 – Comparison of Predicted Annual Mean NO_2 Concentrations at additional modelled receptor locations

Ground floor receptors (1.5m)				
Receptor ID	**Baseline (2019)**	**Future Baseline (2024)**	**Future Baseline + development (2024)**	**Change**
E1	31.4	31.5	31.5	0.0
E2	31.7	31.8	31.8	0.0
E3	31.9	32.0	32.0	0.0
E4	32.5	32.7	32.7	0.0
E5	33.6	33.8	33.8	0.0
E6	37.0	37.4	37.4	0.0
E7	37.1	37.4	37.4	0.0
E8	37.2	37.6	37.6	0.0
E9	38.0	38.4	38.4	0.0
E10	37.3	37.6	37.7	0.0

Table 15 – Comparison of Predicted Annual Mean PM_{10} Concentrations at additional modelled receptor locations

Ground floor receptors (1.5m)				
Receptor ID	**Baseline (2019)**	**Future Baseline (2024)**	**Future Baseline + development (2024)**	**Change**
E1	17.9	17.9	17.9	0.0
E2	18.0	18.0	18.0	0.0
E3	18.0	18.0	18.0	0.0
E4	18.1	18.1	18.1	0.0
E5	18.3	18.3	18.3	0.0
E6	18.9	18.9	19.0	0.0
E7	18.9	19.0	19.0	0.0
E8	18.9	19.0	19.0	0.0
E9	19.1	19.1	19.2	0.0
E10	18.9	19.0	19.0	0.0

Nitrogen dioxide also has an hourly objective of 200 µg/m^3 not to be exceeded more than 18 times in one year. However, the hourly mean concentration has not been calculated directly by ADMS Roads. This is as a result of an evaluation of continuous monitoring data from across the UK that revealed that the relationship between the annual mean and hourly mean NO_2 concentrations was very weak. Nonetheless, research undertaken in 2003[18] has indicated that the hourly NO_2 objective is unlikely to be exceeded at a roadside location where the annual mean NO_2 concentration is less than 60 µg/m^3. Given that predicted NO_2 concentration in 2024 are below 60 µg/m^3 at the additional modelled receptor locations, the likelihood of the short-term objective for NO_2 being exceeded is low.

Table 16 – Comparison of Predicted Annual Mean $PM_{2.5}$ Concentrations at additional modelled receptor locations

Ground floor receptors (1.5m)				
Receptor ID	**Baseline (2019)**	**Future Baseline (2024)**	**Future Baseline + development (2024)**	**Change**
E1	11.9	11.9	11.9	0.0
E2	11.9	11.9	11.9	0.0
E3	11.9	11.9	11.9	0.0
E4	12.0	12.0	12.0	0.0
E5	12.1	12.1	12.1	0.0
E6	12.5	12.5	12.5	0.0
E7	12.5	12.5	12.5	0.0
E8	12.5	12.5	12.5	0.0
E9	12.6	12.6	12.6	0.0
E10	12.5	12.5	12.5	0.0

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

The ADMS predictions for annual mean $PM_{2.5}$ concentrations in 2019 and 2024 indicate that the annual mean objective (25 µg/m^3) would be achieved at all the modelled receptor locations.

6 AIR QUALITY NEUTRAL ASSESSMENT

6.1 Introduction

Section 9.1.9 within the London Plan states that every "major" development in Greater London be at least "air quality neutral" and not lead to further deterioration of existing poor air quality. This definition comes from the Town and Country Planning Order[19], to which the London Plan refers.

Within the London Plan, a "major" development is defined by the following criteria:

- 10 or more residential dwellings (or where the number is not given, an area of more than 0.5 ha); or
- For all other uses, where floor space is 1,000 sq m or more (or the site is 1 ha or more).

As such, the proposed development is classified as a "major" development in accordance with 1,000 sq m or more floor space.

The air quality neutral assessment has followed the methodology outlined in the Sustainable Design and Construction Supplementary Planning Guidance (SPG)[20] and the Air Quality Neutral Planning Support Update[21]. Within these documents, benchmarks have been provided in relation to building and transport emissions, together with a methodology for calculating the building related emissions for a particular development. The building and transport related emissions are then compared to the Building Emissions Benchmarks (BEBs) and Transport Emissions Benchmarks (TEBs) to determine whether the benchmarks are being exceeded. If so, then mitigation measures are required to reduce the site emissions, either by on-site measures or by off-setting.

6.2 Building Emissions

The Building Emissions Benchmark (BEBs) for the land use category applicable to hotels is provided in Table 17. Emissions of PM_{10} have not been considered as oil and/or solid fuel are not proposed to be used at the development.

Table 17 – Building Emissions Benchmarks (BEBs)

Land Use Class	NOx (g/m^2/annum)
B8	1.01

Using the method described within the Air Quality Neutral Planning Support Update, the site specific benchmarked emissions have been calculated using the emission rate in Table 21. These are summarised in Table 18. The total building NOx emissions have then been calculated and are summarised in Table 19.

[19] Town and Country Planning (Development Management Procedure)(England) Order, March 2015
[20] Sustainable Design and Construction Supplementary Planning Guidance (SPG), Mayor of London, April 2014
[21] London Plan Guidance Air Quality Neutral, February 2023

Table 18 – Calculation of Benchmarked NOx Emissions Using Building Emissions Benchmarks for Each Land Use Category

Land Use	GFA (m^2)	Building Emissions Benchmarks (g/m^2/annum)	Benchmarked Emissions (kg/annum)
B8	9,722	1.01	9.8
Total Benchmarked Building NOx Emission			**9.8 kg/annum**

Table 19 – Calculation of Total Building NOx Emissions

Land Use	Boiler Gas Usage (kWh/annum)	Emission Factors (mg/kWh)	Total Building Emissions (kg/annum)
B8	44,574	33	1.5
Total Building NOx Emission			**1.5 kg/annum**

Based on the comparison between the total building emissions and Building Emissions Benchmarks (see Table 20) the proposed development does meet the air quality neutral requirements and therefore, no mitigation is required.

Table 20 – Comparison of Total Building NOx Emissions and Building Emissions Benchmarks

Land Use	Total Benchmarked Emissions (kg/annum)	Total Building Emissions (kg/annum)	Difference (kg/annum)
B8	9.8	1.5	-8.3
Total			-8.3

6.3 Transport Emissions

As per the Air Quality Neutral Planning Update, 'storage and distribution' has been used as the land use type. The Transport Emissions Benchmarks (TEBs) are calculated by multiplying the relevant emission benchmarks by the number of dwellings or floor area for commercial use. This is summarised in Table 21 and Table 22.

Table 21 – Transport Emissions Benchmarks (NOx and PM_{10})

Land Use	GIA (m^2)	Benchmark Trip Rate	Total Benchmark Trip Rate
School	2,602	6.5	16,913
Total	2,602	6.5	16,913

Table 22 – Total Transport Emissions (NOx and PM_{10})

Land Use	Benchmark Trip Rate	Average Distance per trip (km)	Emissions (g/veh-km)		Total Emissions (kg)	
			NOx	$PM_{2.5}$	NOx	$PM_{2.5}$
School	16,913	10.8	0.35	0.028	63.9	5.1
Total					63.9	5.1

The proposed development will generate 106 daily vehicles. As such, the total trip emissions for NOx and PM_{10} have been calculated in Table 23.

Table 23 – Comparison of Total Transport Emissions and Transport Emissions Benchmarks

Land Use	Development Trip Rate	Average distance per trip (km)	Emissions (g/veh-km)		Total Emissions (kg)	
			NOx	$PM_{2.5}$	NOx	$PM_{2.5}$
School	38,690	10.8	0.35	0.028	146.2	11.7
Total					146.2	11.7

Based on the comparison between the total transport emissions and Transport Emissions Benchmarks (see Table 24) the proposed development does not meet the air quality neutral requirements and therefore mitigation is required.

Table 24 – Comparison of Total Transport Emissions and Transport Emissions Benchmarks

Pollutant	Total Emissions Benchmark (Kg)	Total Transport Emissions (Kg)	Difference (Kg)
NO_X	63.9	146.2	82.3
$PM_{2.5}$	5.1	11.7	6.6

8 CONCLUSIONS AND RECOMMENDATIONS

8.1 Impact of Vehicle Emissions

The projected NO_2 concentrations at the development are all below the Air Quality Objective in all modelled locations. The same is true for all existing receptors, although one receptor is predicted to be within 5% of the AQO in the future year. Despite this, the impact of the development on all existing receptors is negligible for the future year.

8.2 Impact of Air Quality Neutral Assessment

The Air Quality Neutral Building Assessment for the proposed development demonstrated that it is below the benchmark. As such, the development is considered air quality neutral in regard to building emissions and therefore no further mitigation is required.

The Air Quality Neutral Transport Assessment for the proposed development demonstrated that it is above the benchmark. As such, the development is not considered air quality neutral in regard to transport emissions and further mitigation measures are required either by on-site measures or by off-setting.