AIR QUALITY ASSESSMENT

AT: Kingston Bridge House

CLIENT: Progress Planning

DATE: May 2023

STROMA PROJECT REF: 09-20-84574

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 Kingston Bridge House in the London Borough of Richmond upon Thames. The pollutants modelled as part of this assessment are nitrogen oxides (NOx) and particulate matter (PM_{10}).

The impacts of vehicle emissions have been assessed using the techniques detailed within Volume 11, Section 3 of the Design Manual for Roads and Bridges (DMRB)[1], the Local Air Quality Management Technical Guidance (LAQM.TG16)[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.

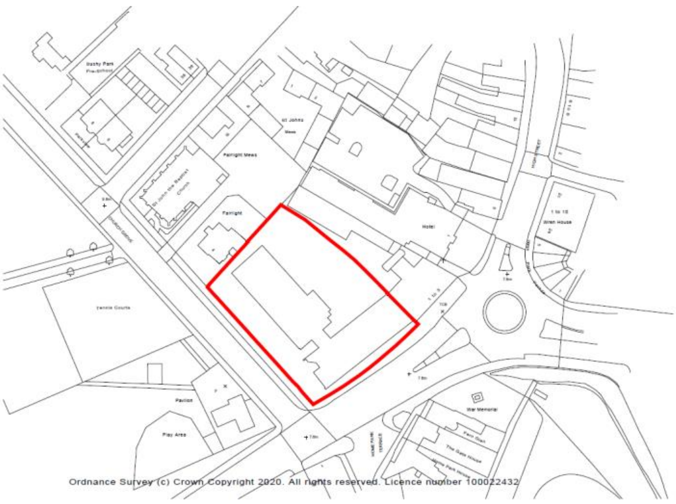
An assessment on the potential impact on local air quality from demolition and construction activities at the site has not been undertaken as a full dataset wasn't available.

An Air Quality Neutral assessment for the transport emissions has been undertaken in accordance with the London Plan however a building emissions assessment has not been undertaken as it does not meet the criteria.

1.2 Site Description

The proposed development consists of façade and elevational improvements, infill extension at ground floor level, and change of use of the building to provide 70 new homes with associated landscaping, access, parking/refuse provision, and external alterations. A location plan can be found in Figure 1.

Figure 1 – Site Location Plan



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

2 Part IV of the Environment Act 1995, Local Air Quality Management Technical Guidance (TG16), Defra, February 2018

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, Scotland, Wales and Northern Ireland on 17 July 2007[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 2010 which came into force on 11th June 2010. Table 2 provides the UK Air Quality Objectives for NO_2 and PM_{10}.

[3] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Department for Environment, Food and Rural Affairs in partnership with the Scottish Executive, Welsh Assembly Government and Department of the Environment Northern Ireland, July 2007

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

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.

As defined in Table 4, background $PM_{2.5}$ concentrations are well below the limit value of 25 µg/m^3. As such, no further consideration has been given to $PM_{2.5}$ within this assessment.

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 The London Borough of Richmond upon Thames

The Council has declared an Air Quality Management Area (AQMA). The AQMA has been declared for the Annual Mean of NO_2 and 24-Hour and Annual Mean of PM_{10}. Furthermore, the AQMA covers the entire borough and as such the proposed development lies within this AQMA.

There are currently 183 Air Quality Focus areas which have been declared across the 33 London Boroughs. The proposed development lies approximately 40m to the west of the Kingston Bridge/Kingston Street focus area and may have an impact despite not being located inside the 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 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.

3.2 Regional Planning Policy

3.2.1 The Mayor's Air Quality Strategy

In October 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

[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

[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

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

at reducing emissions from transport, homes, offices and new developments, as well as raising awareness of air quality issues and its impact on health.

3.2.2 The London Plan

In March 2021, the updated London Plan was published by the Greater London Authority[8]. The London Plan provides an overall strategic plan for London, setting out an integrated economic, environmental, transport and social framework for the development of London over the next 20–25 years. The Plan brings together the geographic and locational aspects of the Mayor's other strategies, including a range of environmental issues such as climate change (adaptation and mitigation), air quality, noise and waste.

Policy 7.14 relates specifically to improving air quality and states the following:

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

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

"Development proposals should:

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

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

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

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

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

[8] The London Plan. The Spatial Development Strategy for London. Consolidated with Alterations. March 2016

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 (2023) representing the first full year with the proposed development in place. Two 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 (2023)

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[9]. 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[10]. 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 London Atmospheric Emissions Inventory (LAEI)[11]. Baseline (2016) data from the LAEI has been projected to 2019 and 2023. 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.

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

[9] Model Version: 5.0.01. Interface Version 5.0.0.5313 (16/03/2020)
[10] https://laqm.defra.gov.uk/documents/EFT2020_v11.0.xlsb
[11] https://data.london.gov.uk/dataset/london-atmospheric-emissions-inventory-2016
[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 2023	HDV (%)	Speed (kph)
Hampton Court Road	32,203	33,329	5.2	18
Church Grove	13,113	13,571	3.5	20

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	517500	169500	21.1
	NOx			30.7
	PM_{10}			16.2
	$PM_{2.5}$			11.0

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

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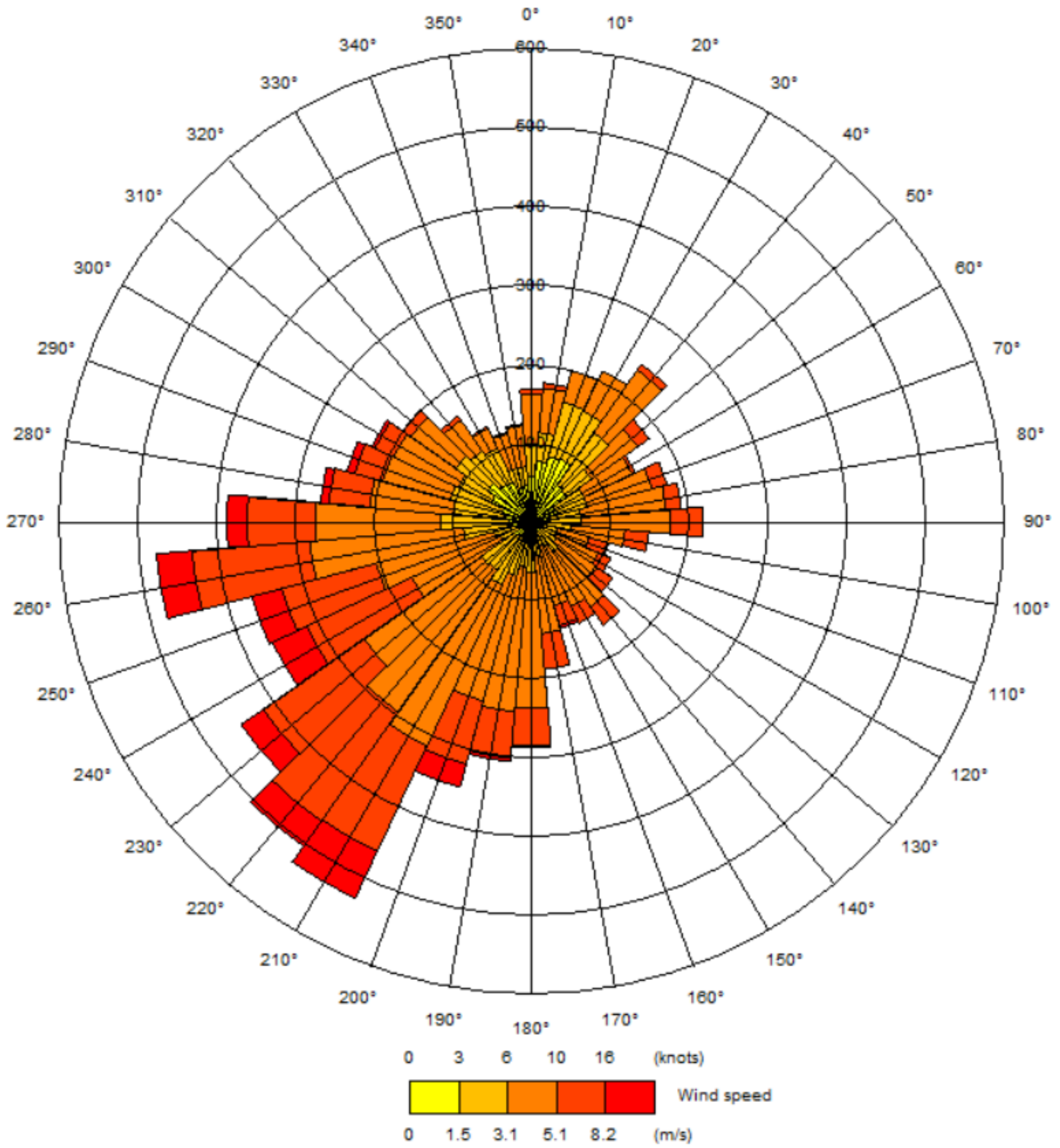
13 https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018

Figure 2 – Wind Speed and Direction Data, London 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.

[14] Trends in Primary Nitrogen Dioxide in the UK, Air Quality Expert Group, 2007

[15] http://laqm.defra.gov.uk/documents/no2tonox9_ja-forweb_june2016.xls

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.

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

Site ID	X	Y	Height (m)
1	515824	168815	2.2
7	515624	170975	2.2
35	517524	169583	2.2
45	516383	171154	2.2

4.5.4 Receptor Locations

In order to meet the requirements of planning condition 21, a 128m X 112m grid consisting of 1,328 individual points have been modelled. These are interpolated into contour plots which can then overlay the site plan to ascertain the air quality concentrations across the development.

4.6 Significance Criteria

4.6.1 Operational Phase

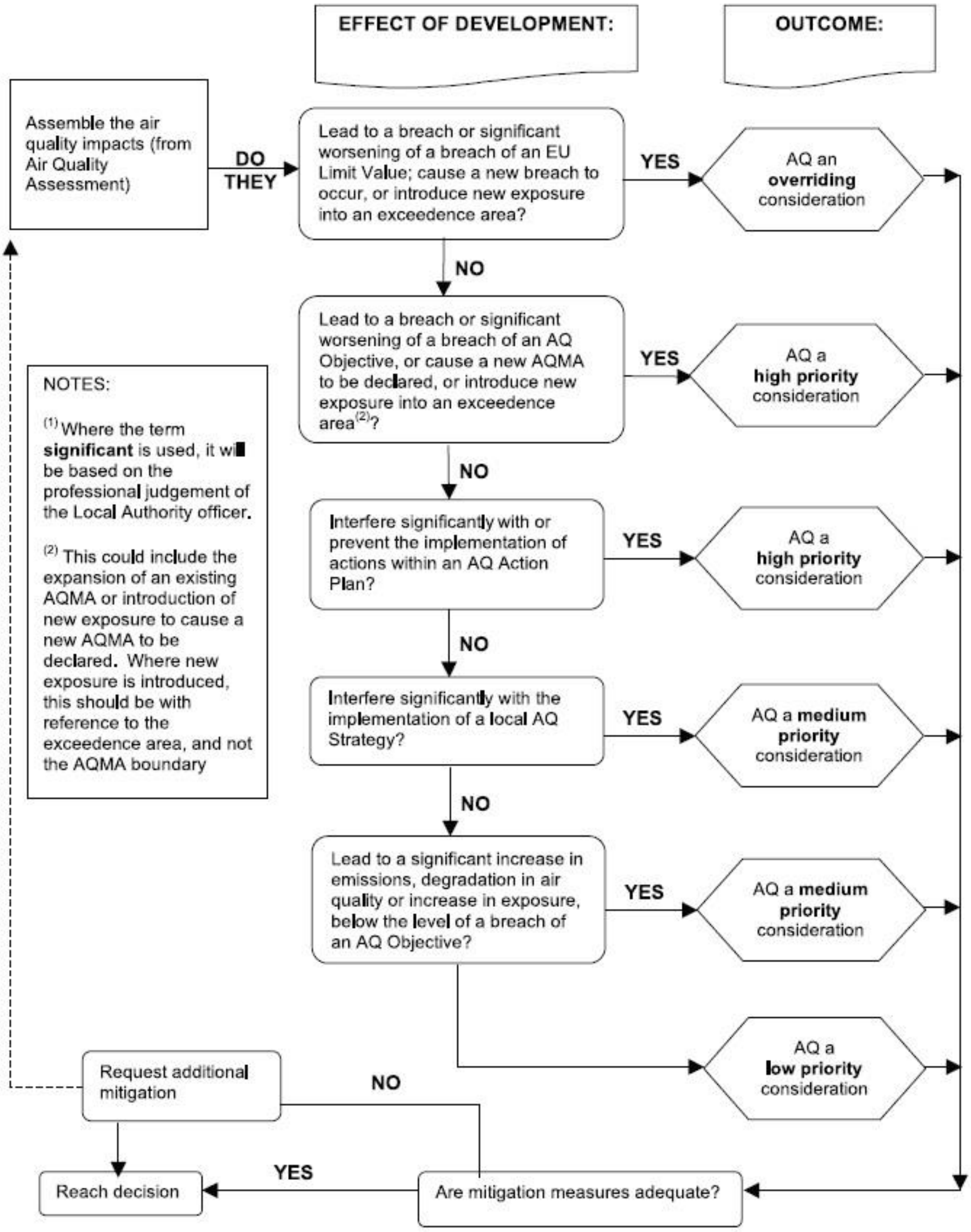
The significance of emissions will be determined by comparing the predicted results to the Air Pollution Exposure Criteria (APEC) detailed in the Air Quality and Planning Guidance written by the London Air Pollution Planning and the Local Environment (APPLE) working group . The Air Pollution Exposure Criteria is considered appropriate to describe the significance of the impacts predicted, together with an indication as to the level of mitigation required in order for the development to be approved. The APEC table is provided below.

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

Table 6 – Air Pollution Exposure Criteria (APEC)

APEC Category	NO_2	PM_{10}	Recommendations
A	>5% below national annual mean objective	>5% below national annual mean objective >1-day less than national 24-hour objective	No air quality grounds for refusal; however mitigation of any emissions should be considered.
B	Between 5% below or above national annual mean objective	Between 5% above or below national annual mean objective Between 1-day above or below national 24-hour objective	May not be sufficient air quality grounds for refusal, however appropriate mitigation must be considered
C	>5% above national annual mean objective	>5% above national annual mean objective >1-day more than national 24-hour objective	Refusal on air quality grounds should be anticipated, unless the Local Authority has a specific policy enabling such land use and ensure best endeavours to reduce exposure are incorporated

Figure 3 – 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 7. The following tables provide a summary of the model verification process for NOx/NO_2 and PM_{10} concentrations.

Table 7 – Comparison of Modelled and Monitored NO_2 and PM_{10} Concentrations ($\mu g/m^3$)

Verification Location	Modelled Concentration	Monitored Concentration	Difference [(modelled - monitored)/ monitored] x100
1	28.2	35.0	-19.5%
7	27.3	39.0	-29.9%
35	29.8	36.0	-17.2%
45	23.7	32.0	-25.9%

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 8.

Table 8 – 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
1	35.0	18.9	16.1	32.7	18.2	1.79
7	39.0	18.3	20.7	42.9	17.7	2.42
35	36.0	21.1	14.9	30.5	17.3	1.76
45	32.0	20.0	12.0	24.0	7.1	3.38

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 2.063 and is used to adjust the modelled road contribution of NOx. This is shown in Table 9.

Figure 4 – Linear Regression of Modelled and Monitored NO_2

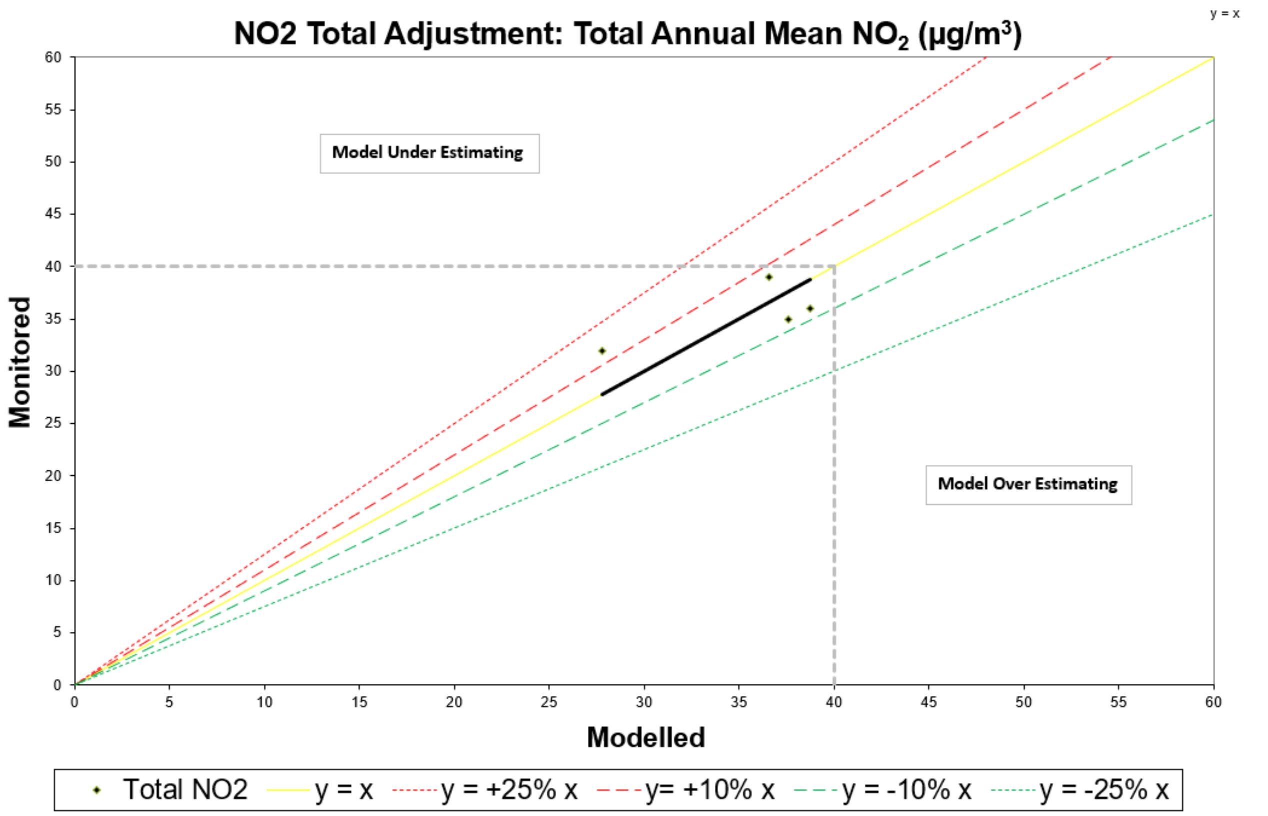


Table 9 – Adjustment of Modelled NOx Contributions

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
1	2.063	37.6	37.2	35.0	6.3%
7	2.063	36.5	36.2	39.0	-7.3%
35	2.063	35.7	38.4	36.0	6.6%
45	2.063	14.6	27.5	32.0	-14.1%

Following adjustment of the modelled NOx concentrations by a factor of 2.063 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 9, indicates a more acceptable model performance when compared against the monitored NO_2 concentrations. This is supported by a very good RMSE value of 3.117. As such, an adjustment factor of 2.063 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 2023 have been plotted in figures 5 to 6. As mentioned in Section 4.5.1, 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.

Figure 5 – Predicted 2019 NO_2 concentrations across the development in μgm^{-3}

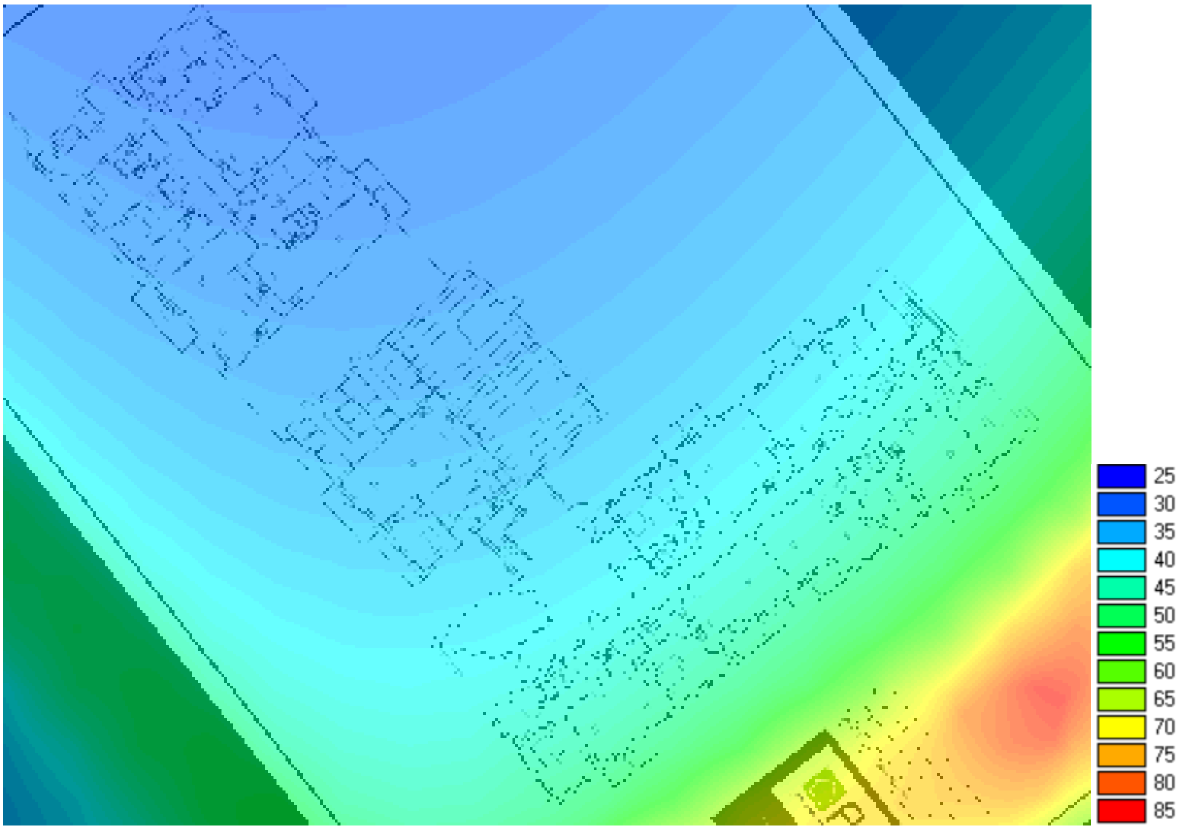
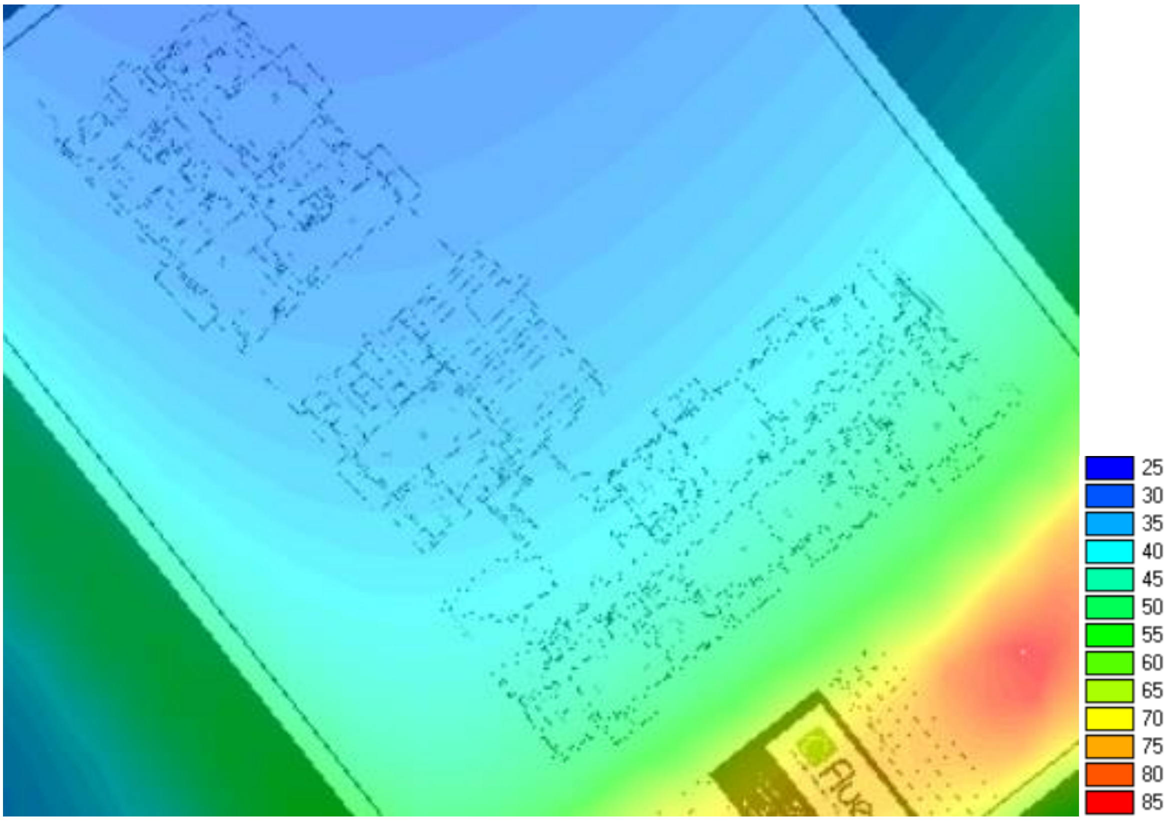


Figure 6 – Predicted 2023 NO_2 concentrations across the development in μgm^{-3}



The ADMS predictions for annual mean NO_2 concentrations in 2019 and 2023 indicate that the annual mean objective (40 μg/m^3) would be achieved at the majority of the modelled receptor locations on all floors. However the receptors on the ground floor closest to Hampton Court Road are within + or - 25% of the annual mean objective and so it is likely they are above the objective at most of the building section adjacent to Hampden Court Road.

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 2023 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

Predicted annual mean concentrations for PM_{10} in 2019 and 2023 are provided in Figures 7 and 8.

Figure 7 – Predicted 2019 PM_{10} concentrations across the development

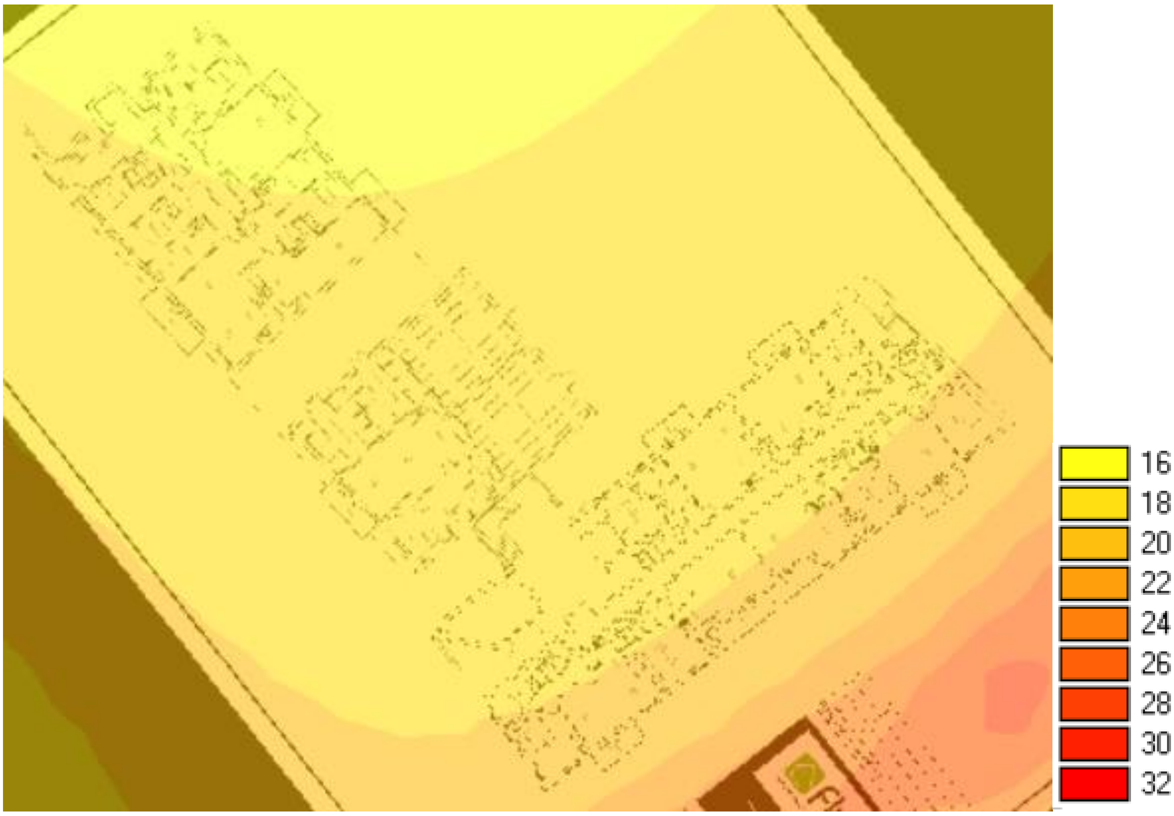
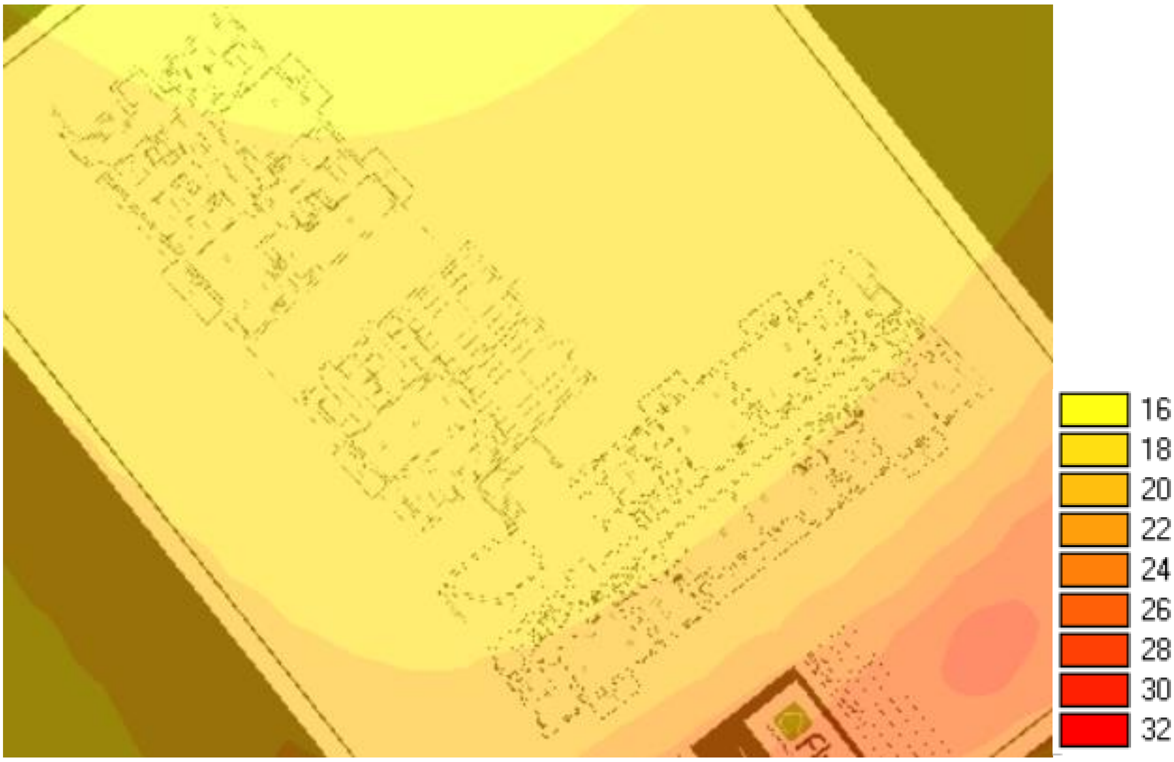


Figure 8 – Predicted 2023 PM_{10} concentrations across the development



The ADMS predictions for annual mean PM_{10} concentrations in 2019 and 2023 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 5, less than the 35 exceedances allowed in the regulations.

6 AIR QUALITY NEUTRAL ASSESSMENT

6.1 Introduction

Policy 7.14 within the London Plan states that every "major" development in Greater London be at least "air quality neutral" and not lead to further deterioration of existing poor air quality. This definition comes from the Town and Country Planning Order[18], 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)[19] and the Air Quality Neutral Planning Support Update[20]. 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

Note that there has been no calculation of the BEB as the development will not have any CHP or biomass boilers and instead will utilise heat pumps and PVs.

6.3 Transport Emissions

As per the Air Quality Neutral Planning Update, the land use category applicable to the residential dwellings, has been used. The Transport Emissions Benchmarks (TEBs) are calculated by multiplying the relevant emission benchmarks by the number of dwellings. This is summarised in Table 10.

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

Table 10 – Transport Emissions Benchmarks (NOx and $PM_{2.5}$)

Benchmark Trips						
Land Use	**No of Dwellings**	**Benchmark Trip Rate**	**Total Benchmark Trip Rate**			
C3	70	447	31,290			
Benchmark Emissions						
Land Use	**Average Distance per trip**	**Benchmark Trip Rate**	**Emission Factor/veh-km**		**Total Emissions/ Kg**	
			NOx	**$PM_{2.5}$**	**NOx**	**$PM_{2.5}$**
C3	11.4	31,290	0.35	0.028	124.8	10.0

The proposed development will generate 106 daily vehicle movements (38,690 per annum) from the proposed residential use.

Table 11 – Actual Emissions and Damage Costs

Actual Emissions					
Land Use	**Total Trips Per Annum**	**Emission Factor/veh-km**		**Total Emissions/ Kg**	
		NOx	**$PM_{2.5}$**	**NOx**	**$PM_{2.5}$**
C3	38,690	0.35	0.028	154.4	12.3
Calculation of Emission Difference					
Pollutant	**Benchmark/ Kg**	**Actual Emissions/ Kg**		**Difference/ Kg**	
NOx	124.8	154.4		29.5	
$PM_{2.5}$	10.0	12.3		2.4	

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 Impact of Vehicle Emissions

The air quality assessment has been based on a number of conservative/worst case assumptions outlined in section 4. This aims to provide confidence in the overall outcomes of the assessment when determining its significance. The back section of the building with respect to Hampden Court Road predicts NO_2 concentrations that fall within APEC Category A, which states that there are “No air quality grounds for refusal; however mitigation of any emissions should be considered”. As such it can be determined that the proposed locations of the air intake locations are in areas which are expected to be below the UK air quality objective limits for NO_2 and PM_{10}. However, the ground floor receptors closest to Hampton Court Road are within + or - 25% of the annual mean objective (APEC Category C).

7.2 Impact of Air Quality Neutral Assessment

The Air Quality Neutral Building Assessment for the proposed development demonstrated that it is above the benchmark. As such, the development is not considered air quality neutral with regards to transport emissions. An agreement with the local authority should be made with regards to potential mitigation measures.