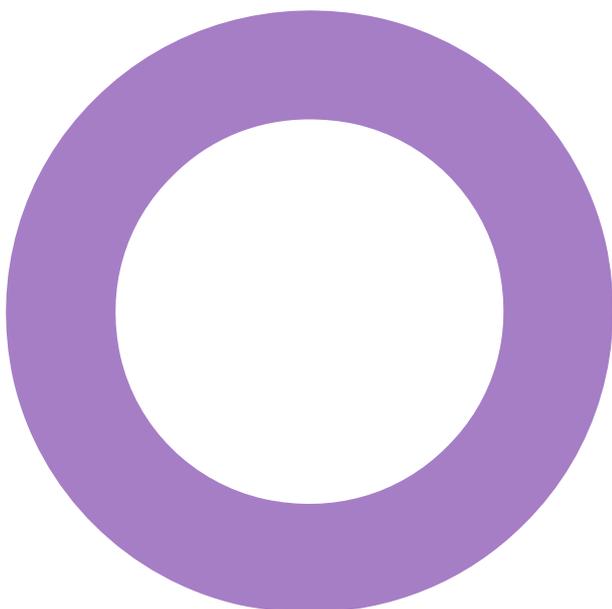


**Homebase, Manor Road.
Richmond, London.**
**Avanton Richmond
Development Ltd.**

AIR QUALITY
AIR QUALITY ADDENDUM

REVISION 03 – 09 FEBRUARY 2023



Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
00	06/12/2022	First Draft	ED	AD/LB	KW
01	06/12/2022	First Issue	ED	AD	KW
02	12/12/2022	Second Issue	BC	AD	KW
03	09/02/2023	Third Issue	ED	AD	KW

This document has been prepared for Avanton Richmond Development Ltd only and solely for the purposes expressly defined herein. We owe no duty of care to any third parties in respect of its content. Therefore, unless expressly agreed by us in signed writing, we hereby exclude all liability to third parties, including liability for negligence, save only for liabilities that cannot be so excluded by operation of applicable law. The consequences of climate change and the effects of future changes in climatic conditions cannot be accurately predicted. This report has been based solely on the specific design assumptions and criteria stated herein.

Project Number: 34/22072

Previous Project Number: 10/10539

Document Reference: REP-3422072-ED-5A-20230209-Manor Road-AQA-Rev03.docx

Contents.

Audit sheet.	2
Contents.	3
Executive Summary.	5
1. Introduction.	6
1.1 Amended Proposed Development.	6
1.2 Site Description and Location.	6
1.3 Scope of Assessment.	7
2. Legislation, Policy and Guidance Documents.	8
2.1 Air Quality Strategy and Local Air Quality Management.	8
2.2 EU Limit Values.	9
2.3 WHO Guideline Values.	9
2.4 The Environment Act.	9
2.5 General Nuisance Legislation.	9
2.6 Clean Air Strategy.	9
2.7 Building Regulations.	10
2.8 Planning Policy.	10
2.9 Local Policy.	11
2.10 Assessment Guidance.	16
3. Methodology of Assessment.	17
3.1 Consultation.	17
3.2 Existing Air Quality in the Study Area.	17
3.3 Construction Phase Impacts.	17
3.4 Operational Phase Impacts.	18
3.5 Assessment of Significance.	20
4. Baseline Environment.	22
4.1 Site Setting.	22
4.2 Local Air Quality Management Review and Assessment.	22
4.3 Local Air Quality Monitoring.	22
4.4 Industrial Pollution.	26
4.5 Defra Predicted Concentrations.	27
4.6 Greater London Authority.	27
4.7 Summary of Background Data.	30

5. Construction Phase Assessment.	32
5.1 Construction Phase Dust Assessment.	32
5.2 Construction Phase – Vehicular Pollutants.	34
5.3 Construction Phase – Non-road Mobile Machinery.	35
5.4 Manor Circus Improvement Works.	35
<hr/>	
6. Operational Phase Assessment.	36
6.1 Road Traffic Emissions Screening Assessment.	36
6.2 Site Suitability.	36
6.3 Air Quality Neutral Assessment	41
<hr/>	
7. Mitigation.	43
7.1 Construction Phase.	43
7.2 Operational Phase.	46
7.3 Cumulative Impacts	47
<hr/>	
8. Summary and Conclusions.	48
<hr/>	
9. Glossary of Terms.	49
<hr/>	
References.	50
<hr/>	
Appendix 1 - EHO Consultation.	52
<hr/>	
Appendix 2 - Amended Proposed Development Plans.	57
<hr/>	
Appendix 3 - Road Traffic Model Input Data.	58
<hr/>	
Appendix 4 - Professional Experience.	63

Executive Summary.

This air quality addendum has been prepared by Hoare Lea on behalf of Avanton Richmond Development Ltd ('the Applicant') following policy updates (in the two years between issue of this air quality addendum and the previous air quality assessment (AQA)) in regard to air quality for the proposed scheme for the redevelopment of the Homebase store at 84 Manor Road, North Sheen, Richmond, TW9 1YB ('the Site').

This air quality addendum provides an update to the previously submitted AQA [REP-Air Quality-1010539-5A-20200730-Manor Road-R01] (the 'Previous AQA'), including updates to account for new policies relating to air quality, more recently available air quality monitoring data, and to re-assess Air Quality Neutral in line with the most recent guidance.

The Site is located within Richmond Air Quality Management Area (AQMA) and in proximity to two Air Quality focus Areas (AQFAs). Local monitoring data indicates exceedances of the annual mean nitrogen dioxide (NO₂) Air Quality Objective (AQO) and World Health Organisation (WHO) guideline for NO₂, but not of the 1-hour mean NO₂ AQO. Monitored concentrations of particulate matter (PM₁₀ and PM_{2.5}) (PM) are below the relevant AQOs but not below the WHO guidelines. Defra predicted background concentrations and modelled London Atmospheric Emissions Inventory (LAEI) concentrations of NO₂, PM₁₀ and PM_{2.5} are also below the respective AQOs but exceedances of the WHO guidelines for PM are predicted.

The impacts of demolition and construction work on dust soiling and ambient fine PM concentrations have been assessed. This identified that there is a medium risk of dust soiling impacts and a low risk of increases in PM concentrations due to construction activities. The risk of dust causing a loss of local amenity and increased exposure to PM₁₀ concentrations has been used to identify appropriate mitigation measures. Provided these are implemented and included within a dust management plan, for example through a planning condition, the residual impacts are considered to be not significant.

The need to undertake a detailed assessment of road traffic emissions associated with both the construction and the operation of the Amended Proposed Development has been scoped out because the traffic generated by the Amended Proposed Development is less than the traffic generated by the existing site use, based on traffic data provided by Sanderson Associates, the appointed transport consultants. As such, the Amended Proposed Development is likely to positively influence local air quality.

As the Amended Proposed Development is for residential uses, the annual mean AQOs for NO₂, PM₁₀ and PM_{2.5} are applicable. Exposure of users of the Amended Proposed Development to concentrations of NO₂, PM₁₀ and PM_{2.5} has been assessed using ADMS-Roads. This Site Suitability Assessment was carried out as part of the Previous AQA and is considered to be a representative worst case assessment. As such, the conclusions drawn from the Site Suitability Assessment in the Previous AQA are still valid and can be viewed as robust. There is predicted to be no exceedance of any of the AQOs and therefore the impacts on the Amended Proposed Development are not significant and mitigation is not required.

Modelling results indicate an exceedance of the WHO guideline for PM_{2.5}, which is due to high local background concentrations as opposed to as a result of the operation of the Amended Proposed Development. Additionally, based on recent advice from the Greater London Authority (GLA), mitigation measures against PM concentrations are not recommended for the purposes of meeting the WHO guidelines. As such, the Site is considered suitable for the Amended Proposed Development without the need for mitigation.

The energy strategy for the Amended Proposed Development is expected to be all electric. As no combustion sources are proposed during normal operation, no local air quality impacts are anticipated and a detailed assessment of impacts of combustion emissions from the energy plant has been screened out of this assessment.

The Amended Proposed Development is Air Quality Neutral for both building and transport emissions in line with the Air Quality Neutral London Plan Guidance (LPG).

Based on the assessment results, the Site is considered suitable for the Amended Proposed Development without the inclusion of mitigation, air quality should not be considered as a constraint to the planning consent and the Amended Proposed Development conforms to the principles of the National Planning Policy Framework, the London Plan and the LBRuT Local Plan.

1. Introduction.

This air quality addendum has been prepared by Hoare Lea on behalf of Avanton Richmond Development Ltd ('the Applicant') following policy updates (in the two years between issue of this air quality addendum and the previous air quality assessment (AQA)) in regard to air quality for the proposed scheme for the redevelopment of the Homebase store at 84 Manor Road, North Sheen, Richmond, TW9 1YB ('the Site').

1.1 Amended Proposed Development.

A planning application for the redevelopment of the Site was submitted to London Borough of Richmond Upon Thames (LBRuT) in February 2019 (ref. 19/0510/FUL) and was considered at LBRuT Planning Committee on 3 July 2019. The Planning Committee resolved that they were minded to refuse the Application, however on 29 July 2019 it was confirmed that the Mayor of London would act as the local planning authority for the purposes of determining the application.

Following review of LBRuT's reasons for refusal and discussions with Officers at the Greater London Authority (GLA) and Transport for London (TfL), the Applicant sought to review the scheme, with the principle aim of increasing the delivery of affordable housing through additional density and addressing other issues raised in the Mayor's Stage 2 Report. An amended proposal was submitted to the GLA in July 2020. An updated AQA [REP-Air Quality-1010539-5A-20200730-Manor Road- R01] (the 'Previous AQA') was produced in 2020 to assess the proposal. The Previous AQA was carried out in accordance with the most up-to-date policy context at the time, which included the NPPF (2019), and the London Plan (2016). At a Mayoral Representation Hearing in October 2020, the Mayor resolved to grant planning permission subject to conditions and a S106 agreement.

Since the Mayoral Representation Hearing, there have been a number of additional policy, guidance and regulatory changes introducing new requirements. To ensure that the proposed development complies with the most up-to-date development plan, the Applicant has voluntarily undertaken a thorough review of the proposal presented at the Mayoral Hearing in October 2020.

With regards to air quality, the changes to policy include the publication of the NPPF (2021), the adoption of the London Plan (2021) and the updated World Health Organisation Guidelines (2021). However, the updated World Health Organisation Guidelines (2021) have not been adopted into planning policy.

In addition, a letter was issued to the Mayor on the 26th of July 2022 regarding the Previous AQA undertaken for the residential development on Manor Road (Planning number 19/0510/FUL GLA reference: GLA/4795/03). This letter (hereafter referred to as the Resident's Letter) was written by a local resident of LBRuT and raised a number of points on air quality. Many of the points raised in the Resident's Letter did not consider the relevant context, technical detail and policy requirements at the time of writing the Previous AQA. The Resident's Letter was addressed in a report note submitted to the GLA on the 26th July 2022 [NOTE-1010539-AD-20220729-Manor Road Air Quality-R00 (d)].

This air quality addendum provides an assessment of the Amended Proposed Development against the most up-to-date policy context, addresses the concerns raised in the Resident's Letter and is to be read in conjunction with the Previous AQA. This air quality addendum provides updates as follows:

- Relevant air quality policies considered, including updates to relevant air quality guidelines;
- Local monitoring data reviewed within the baseline section; and
- Method for assessment of Air Quality Neutral, in line with changes to the guidance.

1.2 Site Description and Location.

The Site is located within LBRuT's administrative area at the approximate National Grid Reference (NGR): X 518910, Y 175430.

The Site is bound to the east by Manor Road (B353) and to the west and the south by overground railway lines. The area surrounding the Site largely consists of residential dwellings and commercial properties, as well as various schools and nurseries.

The Site was formerly occupied by a Homebase branch and associated surface car park.

The Amended Proposed Development is shown in Figure 1 within the wider context of Richmond.

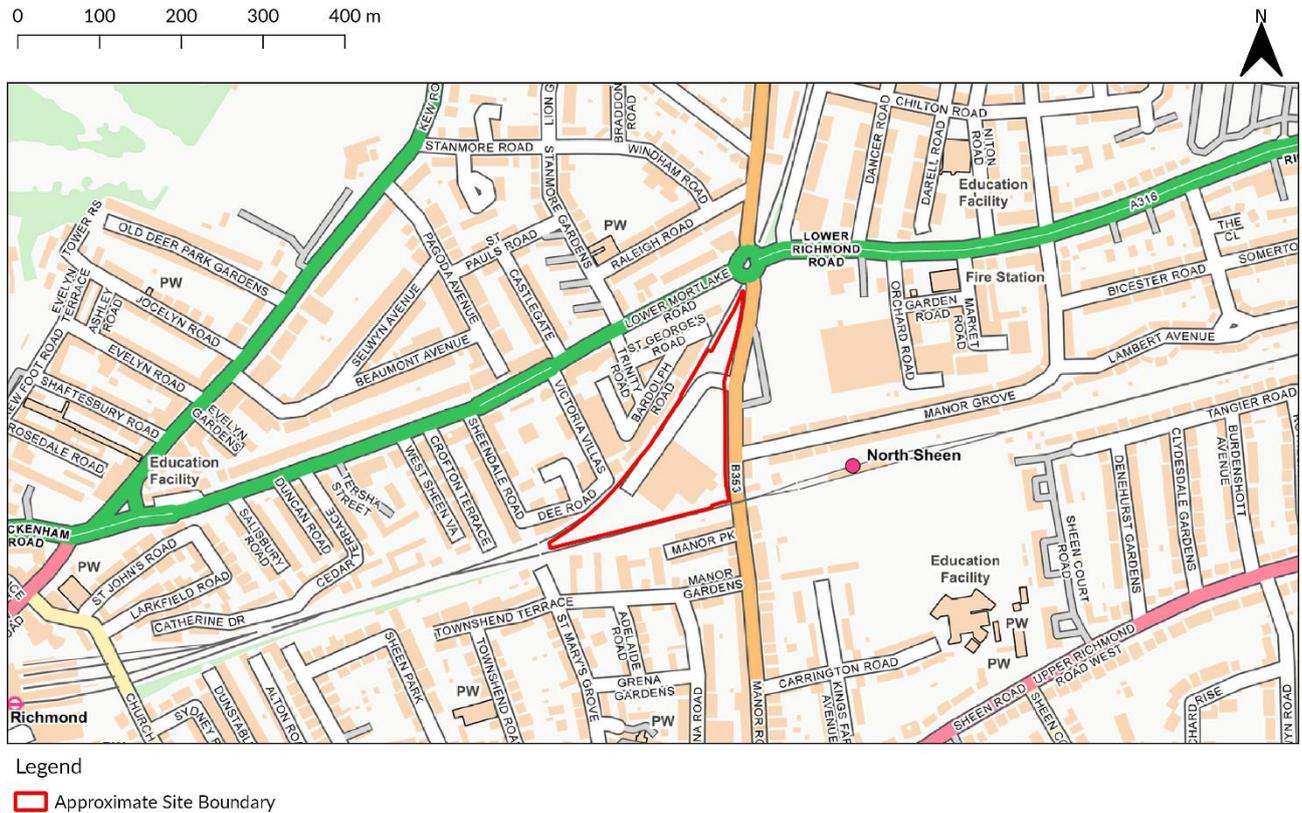


Figure 1: Location of the Site. Contains OS Data © Crown Copyright and Database rights 2022.

The assessment describes the potential air quality impacts associated with the construction and operational phases of the Amended Proposed Development.

1.3 Scope of Assessment.

The scope of the Previous AQA was provided to and agreed with Carol Lee Senior Environmental Health Pollution Practitioner (Air Quality) at the LBRuT by email on the 15th July 2020. Re-consultation has not taken place, given that the overall scope of the assessment remains unchanged. A copy of this correspondence is provided in Appendix 1 and summarised below:

- Baseline assessment will use 2019 data for LBRuT
- A detailed assessment of Site Suitability will be undertaken
- Assessment of impacts from road traffic and energy combustion plant will be screened out
- Assessment of Construction dust will be undertaken
- An air quality neutral assessment will also be undertaken.

The railway line to the west and south of the Site is not a relevant line as detailed in Table 4.2 of the LAQM TG16¹ document (relevant at the time of the original modelling works carried out), nor in Table 7.2 of the LAQM TG22² document (relevant at the time of submission of this addendum). Therefore, an assessment of the impact from the railway line has not been undertaken. There is considered to be no significant impact of this railway line on the Amended Proposed Development.

2. Legislation, Policy and Guidance Documents.

This section provides a summary of the legislation, policy and guidance documents that will guide developments such as the Amended Proposed Development, including relevant updates published since the Previous AQA was issued.

2.1 Air Quality Strategy and Local Air Quality Management.

The Environment Act 1995 (Part IV)³ requires the Secretary of State to publish an air quality strategy and local authorities to review and assess the quality of air within their boundaries. The latter has become known as Local Air Quality Management (LAQM).

The Air Quality Strategy⁴ provides the policy framework for local air quality management and assessment in the UK. It sets out air quality standards and objectives for key air pollutants. These standards and objectives are designed to protect human health and the environment. The Strategy also sets out how the different sectors of industry, transport and local government, can contribute to achieving these Air Quality Objectives (AQOs).

Local authorities are required to identify whether the AQOs have been, or will be, achieved at relevant locations, by the applicable date. If the AQOs are not achieved, the authority must declare an Air Quality Management Area (AQMA) and should prepare an action plan within 12 months. An action plan must identify appropriate measures and policies that can be introduced in order to work towards achieving the AQO(s).

The AQOs set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of economic efficiency, practicability, technical feasibility and timescale. The AQOs for use by local authorities are prescribed within the Air Quality (England) Regulations 2000⁵, and the Air Quality (England) (Amendment) Regulations 2002⁶.

The AQOs for Nitrogen Dioxide (NO₂) and particulate matter (PM₁₀ and PM_{2.5}) (PM) are set out in Table 1. The AQOs for NO₂, PM₁₀ and PM_{2.5} were to have been achieved by 2005, 2004 and 2020 respectively and continue to apply in all future years thereafter. It should be noted that local authorities in England have a flexible role in working towards reducing emissions and concentrations of PM_{2.5}.

Table 1: Air Quality Objectives for NO₂, PM₁₀ and PM_{2.5}

Pollutant	Time Period	Objective
Nitrogen Dioxide (NO ₂)	1-hour Mean	200 µg/m ³ Not to be exceeded more than 18 times a year
	Annual Mean	40 µg/m ³
Fine Particles (PM ₁₀)	24-hour Mean	50 µg/m ³ Not to be exceeded more than 35 times a year
	Annual Mean	40 µg/m ³
Fine Particles (PM _{2.5}) *	Annual Mean	25 µg/m ³

*The time period in LLAQM.TG19 states "Work towards reducing emissions/concentrations of fine particulate matter (PM_{2.5})"

The AQOs apply at locations where members of the public are likely to be regularly present and exposed over the averaging period of the AQO. Examples of where the annual mean AQOs should apply are provided in the London Local Air Quality Management Technical Guidance (LLAQM.TG(19))⁷, and include: building facades of residential properties, schools, hospitals. The annual mean AQOs are not relevant for the building facades of offices or other places of work where members of the public do not have regular access, kerbsides or gardens.

The 24-hour AQO for PM₁₀ is considered to apply at the same locations as the annual mean AQO, as well as in gardens of residential properties and at hotels.

The 1-hour AQO for NO₂ also applies wherever members of the public might regularly spend 1-hour or more, including outdoor eating locations, pavements of busy shopping streets, carparks and bus stations which are not fully enclosed. The 1-hour AQO does not apply at kerbside sites where the public do not have regular access.

2.2 EU Limit Values.

The European Union has also set limit values for NO₂, PM₁₀ and PM_{2.5}; these are legally binding and have been implemented into English legislation by The Air Quality Standards Regulations 2010⁸.

The limit values for NO₂, PM₁₀ and PM_{2.5} are the same as the English AQOs (Table 1), but applied from 2010 for NO₂, 2005 for PM₁₀ and 2015 for PM_{2.5}. The limit values apply at all locations (apart from where the public does not have access, where health and safety at work provisions apply and on the road carriageway).

2.3 WHO Guideline Values.

The WHO has produced air quality guidelines⁹ to offer global guidance on thresholds and limits for key air pollutants that pose health risks. The GLA confirmed that the relevant WHO guidelines referred to in the London plan are from 2005 and as such these have been provided below in Table 2 for NO₂, PM₁₀ and PM_{2.5} concentrations.

Table 2: WHO guidelines for NO₂, PM₁₀ and PM_{2.5}

Pollutant	Time Period	Objective
NO ₂	1-hour Mean	200 µg/m ³ 1-hour mean
	Annual Mean	40 µg/m ³ annual mean
PM ₁₀	Annual Mean	20 µg/m ³
PM _{2.5}	Annual Mean	10 µg/m ³

The WHO released revised air quality guidelines in September 2021. The revised annual mean thresholds for NO₂, PM₁₀ and PM_{2.5} are 10 µg/m³, 15 µg/m³ and 5 µg/m³ respectively, whilst the short-term threshold for NO₂ is based on a 24-hour mean rather than 1-hour mean.

However, the revised guidelines are yet to be included in planning policies and carried into effect. As such, the guidelines published before September 2021 have been considered in this assessment instead.

2.4 The Environment Act.

The Environment Act 2021¹⁰ acts as the UK's new framework of environmental protection and came into force on 1st April 2022. With regard to air quality, the Environment Act establishes a legally binding duty on government to bring forward at least two new air quality targets in secondary legislation by 31st October 2022, although these have since been delayed indefinitely¹¹. Target objectives¹² under consideration for air quality include:

- Reducing the annual mean level of PM_{2.5} in ambient air (as required by Clause 2 of the Environment Act); and
- Reducing population exposure to PM_{2.5}.

2.5 General Nuisance Legislation.

Part III of the Environmental Protection Act (EPA) 1990 (as amended)¹³ contains the main legislation on Statutory Nuisance and allows local authorities and individuals to take action to prevent a statutory nuisance. Section 79 of the EPA defines, amongst other things, smoke, fumes, dust and smells emitted from industrial, trade or business premises so as to be prejudicial to health or a nuisance, as a potential Statutory Nuisance.

Fractions of dust greater than 10 µm (i.e. greater than PM₁₀) in diameter typically relate to nuisance effects as opposed to potential health effects and therefore are not covered within the UK Air Quality Strategy. In legislation there are currently no numerical limits in terms of what level of dust deposition constitutes a nuisance.

2.6 Clean Air Strategy.

The Clean Air Strategy (CAS)¹⁴, published in 2019, sets out the Government's proposals aimed at delivering cleaner air in England, and also indicates how devolved administrations intend to make emissions reductions. It

sets out the comprehensive action that is required from across all parts of government and society to deliver clean air.

2.7 Building Regulations.

The Building Regulations help to ensure that new buildings, conversions, renovations and extensions (domestic or commercial) will be safe, healthy and high performing. Detailed regulations cover specific topics including structural integrity, fire protection, accessibility, energy performance, acoustic performance, protection against falls, electrical and gas safety. Part F of the Building Regulations (2021)¹⁵ provides guidance for indoor air quality and the pollutant concentrations that must not be exceeded in both buildings for dwellings and non-dwellings.

2.8 Planning Policy.

2.8.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF) 2021¹⁶ sets out planning policy for England. It includes advice on when air quality should be a material consideration in development control decisions. Relevant sections are set out below:

Paragraph 55: “Local planning authorities should consider whether otherwise unacceptable development could be made acceptable through the use of conditions or planning obligations. Planning obligations should only be used where it is not possible to address unacceptable impacts through a planning condition.”

Paragraph 174: “Planning policies and decisions should contribute to and enhance the natural and local environment by: preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality”

Paragraph 185: “Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development”.

Paragraph 186: “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.”

Paragraph 188: “The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.”

The NPPF is supported by Planning Practice Guidance (PPG)¹⁷.

The PPG states that:

Paragraph 001 (Reference ID: 32-001-20191101): “Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance relevant Limit Values. It is important that the potential impact of new development on air quality is taken into account in planning where the national assessment indicates that relevant limits have been exceeded or are near the limit or where the need for emissions reductions has been identified.”

Paragraph 002 (Reference ID: 32-002-20191101): Plans may need to consider ways in which the development could be made appropriate in locations where air quality is or is likely to be a concern, and not give rise to unacceptable risks from pollution. This could, for example entail identifying measures for offsetting the impact on air quality arising from new development including supporting measures in an air quality action plan or low emissions strategy where applicable”.

Paragraph 005 (Reference ID: 32-005-20191101): “Whether air quality is relevant to a planning decision will depend on the proposed development and its location. 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.

The PPG also sets out the information that may be required in an AQA, stating that:

Paragraph 007 (Reference ID: 32-007-20191101): “Assessments need to be proportional to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions), and because of this are likely to be locationally specific. The scope and content of supporting information is best discussed and agreed between the local planning authority and applicant before it is commissioned”.

It also provides guidance on options for mitigating air quality impacts, and makes clear that:

Paragraph 008 (Reference ID: 32-008-20191101): “Mitigation options will need to be locationally specific, will depend on the proposed development and need to be proportionate to the likely impact.”

2.9 Local Policy.

2.9.1 The London Plan 2021

The London Plan 2021¹⁸ is the Spatial Development Strategy for Greater London. It sets out a framework for how London will develop over the next 20-25 years (covering the period 2019-2041) and the Mayor’s vision for Good Growth. The Plan is part of the statutory development plan for London, meaning that the policies in the Plan should inform decisions on planning applications across the capital.

The London Plan 2021 is the third London Plan, the previous ones being the 2004 London Plan and the 2011 London Plan. All of the other iterations of the London Plan from 2004-2016 have been alterations. This London Plan replaces all previous versions.

The following policy relating to air quality is contained within The London Plan 2021¹⁸: Policy SI 1 ‘Improving air quality’ 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

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 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:

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

2) 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 Plan 2021 provides further information on Policy SI that requires consideration, as detailed below.

Section 9.1.2: “The Mayor is committed to making air quality in London the best of any major world city, which means not only achieving compliance with legal limits for Nitrogen Dioxide as soon as possible and maintaining compliance where it is already achieved, but also achieving World Health Organisation targets for other pollutants such as Particulate Matter.”

Section 9.1.3: “The aim of this policy is to ensure that new developments are designed and built, as far as is possible, to improve local air quality and reduce the extent to which the public are exposed to poor air quality. This means that new developments, as a minimum, must not cause new exceedances of legal air quality standards, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits. Where limit values are already met, or are predicted to be met at the time of completion, new developments must endeavour to maintain the best ambient air quality compatible with sustainable development principles.”

Section 9.1.4: “Where this policy refers to ‘existing poor air quality’ this should be taken to include areas where legal limits for any pollutant, or World Health Organisation targets for Particulate Matter, are already exceeded and areas where current pollution levels are within 5 per cent of these limits.”

Additionally, Policy GG3 ‘Creating a healthy city’ states:

“To improve Londoners’ health and reduce health inequalities, those involved in planning and development must:

[...]

F seek to improve London’s air quality, reduce public exposure to poor air quality and minimise inequalities in levels of exposure to air pollution”.

2.9.2 The London Environment Strategy

The London Environment strategy (LES), published in May 2018¹⁹, supersedes the previous Mayor's Air Quality Strategy (MAQS) for London, published in December 2010. The LES strategy aims to reduce pollution concentrations in London to achieve compliance within the EU limit values as soon as possible. The LES commits to the continuation of measures identified in the 2002 and 2010 MAQS and sets out a series of additional measures.

Proposal 4.3.3.a states that the London Strategy provides policies in which all new large-scale developments can not only become 'Air Quality Positive', but also maintain Air Quality Neutral requirements for all other developments. Within the planning guidance for building operations and transport emissions, information about emission benchmarks for 'Air Quality Neutral' developments are set out. Any development that either meets or exceeds the benchmarks is considered Air Quality Neutral as they avoid any increase in PM and Nitrogen oxides (taken to be NO₂ + NO) (NO_x) emissions. In order for the benchmarks to remain relevant, the Mayor will continue to review them. To ensure that the requirements are met, execution of the Air Quality Neutral policy will be monitored by utilising both the LLAQM and the London Plan monitoring report.

The following proposed policies relate to the planning process with regards to improving air quality:

Policy 4.2.2: "Reduce emissions from non-road transport sources, including by phasing out fossil fuels;"

Policy 4.2.3: "Reduce emissions from non-transport sources, including by phasing out fossil fuels;"

Policy 4.2.4: "The Mayor will work with the government, the London boroughs and other partners to accelerate the achievement of legal limits in Greater London and improve air quality;"

Policy 4.2.5: "The Mayor will work with other cities (here and internationally), global city and industry networks to share best practice, lead action and support evidence-based steps to improve air quality;"

Policy 4.3.1: "The Mayor will establish new targets for PM_{2.5} and other pollutants where needed. The Mayor will seek to meet these targets as soon as possible, working with government and other partners;"

Policy 4.3.2: "The Mayor will encourage the take up of ultra-low and zero emission technologies to make sure London's entire transport system is zero emission by 2050 to further reduce levels of pollution and achieve WHO air quality guidelines;"

Policy 4.3.3: "Phase out the use of fossil fuels to heat, cool and maintain London's buildings, homes and urban spaces, and reduce the impact of building emissions on air quality;"

Policy 4.3.4: "Work to reduce exposure to indoor air pollutants in the home, schools, workplace and other enclosed spaces."

Furthermore, the strategy outlines that negative consequences that can occur from developing air quality and climate policies in isolation, particularly with regards to energy and planning policy. Instead, integrated policy design can lead to benefits such as reducing carbon emissions by switching to zero emission vehicles simultaneously.

The Strategy also includes the focus on the 187 Air Quality Focus Areas (AQFA) declared by the GLA. Focus Areas are defined to address concerns raised by boroughs within the LAQM review process and forecasted air pollution trends. These are locations that not only exceed the EU annual mean limit value for NO₂ but are also locations with high human exposure. This is not an exhaustive list of London's hotspot locations, but where the GLA believe the problem to be most acute.

2.9.3 London Borough of Richmond Upon Thames Local Plan.

The LBRuT Local Plan²⁰ was adopted on the 3rd July 2018. This document sets out the policies and guidance for the development of the Borough over the following 15 years. It looks ahead to 2033 and identifies where the main developments will take place, and how areas of the Borough will change, or be protected from change, over that period.

The following policies relating to air quality and relevant to the Amended Proposed Development, are contained within the Local Plan.

Policy LP 8. Amenity and Living Conditions

“All development will be required to protect the amenity and living conditions for occupants of new, existing, adjoining and neighbouring properties. The Council will:

[...]

4. Ensure there is no harm to the reasonable enjoyment of the use of buildings, gardens and other spaces due to increases in traffic, servicing, parking, noise, light, disturbance, air pollution, odours or vibration or local micro-climatic effects.”

Policy LP 10. Local Environmental Impacts, Pollutions and Land Contamination

“A. The Council will seek to ensure that local environmental impacts of all development proposals do not lead to detrimental effects on the health, safety and the amenity of existing and new users or occupiers of the development site, or the surrounding land. These potential impacts can include, but are not limited to, air pollution, noise and vibration, light pollution, odours and fumes, solar glare and solar dazzle as well as land contamination. Developers should follow any guidance provided by the Council on local environmental impacts and pollution as well as on noise generating and noise sensitive development. Where necessary, the Council will set planning conditions to reduce local environmental impacts on adjacent land uses to acceptable levels.

Air Quality

B. The Council promotes good air quality design and new technologies. Developers should secure at least ‘Emissions Neutral’ development. To consider the impact of introducing new developments in areas already subject to poor air quality, the following will be required:

- 1. an air quality impact assessment, including where necessary, modelled data;*
- 2. mitigation measures to reduce the development's impact upon air quality, including the type of equipment installed, thermal insulation and ducting abatement technology;*
- 3. measures to protect the occupiers of new developments from existing sources;*
- 4. strict mitigation for developments to be used by sensitive receptors such as schools, hospitals and care homes in areas of existing poor air quality; this also applies to proposals close to developments used by sensitive receptors.*

[...]”

2.9.4 London Borough of Richmond Upon Thames Draft Local Plan.

The first draft of the new Local Plan²¹ sets out the strategic vision, objectives and spatial strategy, with place-based strategies, thematic policies and guidance to manage growth and guide development across the Borough over a 15-year period, from the date of its adoption. Given that this Local Plan is still in draft form, the following policies have been included for information only and are not yet active policies.

The following draft policies relating to air quality and relevant to the Amended Proposed Development, are contained within the draft Local Plan.

Policy 3. Tackling the Climate change Emergency

“A. Climate change is now the greatest challenge facing our society. The Council will promote zero carbon development, with the aim that all buildings and infrastructure projects in the borough will be net-zero carbon by 2050. This will require substantial reductions in greenhouse gas emissions and will also reduce fuel poverty and improve long term energy security for Richmond's residents and businesses. Development must not exacerbate climate change. Development should increase local resilience to current and future impacts of climate changes, especially for the most vulnerable people and property.

B. This will be achieved by requiring all development to:

[...]

6. enhance and improve the borough's green and blue infrastructure to ensure it delivers multi-functional benefits, such as enhancing micro-climates and natural carbon sinks as well as improving air quality;

[...]"

Policy 53. Local Environmental Impacts

"A. The Council will seek to ensure that local environmental impacts of all development proposals do not lead to detrimental effects on the health, safety and the amenity of existing and new users or occupiers of the development site, or the surrounding land. These potential impacts can include, but are not limited to, air pollution, noise and vibration, light pollution, odours and fumes, solar glare and solar dazzle as well as land contamination.

B. Developers should follow any guidance provided by the Council on local environmental impacts and pollution as well as on noise generating and noise sensitive development. Where necessary, 304 25 Creating safe, healthy and inclusive communities Richmond Local Plan - Regulation 18 the Council will set planning conditions to reduce local environmental impacts on adjacent land uses to acceptable levels.

C. In accordance with London Plan Policy D13 Agent of Change, the Council will apply the Agent of Change principle, which places the responsibility for mitigating impacts from existing noise and other nuisance-generating activities or uses firmly on the proposed new noise-sensitive development.

Air Quality

D. The Council promotes good air quality design and new technologies. All developments must comply with the new London Plan 2021 Policy S11 Improving Air Quality.

E. Major developments and large-scale development subject to an Environmental Impact Assessment (EIA) are required to achieve "Air Quality Positive".

F. All developments must be at least "Air Quality Neutral". Proposals that would materially increase exceedances of local air pollutants will be resisted unless the development mitigates this impact through physical measures and/or financial contributions to implement proposals in Richmond's Local Air Quality Management Plan.

G. To consider the impact of introducing new developments in areas already subject to poor air quality, the following will be required:

- 1. an air quality impact assessment, including where necessary modelled data; this also applies to change of use to residential at street level;*
- 2. mitigation measures to reduce the development's impact upon air quality, including the type of equipment installed, thermal insulation and ducting abatement technology;*
- 3. measures to protect the occupiers of new developments from existing sources;*
- 4. strict mitigation for developments to be used by sensitive receptors such as schools, hospitals and care homes in areas of existing poor air quality; this also applies to proposals close to developments used by sensitive receptors;*
- 5. mitigation measures to reduce the impact of transport from the development upon air quality, including support for active travel, electric vehicles and car club membership.*

H. The Council will require financial contributions towards off-site air quality measures where a proposed development is not air quality neutral, or mitigation measures do not reduce the impact upon poor air quality. Specific guidance for air quality in new developments is set out in the Council's Air Quality SPD (2020).

[...]"

2.9.5 London Borough of Richmond Upon Thames Air Quality Action Plan

The LBRuT Air Quality Action Plan²² (AQAP) covers the actions intended to be taken to tackle air pollution in the Borough between 2020-2025.

The AQAP is split into five key areas:

- Monitoring air quality;
- Changing out environment;
- Changing behaviour;
- Tackling pollution; and
- Protecting our schools.

2.10 Assessment Guidance.

The primary guidance documents consulted in undertaking this assessment are detailed below.

2.10.1 Mayor of London, London Local Air Quality Management Technical Guidance

The Mayor of London's LLAQM.TG(19)⁷ was published for use by local authorities in their LAQM review and assessment work. The document provides key guidance in aspects of AQA, including screening, use of monitoring data, and use of background data that are applicable to all AQAs (and in this case the air quality addendum).

2.10.2 EPUK and IAQM 'Air Quality Guidance for Planning'

Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) have together published guidance²³ to help ensure that air quality is properly accounted for in the development control process. It clarifies when an AQA should be undertaken, what it should contain, and how impacts should be described and assessed including guidelines for assessing the significance of impacts.

2.10.3 GLA 'Construction and Demolition Dust Guidance'

Guidance on the assessment of dust from demolition and construction has been published by the GLA²⁴. The guidance provides a methodology to determine the dust emission magnitude and provides a series of matrices to determine the risk magnitude of potential dust sources associated with construction activities. This allows for the identification of appropriate mitigation measures that are defined within further IAQM guidance.

2.10.4 Air Quality Neutral London Plan Guidance

The Air Quality Neutral London Plan Guidance (LPG)²⁵ document sets out the benchmarks for transport and building emissions from new developments. These are based on research and evidence carried out by building and transport consultants.

2.10.5 Sustainable Design and Construction Supplementary Planning Guidance

The Greater London Authority published supplementary planning guidance (SPG) on sustainable design and construction in April 2014²⁶, in order to improve the environmental performance of new developments.

2.10.6 London Borough of Richmond Upon Thames Air Quality Supplementary Planning Document

The LBRuT Air Quality Supplementary Planning Document²⁷ (SPD) has been produced to address common air quality issues affecting the Borough and assist in providing a consistent approach to new development. The primary aim of the SPD is to supplement existing Local Plan policies which seek to improve air quality in the Borough. The SPD assists developers, decision makers, agents, residents and others to identify issues to be addressed in any application for development consent in which air quality will be an important consideration when assessing that application.

3. Methodology of Assessment.

3.1 Consultation.

As described in section 1.3, the approach to the Previous AQA was provided to and agreed with the Senior Environmental Health Pollution Practitioner (Air Quality) at the LBRuT by email on the 15th July 2020. Re-consultation has not taken place, given that the general scope of the assessment remains unchanged. A copy of this correspondence is provided in Appendix 1.

3.2 Existing Air Quality in the Study Area.

A baseline air quality review was undertaken to determine the existing air quality in the vicinity of the Site.

This desk-top study was undertaken using the following sources:

- Air quality data for LBRuT and the London Borough of Hounslow (LBH), including a review of LBRuT annual status reports (ASR) from the years of 2019 to 2022^{28,29,30,31}, the most recent ASR from LBH (2020)³², and local monitoring data;
- The UK Pollutant Release and Transfer Register³³;
- Background pollution maps from Defra’s Local Air Quality Management (LAQM) website³⁴;
- London Atmospheric Emissions Inventory (LAEI) modelled annual mean concentrations from the GLA⁴⁰;
- Pollution Inventory from the Environment Agency³⁵
- The UK Ambient Air Quality Interactive Map³⁶;
- Aerial photography from Google Maps.

3.3 Construction Phase Impacts.

3.3.1 Construction Dust Assessment

The assessment of construction dust impacts has been undertaken in line with the GLA methodology. Activities on the proposed construction site have been divided into four types to reflect their different potential impacts. These are:

- Demolition;
- Earthworks;
- Construction; and
- Trackout

The risk of dust emissions was assessed for each activity with respect to:

- Potential loss of amenity due to dust soiling; and
- The risk of health effects due to a significant increase in exposure to PM₁₀.

The first stage of the assessment involves screening to determine whether there are any sensitive receptors within the threshold distances defined by the GLA guidance. A detailed assessment of the impact of dust from construction sites will be required where:

- A ‘human receptor’ is located within 50 m of the boundary of the Site or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the Site entrance;
- An ‘ecological receptor’ is located within 50 m of the boundary of the Site or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the Site entrance.

The magnitude of dust emission for each activity is determined on the basis of the guidance, indicative thresholds, information available relating to the project and expert judgement. The risk of dust effects arising is based upon the relationship between the dust emission magnitude and the sensitivity of the area. The risk of impact is then used to determine the mitigation requirements.

Descriptors for magnitude of impact and impact significance used in this assessment of construction phase dust are given in the guidance available online²³.

3.3.2 Construction Traffic

3.3.2.1 Construction Traffic Emissions Screening

The screening assessment has been undertaken with reference to the following EPUK and IAQM guidance indicative criteria:

- a change of Light Duty Vehicle (LDV) flows of more than 100 annual average daily traffic (AADT) (within an AQMA); and/or
- a change of Heavy Duty Vehicle (HDV) flows of more than 25 AADT (within an AQMA).

3.3.2.2 NRMM Emissions Screening

Non-Road Mobile Machinery (NRMM) refers to mobile machines, transportable industrial equipment or vehicles which are fitted with an internal combustion engine and not intended for transporting goods or passengers on roads. NRMM emissions have been screened following IAQM guidance³⁷.

3.4 Operational Phase Impacts.

3.4.1 Road Traffic Impacts

The screening assessment has been undertaken following the EPUK and IAQM guidance indicative criteria, i.e.:

- a change of LDV flows of more than 100 AADT (within an AQMA); and/or
- a change of HDV flows of more than 25 AADT (within an AQMA).

Where these criteria are exceeded, a detailed assessment is required, although the guidance advises that “the criteria provided are precautionary and should be treated as indicative”, and “it may be appropriate to amend them on the basis of professional judgement”.

Where impacts can be screened out there is no need to progress to a more detailed assessment.

3.4.2 Site Suitability

A detailed assessment was undertaken to consider the Site Suitability in the Previous AQA [REP-Air Quality-1010539-5A-20200730-Manor Road-R01], which refers to the exposure of future occupants of the Amended Proposed Development to existing air quality. Concentrations of NO₂, PM₁₀ and PM_{2.5} were predicted at proposed sensitive receptors in the year of 2023, which is the earliest anticipated year of occupation for the Amended Proposed Development.

The emissions factors and background concentrations used for the air quality modelling carried out in the Previous AQA [REP-Air Quality-1010539-5A-20200730-Manor Road-R01] were from 2019. Emissions are expected to reduce in the future and background concentrations of the pollutants considered are also expected to decrease. NO_x concentrations are likely to be impacted (and reduce) as a result of the expected transition to hybrid and fully electric vehicles. Furthermore, due to the COVID-19 Pandemic, there were unprecedented reductions in pollutant concentrations in 2020 and 2021 and these years are therefore not considered to be representative of ‘normal’ air quality conditions. As such, 2019 is the most recent year with available representative air quality data for use in this air quality addendum. Therefore, owing to the emission factors and background concentrations used in the Previous AQA, the previous Site Suitability Assessment can be considered worst case. As such, the conclusions drawn from the Site Suitability Assessment in the Previous AQA are still valid and can be viewed as conservative in nature.

Concentrations at proposed sensitive receptors were modelled using the dispersion model ADMS Roads (version 4.1.1.0)³⁸. This model has been extensively validated and is widely used by regulators, government departments, consultancies and industry. Emission factors were used from EFT v9.0 which is embedded within the ADMS-Roads model. The NO_x to NO₂ calculator v7.1 were used to convert the total NO_x concentrations to NO₂ concentrations. At the time of the Previous AQA, EFT v9.0 and the NO_x to NO₂ calculator v7.1, were the most up-to-date versions available.

The model was run using meteorological data from Heathrow Airport in the verification year of 2019. Traffic data was sourced from the LAEI and from the Department for Transport (DfT) and factored to the required years

using TEMPro. Defra background concentrations were used for the baseline year of 2019 and kept constant in the future year. Emissions are expected to reduce in the future but there are inherent uncertainties when predicting future emissions. Keeping the emission factors constant at the baseline year was therefore considered to be a conservative approach.

Full details of the air quality modelling methodology are provided in Appendix 3.

The following scenarios were modelled:

- Base year traffic data (2019) with 2019 emission factors and background concentrations;
- Future year traffic data (2023) with 2019 emission factors and background concentrations;

Future year traffic data was factored to the year 2023 using TEMPro to account for the changes in traffic as a result of other consented schemes in the vicinity of the Site. This approach considered the cumulative impacts of the Amended Proposed Development and other consented schemes on local air quality.

The proposed sensitive receptors are located at the road facing façades of the Amended Proposed Development where concentrations are expected to be greatest.

Predicted concentrations for NO₂, PM₁₀ and PM_{2.5} in the earliest expected opening year of 2023 are shown in Table 7.

The predicted concentrations include the contributions from road traffic and existing background concentrations and have been modelled at 14 proposed sensitive receptors. The locations of the proposed sensitive receptors are provided in Table 3 and shown in Figure 2.

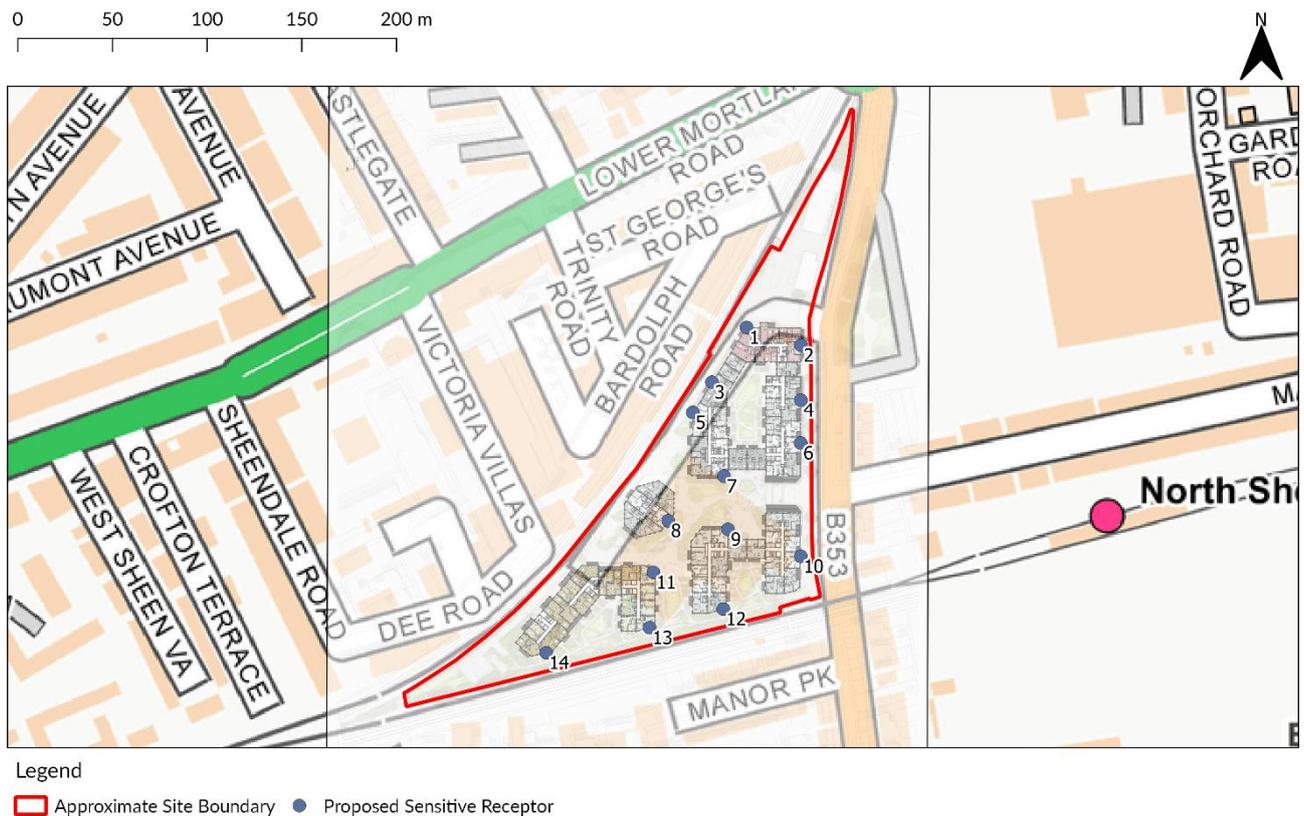


Figure 2 Location of proposed sensitive receptors. Contains OS Data © Crown Copyright and Database rights 2022.

Table 3 Modelled Proposed Sensitive Receptors within the Site boundary.

Receptor ID	Receptor Location	Grid Reference		Height (m)	Receptor Type
		X	Y		
1	Block A- NW	518931	175539	1.5, 5.7, 9	Residential
2	Block A- NE	518959	175530	1.5, 5.7, 9	Residential
3	Block A- W Central	518912	175510	1.5, 5.7, 9	Residential
4	Block A- E Central	518959	175501	1.5, 5.7, 9	Residential
5	Block A- SW	518959	175478	1.5, 5.7, 9	Residential
6	Block A- SE	518902	175494	1.5, 5.7, 9	Residential
7	Block A- S	518919	175460	1.5, 5.7, 9	Residential
8	Block B	518889	175437	1.5, 5.7, 8.9	Residential
9	Block D- NW	518921	175432	1.5, 5.0, 8.2	Residential
10	Block D- E	518959	175418	1.5, 5.0, 8.2	Residential
11	Block C- NE	518881.4	175409.2	1.5, 5.0, 8.2	Residential
12	Block D- SW	518918.3	175389.8	1.5, 5.0, 8.2	Residential
13	Block C- SE	518879.5	175379.8	1.5, 5.0, 8.2	Residential
14	Block C- SW	518824.8	175366.6	1.5, 5.0, 8.2	Residential

3.4.3 Air Quality Neutral Assessment

To enable the implementation of the air quality neutral policy of the LPG, emission benchmarks have been developed for buildings and transport, the latter of which are dependent on the zone in London where the Amended Proposed Development is located. Developers are required to calculate emissions due to building operations and transport, and to compare these emissions to the benchmarks set out in the Air Quality Neutral LPG²⁵.

Where the Amended Proposed Development’s emissions exceed the benchmarks, on-site mitigation is required. Where emissions continue to exceed the benchmarks after appropriate on-site mitigation, the excess emissions need to be off-set off-site through agreement with the local planning authority.

3.5 Assessment of Significance.

3.5.1 Construction Dust

The GLA guidance²⁴ on the assessment of dust from demolition and construction states that the primary aim of the risk assessment is to identify site specific mitigation that, once implemented, should ensure that there will be no significant effect. Therefore, the assessment has been used to determine an appropriate level of mitigation for the construction phase.

The determination of which mitigation measures are recommended include elements of professional judgement and the professional experience of the consultants preparing this report is set out in Appendix 2.

3.5.2 Operational Impacts

The EPUK and IAQM guidance²³ has been used to assess the potential for significant impacts as a result of vehicle emissions from traffic associated with the Amended Proposed Development. The focus of the guidance is to assess traffic emission impacts and advises on how to describe the air quality impacts and their significance.

3.5.3 Site Suitability Assessment

To determine the significance of predicted air quality impacts based upon a Site Suitability Assessment, the EPUK and IAQM guidance states:

“Where the air quality is such that an air quality objective at the building façade is not met, the effect on residents or occupants will be judged as significant, unless provision is made to reduce their exposure by some means.”

Additionally, as stated in The London Plan 2021,

“The Mayor is committed to making air quality in London the best of any major world city, which means not only achieving compliance with legal limits for Nitrogen Dioxide as soon as possible and maintaining compliance where it is already achieved, but also achieving World Health Organisation targets for other pollutants such as Particulate Matter.”

As such, pollutants will also be assessed against WHO guidelines when determining the suitability of the Site for its proposed use.

It should be noted that, based on recent advice from the GLA, mitigation measures against PM concentrations are not recommended for the sole purpose of meeting the WHO guidelines. This is due to the energy penalties associated with the installation, operation and maintenance of this filtration which, in the absence of any other objective exceedances, is not considered to be appropriate. PM concentrations exceed the WHO guideline across London and regional measures to reduce concentrations (being principally delivered by the GLA) are considered more appropriate than mitigation at individual developments.

4. Baseline Environment.

This section sets out the available information on air quality in the vicinity of the Site.

4.1 Site Setting.

The Site is located within LBRuT's administrative area at the approximate NGR: X 518910, Y 175430.

The Site is bound to the east by Manor Road (B353) and to the west and the south by overground railway lines. The area surrounding the Site largely consists of residential dwellings and commercial properties, as well as various schools and nurseries.

The Site was formerly occupied by a Homebase branch and associated surface car park.

4.2 Local Air Quality Management Review and Assessment.

From review of LBRuT's recent ASRs^{30,31}, NO₂ concentrations within LBRuT's administrative area continue to show widespread exceedance of the AQOs for NO₂, however a slight downward trend in NO₂ concentrations has been observed from 2017 onwards. PM₁₀ concentrations are below the annual mean AQO, but concentrations of PM₁₀ are not decreasing year on year. PM_{2.5} concentrations are not currently being monitored within LBRuT. The whole of LBRuT has been declared an AQMA for high concentrations of NO₂ and PM₁₀.

Additionally, based on the available monitoring data, during the onset of the COVID-19 pandemic, average reductions in NO₂ at automatic monitoring sites and passive diffusion tube monitoring locations in LBRuT from 2019 to 2020 were approximately 27% and 18% respectively. The percentage reductions in pollutant concentrations during both 2020 and 2021 are directly attributable to reduced traffic levels as a result of Government implemented lockdowns. As such, the pollutant concentrations recorded at monitoring stations in 2020 and 2021 are not considered to be representative of "normal" air quality conditions. Whilst it is expected that as a result of the COVID-19 pandemic that behaviours will change in the future, the impact of this on air quality long-term is currently unknown and therefore the use of 2020 and 2021 data has been omitted from this assessment however has been shown in the report for information.

4.3 Local Air Quality Monitoring.

The UK Automatic Urban and Rural Network (AURN) is a countrywide network of air quality monitoring stations operated on behalf of Defra. Monitoring data for AURN sites is available from the UK Air Information Resource website (UK AIR). The closest AURN to the Site is Teddington AURN. However, owing to the presence of other automatic monitoring locations closer to the Site and that are likely to be more representative of air quality at the Site, monitoring data from Teddington AURN has not been included in this baseline review.

As of 2021, LBRuT operate three automatic monitoring locations within the administrative area. Monitoring data from three automatic monitoring locations in LBRuT (all within 4 km of the Site boundary) has been included in the baseline section of this air quality addendum for robustness, although monitoring at the Chertsey Road mobile site ceased in 2019. Furthermore, within 4 km of the Site boundary are three additional automatic monitoring locations, located in LBH and monitoring data from these locations has also been considered.

LBRuT's main roadside automatic monitoring site is Castlenau Library, on the main road to Hammersmith Bridge. This road has been closed to all vehicles since 10th April 2019. Although technically a roadside site, in practice Castlenau Library has become more of a background site in recent years.

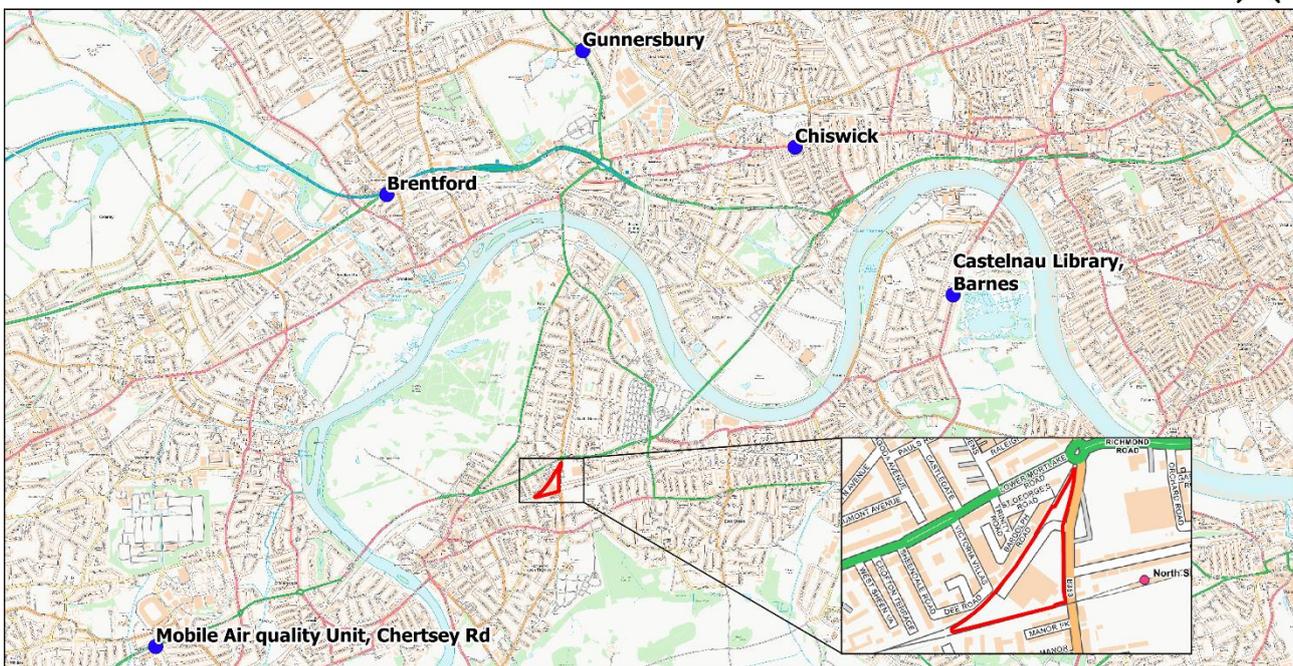
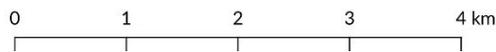
Recent monitoring data for the automatic monitoring stations is detailed in Table 4 and a visual representation of the locations of the automatic monitoring stations is shown in Figure 3.

Table 4: Automatic Monitoring Locations

Monitoring site and distance (km) from site boundary (approx.)	Objective	2015	2016	2017	2018	2019	2020	2021
NO₂								
Brentford, Roadside, 2.9 km, LBH	Annual mean (µg/m ³)	53	57	54	48	44	33	36
	Number of hours with concentrations >200 µg/m ³	0	7	12	0	0	0	0
Chiswick, Roadside, 3.5 km, LBH	Annual mean (µg/m ³)	45	50	53	47	42	32	33
	Number of hours with concentrations >200 µg/m ³	0	6	12	0	0	0	0
Mobile Air Quality Unit Chertsey Road, Roadside, 3.7 km, LBRuT	Annual mean (µg/m ³)	-	-	37	34	36	-	-
	Number of hours with concentrations >200 µg/m ³	-	-	0	0	0	-	-
Gunnersbry, Roadside, 3.7 km, LBH	Annual mean (µg/m ³)	53	59	53	45	45	37	36
	Number of hours with concentrations >200 µg/m ³	0	39	46	0	0	0	0
Castelnau Library, Roadside, 3.8 km, LBRuT	Annual mean (µg/m ³)	34	36	31	31	27	20	21
	Number of hours with concentrations >200 µg/m ³	0	0	0	0	0	0	0
PM₁₀								
Brentford, Roadside, 2.9 km, LBH	Annual mean (µg/m ³)	31	30	28	26	22	25	21
	Number of days with concentrations > 50 µg/m ³	30	28	24	4	8	9	3
Chiswick, Roadside, 3.5 km, LBH	Annual mean (µg/m ³)	22	22	20	20	20	21	16
	Number of days with concentrations > 50 µg/m ³	5	9	6	1	3	3	0
Mobile Air Quality Unit Chertsey Road, Roadside, 3.7 km, LBRuT	Annual mean (µg/m ³)	-	-	18	21	20	-	-
	Number of days with concentrations > 50 µg/m ³	-	-	1	1	8	-	-
Gunnersbry, Roadside, 3.7 km, LBH	Annual mean (µg/m ³)	25	27	27	22	20	22	21
	Number of days with concentrations > 50 µg/m ³	15	15	15	1	5	2	2
Castelnau Library, Roadside, 3.8 km, LBRuT	Annual mean (µg/m ³)	22	20	18	19	15	15	16
	Number of days with concentrations > 50 µg/m ³	5	7	4	1	3	0	0

PM _{2.5}								
Brentford, Roadside, 2.9 km, LBH	Annual mean (µg/m ³)	-	-	15	15	13	12	10
Chiswick, Roadside, 3.5 km, LBH	Annual mean (µg/m ³)	-	-	14	14	13	10	10

*Concentrations shown in **bold** represent exceedances of the relevant AQO. '-' denotes where monitoring data was not available, at the time of writing.



Legend

- Approximate Site Boundary
- Automatic Monitoring Location

Figure 3: Automatic Monitoring Locations within the vicinity of the Site. Contains OS Data © Crown Copyright and Database rights 2022.

The monitoring results indicate that at the roadside automatic monitoring stations located within LBH, there have been exceedances of the annual mean NO₂ AQO and the WHO guideline for NO₂ in every year between 2015 and 2019. However, at automatic monitoring stations within LBRuT, no exceedances of the annual mean NO₂ AQO and WHO guideline for NO₂ have been observed in recent years. No exceedances of the 1-hour mean NO₂ AQO have been observed at any of the automatic monitoring locations within 4 km of the Site boundary (in both LBRuT and LBH) from 2015 onwards.

Monitored concentrations of PM₁₀ and PM_{2.5} are below the respective annual mean AQOs and there are no exceedances of the 24-hour mean PM₁₀ AQO in recent years. In 2019 there were exceedances of the WHO guideline for PM₁₀ at three out of the four automatic monitors in operation, and exceedances of the WHO guideline for PM_{2.5} at one of the two automatic monitors that monitored PM_{2.5} concentrations in 2019.

In 2021, LBRuT operated 63 passive diffusion tubes to monitor NO₂ concentrations. A review of the most recent monitoring data available indicated that there are 12 passive diffusion tube monitoring locations within 1 km of the Site boundary. Recent monitoring results are shown in Table 5 and the passive diffusion tube monitoring locations are illustrated in Figure 4.

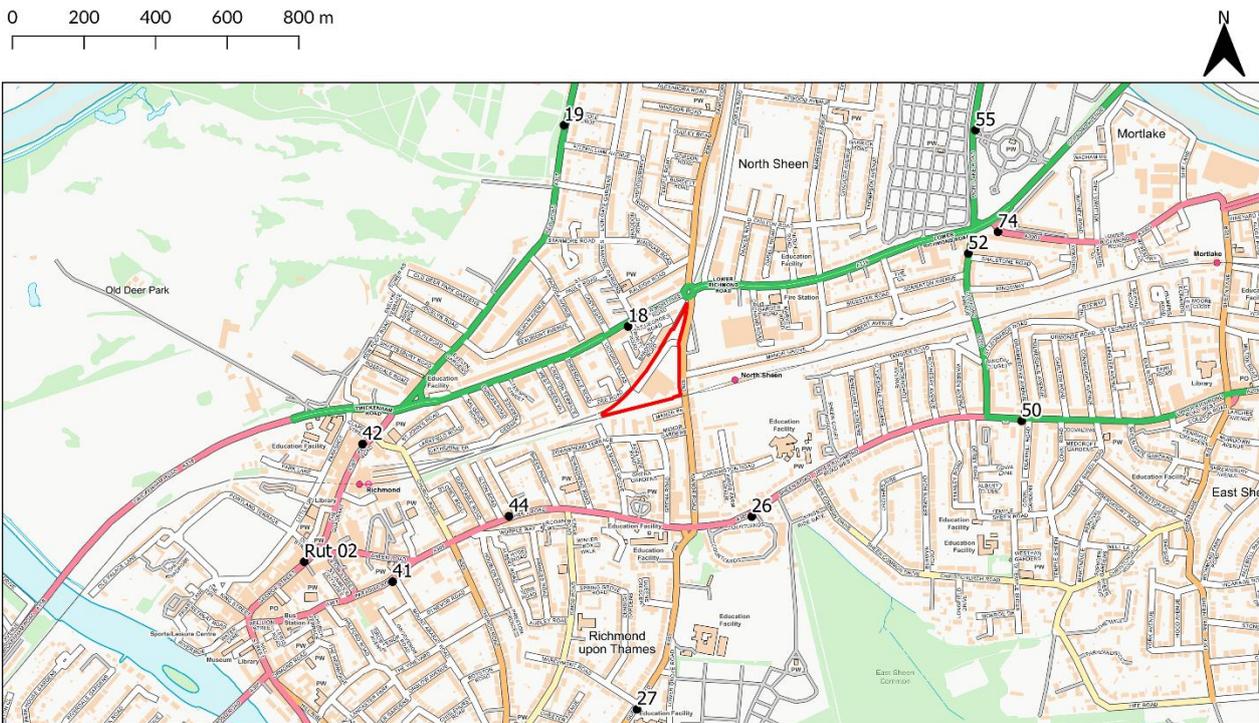
Table 5 details the monitoring results for all passive diffusion tube monitoring locations for the most recent years available.

Table 5: Passive Diffusion Tube Monitoring Results

Site	Site Type	Site Name	Distance (km) from site (approx.)	2015	2016	2017	2018	2019	2020	2021
18	Roadside	Lower Mortlake Road	0.1	67	56	58	46	46	41	39
44	Kerbside	Sheen Road	0.4	39	42	41	40	37	33	32
26	Roadside	URWW Sheen	0.4	40	40	36	36	34	32	33
42	Roadside	The Quadrant/Kew Rd	0.7	47	82	89	72	62	60	54
19	Roadside	Kew Rd	0.7	48	49	49	42	37	30	28
52	Kerbside	Clifford Av	0.8	55	57	50	59	55	46	45
41	Kerbside	Paradise Rd	0.8	38	39	36	34	32	-	-
55	Kerbside	Mortlake Road	0.9	50	50	45	41	40	33	29
74	Kerbside	Lower Richmond Rd	0.9	37	39	36	50	52	43	44
Rut 02	Kerbside	George Street	0.9	88	96	82	72	63	52	55
50	Kerbside	URWW nr Clifford Av	1.0	57	55	53	52	50	45	46
27	Roadside	Queens Rd	1.1	37	43	41	37	32	21	23

*Concentrations shown in **bold** represent exceedance of the annual mean NO₂ AQO, whilst concentrations also underlined represent likely exceedances of the 1-hour mean NO₂ AQO. '-' denotes were monitoring data was not available, at the time of writing.

0 200 400 600 800 m



Legend

- Approximate Site Boundary
- Passive Diffusion Tube Monitoring Location

Figure 4: Passive Diffusion Tube Monitoring Locations within the vicinity of the Site. Contains OS Data © Crown Copyright and Database rights 2022.

As shown in Table 5 above, in 2019, the most recent year with available representative monitoring data, exceedances of the annual mean NO₂ AQO and WHO guideline for NO₂ were recorded at six of the twelve passive diffusion tube monitoring locations within 1 km of the Site boundary.

An annual mean concentration of 60 µg/m³ or above is often used to indicate a possible exceedance of the 1-hour mean NO₂ AQO. In 2019, the most recent year with available representative monitoring data, a likely exceedance of the 1-hour mean NO₂ AQO was recorded at two nearby passive diffusion tube monitoring locations, but not at passive diffusion tube monitoring location 18 (lower Mortlake Road), the closest passive diffusion tube monitoring location to the Site.

4.3.1 Regression Analysis

To understand whether air quality is improving in LBRuT, a five-year regression analysis has been undertaken on average annual mean NO₂ concentrations recorded at all passive diffusion tube monitoring locations with 5 years' worth of data within LBRuT's administrative area between 2015 and 2019, as shown Figure 5 below.

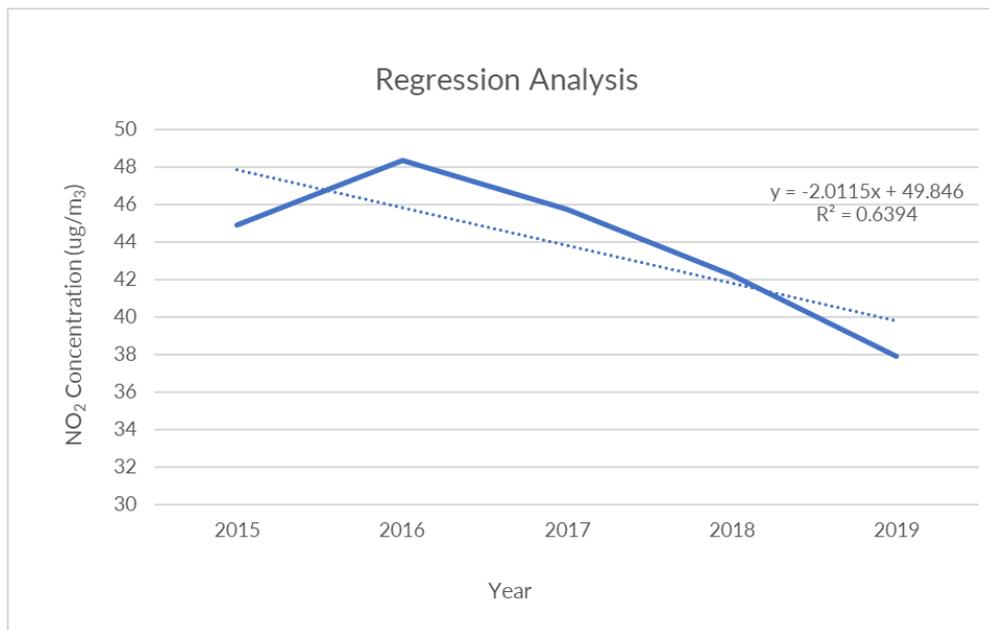


Figure 5: Regression Analysis of monitored NO₂ concentrations recorded at passive diffusion tube monitoring locations within LBRuT, with 5 years' worth of data from 2015 to 2019.

The regression analysis has shown an average decrease in NO₂ concentrations within LBRuT of 2 µg/m³ per year. However, this trend is not statistically significant.

4.4 Industrial Pollution.

A desk-based review of potential industrial sources using the UK Pollutant Release and Transfer Register³³ and the Pollution Inventory³⁵ from the Environment Agency identified two potential source of industrial pollution within 2 km of the Site.

From Townmead Civic Amenity Site there has been no pollutant release to air from 2015 onwards. At Mogden STW, there have been no pollutant release to air recorded from 2018 onwards. Prior to this, the release of methane to air was recorded. As such, owing to the distance of Mogden STW from the Site, and the pollutant type released, this industrial/waste management source of air pollution is not likely to affect the Site with regard to air quality, nor is Townmead Civic Amenity Site.

Table 6: Industrial/Waste Management Sources of Air Pollution within 2 km of the Site from 2015 onwards.

Source Name	Source Type	Air Pollutant Release
Mogden STW	Urban waste-water treatment	Methane (CH ₄) prior to 2019
Townmead Civic Amenity Site	Treatment and disposal of non-hazardous waste	No release to air

4.5 Defra Predicted Concentrations.

The background concentrations have been obtained from the national maps published by Defra³⁴. These estimated concentrations are produced on a 1 km by 1 km grid basis for the whole of the UK. The Site falls into grid square X 518500 Y 175500 and the predicted concentrations for this grid square for NO₂, PM₁₀ and PM_{2.5} are provided in Table 7 for 2019, the most recent year with available monitoring data, and for 2023, the current year and earliest anticipated opening year for the Amended Proposed Development.

Table 7: Predicted Background Concentrations

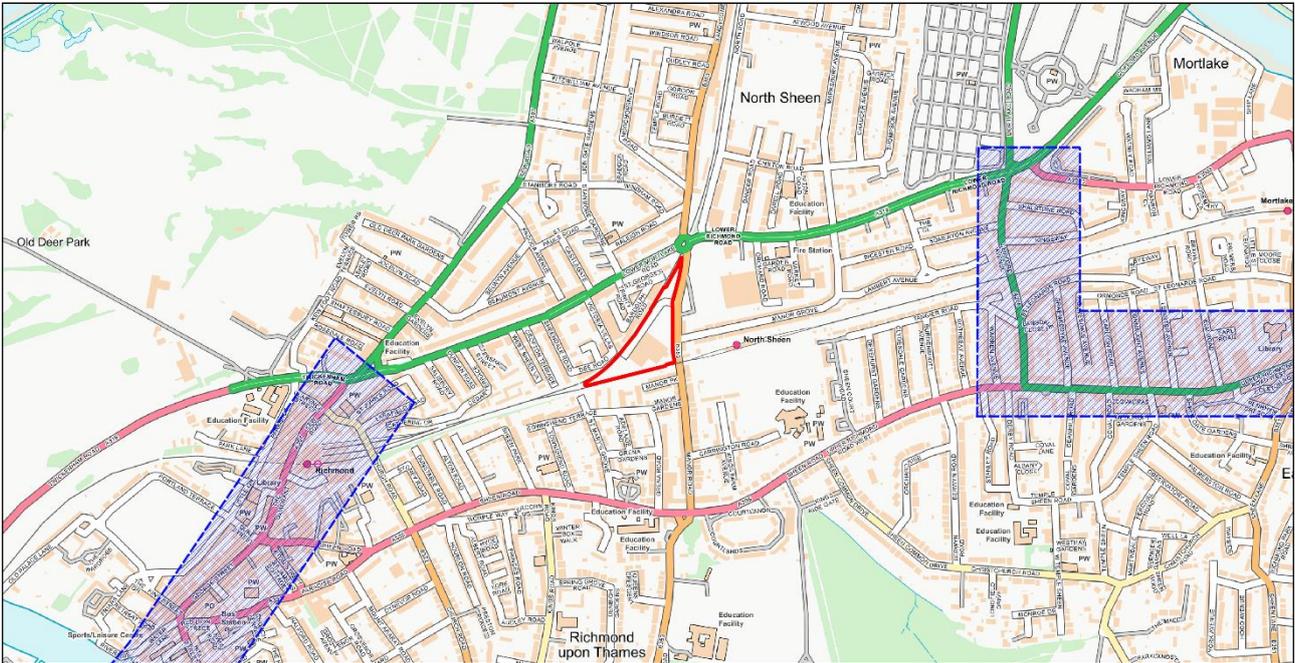
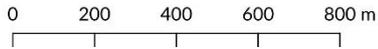
Year	Predicted Background Concentration (µg/m ³)		
	NO ₂	PM ₁₀	PM _{2.5}
2019	23.1	17.1	11.9
2023	19.3	16.3	11.3

As shown in Table 7, background concentrations are below the relevant annual mean AQOs for all pollutants. The predicted concentrations of NO₂ and PM₁₀ are also below the respective WHO guidelines. However, the predicted concentrations of PM_{2.5} are in exceedance of the WHO guideline for PM_{2.5} in both years. This shows that exceedances of the WHO guideline for PM_{2.5} are a wider issue, and not specific to the Site or the Amended Proposed Development.

4.6 Greater London Authority.

4.6.1 Air Quality Focus Areas

AQFAs³⁹ are locations that not only exceed the annual mean limit value for NO₂ but are also locations with high human exposure. As shown in Figure 6, the Site is located in proximity to two AQFAs. “Richmond Town Centre including Bridge St” AQMA is located approximately 420 m to the west of the Site, and “Richmond Chalker’s Corner/Clifford Av/A205/Upper Richmond Rd/Milestone Green” AQMA is approximately 720 m to the east.



Legend

- Approximate Site Boundary
- Air Quality Focus Area

Figure 6: Air Quality Focus Areas in the Vicinity of the Site. Contains OS Data © Crown Copyright and Database rights 2022.

4.6.2 LAEI Pollution Maps

The GLA produce LAEI annual mean concentration maps for the whole of London on a 20 m by 20 m grid for a historic year (2019)⁴⁰.

Figure 8, Figure 9, and Figure 10 illustrate the annual mean NO₂, PM₁₀ and PM_{2.5} concentrations in the immediate area of the Site for 2019.



Figure 7: Modelled 2019 Annual Mean NO₂ Concentrations (GLA, 2019). Contains OS Data © Crown Copyright and Database rights 2022.



Figure 8: Modelled 2019 Annual Mean PM₁₀ Concentrations (GLA, 2019). Contains OS Data © Crown Copyright and Database rights 2022.

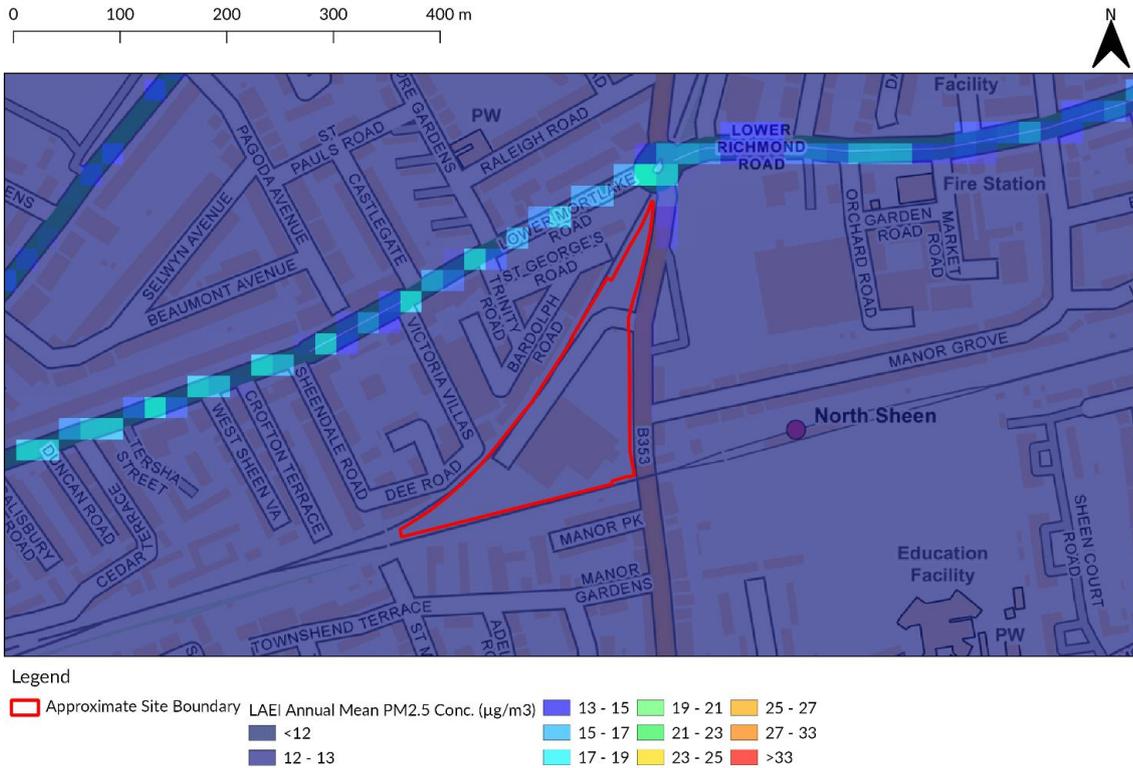


Figure 9: Modelled 2019 Annual Mean PM_{2.5} Concentrations (GLA, 2019). Contains OS Data © Crown Copyright and Database rights 2022.

The worst case concentrations of key pollutants have been taken from the eastern boundary of the Site, just north of the junction between Manor Road and the Homebase access road in 2019 and are shown in Table 8 for the Site.

Table 8: Annual mean concentrations of NO₂, PM₁₀ and PM_{2.5}

Year	Pollutant Concentration - (µg/m ³)		
	NO ₂	PM ₁₀	PM _{2.5}
2019	35.9	20.5	11.9

Table 8 above shows that the 2019 predicted pollutant concentrations are below the respective AQOs for all pollutants. Although there is no modelled exceedance of the WHO guideline for NO₂ at the Site, exceedances of the WHO guidelines for PM₁₀ and PM_{2.5} are predicted. This shows that exceedances of the WHO guidelines for PM are a wider issue, and not specific to the Site or the Amended Proposed Development.

4.7 Summary of Baseline Data.

The Site is located within Richmond AQMA and in proximity to two AQFAs.

Automatic monitoring data indicates exceedances of the annual mean NO₂ AQO and WHO guideline for NO₂, but not of the 1-hour mean NO₂ AQO. Passive diffusion tube monitoring in the vicinity of the Site also indicates exceedances of the annual mean NO₂ AQO and WHO guideline for NO₂.

Monitored concentrations of PM₁₀ and PM_{2.5} are below the respective annual mean AQOs and there have been no exceedances of the 24-hour mean PM₁₀ AQO in recent years. In 2019 there were multiple exceedances of the WHO guidelines for PM₁₀ and PM_{2.5} at nearby automatic monitors in operation.

Defra predicted background concentrations are below the relevant AQOs for all pollutants. The predicted concentrations of NO₂ and PM₁₀ are also below the respective WHO guidelines, but concentrations of PM_{2.5} are not.

LAEI 2019 modelled pollutant concentrations are below the respective AQOs for all pollutants. Although there is no modelled exceedance of the WHO guideline for NO₂ at the Site, exceedances of the WHO guidelines for PM₁₀ and PM_{2.5} are predicted.

As evidenced by the local monitoring data, Defra predicted background concentrations, and LAEI modelled concentrations of PM_{2.5} in the vicinity of the Site, exceedances of the WHO guideline for PM_{2.5} are a borough-wide (and London wide) issue, and not specific to the Site or the Amended Proposed Development.

There are no sources of industrial/waste management pollution that are likely to impact air quality at the Site.

5. Construction Phase Assessment.

The potential for air quality impacts during the construction of the Amended Proposed Development are assessed in this section.

5.1 Construction Phase Dust Assessment.

The risk of dust impacts is based on the potential dust emissions magnitude and the sensitivity of the area. These two factors are then combined to determine the risk of dust impacts with no mitigation applied. In the absence of any site-specific information, a higher risk category has been applied to represent a worst case scenario.

5.1.1 Assessment Screening

There are 'human receptors' within 50 m of the Site but no designated habitat sites within 50 m of the Site boundary or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the Site entrance. The closest ecological receptor to the Site is Richmond Park, a Special Area of Conservation located approximately 1 km to the south of the Site.

Therefore, an assessment of construction dust at human receptors is required, but an assessment of construction at ecological receptors can be screened out from this assessment.

5.1.2 Potential Dust Emission Magnitude

The potential magnitude of dust emissions from demolition, earthworks, construction and trackout have been assessed, as identified in Table 9.

Table 9: Predicted Magnitude of Dust Emissions

Activity	Magnitude	Justification
Demolition	Medium	The total building volume to be demolished is expected to be between 20,000 m ³ and 50,000 m ³ , with potentially dusty materials, such as concrete. The potential dust emission magnitude from demolition activities would therefore be considered medium in line with GLA guidance.
Earthworks	Large	The Site is large at approximately 15,000 m ² , and there will be considerable earthworks proposed to include a basement in Blocks A and D. The soil type at the Site is Loamy ⁴¹ . The potential dust emission magnitude from earthworks activities would therefore be considered large in line with GLA guidance.
Construction	Large	The total building volume of the Amended Proposed Development is likely to be over 100,000 m ³ . The construction materials will be mainly concrete and masonry, which have potential for high dust release. The potential dust emission magnitude from construction activities would therefore be considered large in line with GLA guidance.
Trackout	Medium	It is expected that there will be an average of 10-50 HDV trips generated during the construction phase per day. There may be short distances of unpaved road proposed as part of the Amended Proposed Development. Given the dimensions of the Site, the unpaved roads are likely to be between 50 m to 100 m in length. The potential dust emissions magnitude from trackout would therefore be considered medium in line with GLA guidance.

5.1.3 Sensitivity of the Study Area

The sensitivity of the area takes into account the following factors:

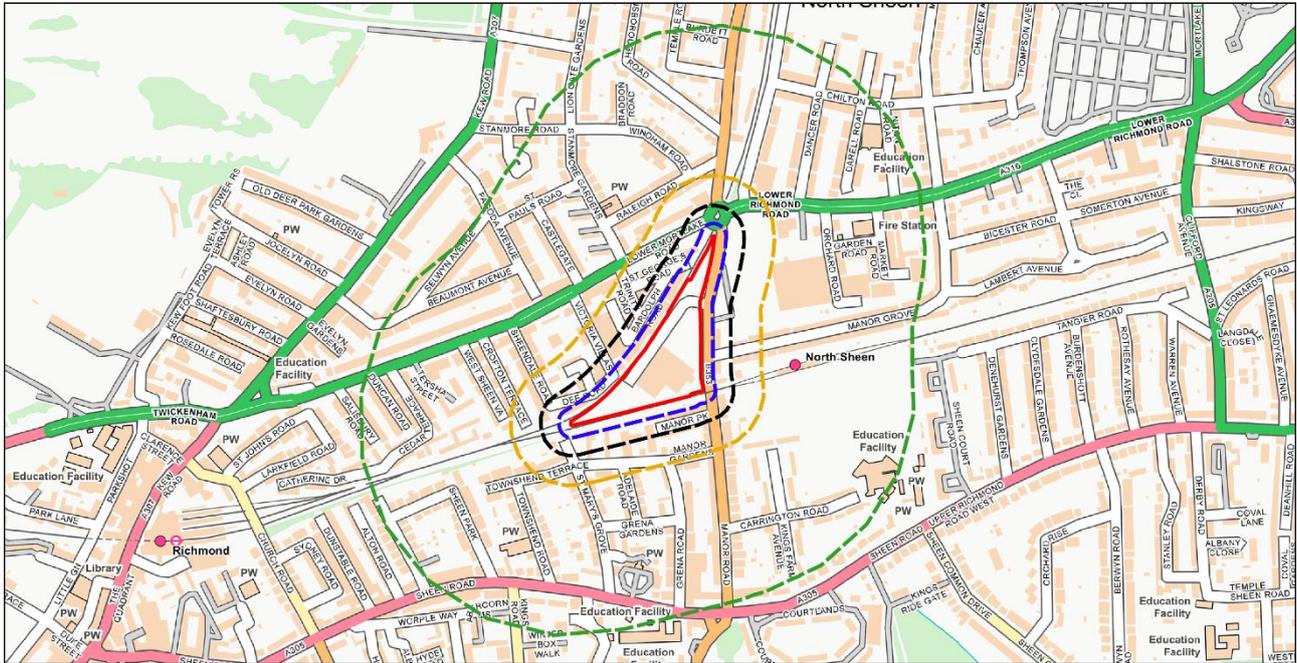
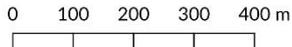
- The specific sensitivities of receptors in the area;
- The proximity and number of those receptors;
- In the case of PM₁₀, the local background concentration; and

- Site-specific factors, such as whether there are natural shelters, such as trees or other vegetation, to reduce the risk of wind-blown dust.

The sensitivity of the area and the factors considered are detailed in Table 10.

Table 10: Sensitivity of the Area

Sensitivity Type	Factors	Sensitivity of Area	
		On – Site Activity	Trackout
Dust Soiling	<p>Within 20 m of the Site boundary are between 1-10 residential dwellings, classified as high sensitivity receptors. Within 50 m of the Site boundary are over 100 residential dwellings, between 10-100 car parking spaces, and numerous commercial properties. All receptors within 350 m of the Site, including residential dwellings, schools, car parks, and commercial properties have been considered.</p> <p>For trackout, the distances are measured from the side of the roads used by construction traffic. Without site specific mitigation, trackout may occur from roads up to 200m from medium development sites such as this, as measured from the Site exit, and up to 50m from the edge of the road. There are between 10-100 high sensitivity receptors within 20 m of the surrounding road network. The sensitivity of the area in regard to dust soiling from trackout is therefore high.</p>	Medium	High
Human Health	<p>In 2019, the most recent year with available representative monitoring data, the PM₁₀ concentrations recorded at all automatic monitoring locations within 4 km of the Site were below 24 µg/m³. LAEI modelled concentrations for 2019 were also below 24 µg/m³. As such, although there are 1-10 residential dwellings within 20 m of the Site boundary, the sensitivity of the area in regard to human health can be regarded as low, in line with GLA guidance.</p> <p>For trackout, the distances are measured from the side of the roads used by construction traffic. Without site specific mitigation, trackout may occur from roads up to 200m from medium development sites such as this, as measured from the Site exit, and up to 50m from the edge of the road. There are between 10-100 high sensitivity receptors within 20 m of the surrounding road network. However, owing to the likelihood of PM₁₀ concentrations being below 24 µg/m³, the sensitivity of the area in terms of human health and in regard to dust soiling from trackout is considered low.</p>	Low	Low



Legend

- Approximate Site Boundary
- 20m from Site
- 50m from Site
- 100m from Site
- 350m from Site

Figure 10: GLA Demolition and Construction Dust Distance band criteria from the Site boundary. Contains Ordnance Survey Data © Crown Copyright 2022.

5.1.4 Risk of Dust Impacts

The outcomes of the assessments of potential magnitude of dust emissions and the sensitivity of the area are combined to determine the risk of impact. This risk is then used to inform the selection of appropriate mitigation. Table 11 details the risk of dust impacts for demolition, earthworks, construction and trackout activities.

Table 11: Summary of Potential Unmitigated Dust Risks

Potential Impact	Sensitivity	Demolition	Earthworks	Construction	Trackout
Magnitude		Medium	Large	Large	Medium
Dust Soiling Impacts	Medium (High for trackout)	Medium Risk	Medium Risk	Medium Risk	Medium Risk
Human Health Impacts	Low	Low Risk	Low Risk	Low Risk	Low Risk

5.2 Construction Phase – Vehicular Pollutants.

Information on traffic movements anticipated during construction works was unavailable for the completion of the air quality addendum. However, the development quantum is not anticipated to result in a significant increase in movements above the EPUK and IAQM criterion. The duration of movements will be short-term in nature and are not considered further within the context of this assessment. Therefore, in accordance with the criterion presented within EPUK and IAQM guidance, additional road vehicle trips during the construction phase of the Amended Proposed Development “can be considered to have insignificant effects” on air quality.

5.3 Construction Phase – Non-road Mobile Machinery.

Pollutants emitted by NRMM that may have the most significant potential effects on local air quality are PM₁₀, PM_{2.5}, and NO_x/NO₂. Typically, NRMM is associated with construction sites and, therefore there is a potential for NRMM emissions to adversely affect local air quality as a result of the Amended Proposed Development.

The London Environment Strategy guidance¹⁴ states that “Emissions from NRMM construction and maintenance activities will, where appropriate, meet or exceed the standards set out by the NRMM Low Emission Zone” and, as such, emissions from NRMM will be controlled at the Site.

Furthermore, IAQM guidance states that “Experience of assessing the exhaust emissions from on-site plant (also known as non-road mobile machinery or NRMM) and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed.”

5.4 Manor Circus Improvement Works.

The Manor Circus improvement works will require its own construction phase mitigation measures and it has been assumed that these will be implemented, therefore reducing the off-site construction phase impacts to negligible for this development. As such, the Manor Circus improvement works should not pose additional concerns in regard to the risk of impacts from dust.

6. Operational Phase Assessment.

The potential for air quality impacts during the operation of the Amended Proposed Development are assessed in this section.

6.1 Road Traffic Emissions Screening Assessment.

Road traffic data associated with the Amended Proposed Development has been provided by Sanderson Associates, the appointed Transport Consultants for the project.

Traffic information provided indicates that the existing development has AADT flows of 1779 LDVs and HDVs. The AADT flows for the Amended Proposed Development are expected to decrease to 679 along the local road network. Therefore, there will be an overall net AADT reduction of 1100 LDVs and HDVs on the local road network as a result of the Amended Proposed Development.

As there is a reduction in traffic compared to the existing use, there are not expected to be impacts on local air quality or any cumulative impacts as a result of the traffic generated by the Amended Proposed Development and other consented schemes. Given the reduction in traffic associated with the operation of the Amended Proposed Development, the Amended Proposed Development will contribute to an improvement in air quality. Therefore, no further assessment is required.

In accordance with the EPUK and IAQM guidance, the impacts on air quality from operational phase traffic generation are considered to be not significant.

6.2 Site Suitability.

The future year (2023) with baseline (2019) emission factors and background concentrations has been used for the Site Suitability Assessment as this will give a precautionary prediction of onsite concentrations.

The emissions factors and background concentrations used for the air quality modelling carried out in the Previous AQA [REP-Air Quality-1010539-5A-20200730-Manor Road-R01] were from 2019. Emissions are expected to reduce in the future and background concentrations of the pollutants considered are also expected to decrease. NO_x concentrations are likely to be impacted (and reduce) as a result of the expected transition to hybrid and fully electric vehicles. As such, owing to the emission factors and background concentrations used in the Previous AQA, the previous Site Suitability Assessment can be considered worst case. As such, the conclusions drawn from the Site Suitability Assessment in the Previous AQA are still valid and can be viewed as conservative in nature. The results of the modelling carried out in the Previous AQA are shown below in Table 12, Table 13 and Table 14.

Table 12, Table 13 and Table 14 show the modelled pollutant concentrations at ground floor, first floor and second floor proposed sensitive receptors. Ground level proposed sensitive receptors represent worst case locations as they are the closest to the road source of emissions. The highest concentration for each proposed sensitive receptor is recorded on the ground floor.

As presented in section 2 in line with LLAQM.TG(19)⁷ the annual mean AQOs for NO₂, PM₁₀ and PM_{2.5} apply, along with the 1-hour NO₂ AQO and the 24-hour PM₁₀ AQO. The WHO guidelines for NO₂, PM₁₀ and PM_{2.5} will also apply. For NO₂, the WHO guideline is the same as the annual mean AQO of 40 µg/m³ and as such, modelled concentrations of NO₂ have been expressed as a percentage of the annual mean NO₂ AQO. For PM₁₀ and PM_{2.5}, the annual mean AQOs do not align with the respective WHO guidelines and as such, the modelled concentrations of PM₁₀ and PM_{2.5} have been expressed as both a percentage of the respective annual mean AQOs and the WHO guidelines. The AQOs and WHO guidelines for NO₂, PM₁₀ and PM_{2.5} are presented in Table 1 and Table 2, for reference.

6.2.1 NO₂

Annual mean NO₂ concentrations were predicted for the year of 2023 and are summarised in Table 12 below.

Table 12 Predicted concentrations of NO₂ in 2023 at proposed sensitive receptors.

Receptor	Level Height (m)	Total Conc. (µg/m ³)	Total Conc. Expressed as % of the AQO
1 - G	1.5	27.1	68
2 - G	1.5	28.1	70
3 - G	1.5	26.5	66
4 - G	1.5	27.7	69
5 - G	1.5	27.5	69
6 - G	1.5	26.3	66
7 - G	1.5	25.9	65
8 - G	1.5	25.6	64
9 - G	1.5	25.7	64
10 - G	1.5	27.1	68
11 - G	1.5	25.4	63
12 - G	1.5	25.4	64
13 - G	1.5	25.2	63
14 - G	1.5	25.1	63
1 - 1	5.7	26.6	67
2- 1	5.7	26.7	67
3- 1	5.7	26.2	65
4- 1	5.7	26.4	66
5- 1	5.7	26.2	66
6- 1	5.7	26.0	65
7- 1	5.7	25.7	64
8- 1	5.7	25.4	64
9- 1	5	25.5	64
10- 1	5	26.1	65
11- 1	5	25.3	63
12- 1	5	25.3	63
13- 1	5	25.1	63
14- 1	5	25.1	63
1 - 2	9	26.0	65
2- 2	9	25.8	64
3- 2	9	25.8	64
4- 2	9	25.6	64
5- 2	9	25.4	64
6- 2	9	25.6	64
7- 2	9	25.3	63
8- 2	8.9	25.2	63
9- 2	8.2	25.2	63
10- 2	8.2	25.3	63
11- 2	8.2	25.1	63

Receptor	Level Height (m)	Total Conc. ($\mu\text{g}/\text{m}^3$)	Total Conc. Expressed as % of the AQO
12- 2	8.2	25.0	63
13- 2	8.2	25.0	62
14- 2	8.2	25.0	62

The maximum annual mean NO₂ concentration was recorded at R2-G and was modelled as 28.1 $\mu\text{g}/\text{m}^3$, which represents 70% of the annual mean NO₂ AQO and WHO guideline for NO₂. NO₂ concentrations are therefore predicted to be below the annual mean NO₂ AQO of 40 $\mu\text{g}/\text{m}^3$ and therefore also below 60 $\mu\text{g}/\text{m}^3$, which is considered to be the annual mean concentration at which the 1-hour mean AQO for NO₂ may be exceeded. Therefore, both the annual mean and 1-hour mean NO₂ AQOs and the WHO guideline for NO₂ are likely to be met.

There are predicted to be no exceedances of the annual mean NO₂ AQO, nor WHO guideline for NO₂, at any proposed sensitive receptor on ground, first and second floor of the Amended Proposed Development and as such, no mitigation measures are required.

6.2.2 PM₁₀

Annual mean PM₁₀ concentrations were predicted for the year of 2023 and are summarised in Table 13 below.

Table 13 Predicted concentrations of PM₁₀ in 2023 at proposed sensitive receptors.

Receptor	Level Height (m)	Total Conc. ($\mu\text{g}/\text{m}^3$)	Total Conc. Expressed as % of the AQO	Total Conc. Expressed as % of the WHO guideline
1 - G	1.5	17.8	44	89
2 - G	1.5	17.9	45	90
3 - G	1.5	17.7	44	89
4 - G	1.5	17.9	45	90
5 - G	1.5	17.8	45	89
6 - G	1.5	17.6	44	88
7 - G	1.5	17.6	44	88
8 - G	1.5	17.5	44	88
9 - G	1.5	17.5	44	88
10 - G	1.5	17.8	44	89
11 - G	1.5	17.5	44	88
12 - G	1.5	17.5	44	88
13 - G	1.5	17.4	44	87
14 - G	1.5	17.4	44	87
1 - 1	5.7	17.7	44	89
2- 1	5.7	17.7	44	89
3- 1	5.7	17.6	44	88
4- 1	5.7	17.6	44	88
5- 1	5.7	17.6	44	88
6- 1	5.7	17.6	44	88
7- 1	5.7	17.5	44	88
8- 1	5.7	17.5	44	88
9- 1	5	17.5	44	88
10- 1	5	17.6	44	88

Receptor	Level Height (m)	Total Conc. ($\mu\text{g}/\text{m}^3$)	Total Conc. Expressed as % of the AQO	Total Conc. Expressed as % of the WHO guideline
11- 1	5	17.4	44	87
12- 1	5	17.4	44	87
13- 1	5	17.4	44	87
14- 1	5	17.4	44	87
1 - 2	9	17.6	44	88
2- 2	9	17.5	44	88
3- 2	9	17.5	44	88
4- 2	9	17.5	44	88
5- 2	9	17.5	44	88
6- 2	9	17.5	44	88
7- 2	9	17.5	44	88
8- 2	8.9	17.4	44	87
9- 2	8.2	17.4	44	87
10- 2	8.2	17.4	44	87
11- 2	8.2	17.4	44	87
12- 2	8.2	17.4	43	87
13- 2	8.2	17.4	43	87
14- 2	8.2	17.4	43	87

The maximum annual mean PM_{10} concentration was recorded at R2-G and R4-G and was modelled to be $17.9 \mu\text{g}/\text{m}^3$, which represents 45% of the annual mean PM_{10} AQO and 90% of the WHO guideline for PM_{10} . Based upon the maximum predicted annual mean PM_{10} concentration, this equates to 1 day when 24-hour mean PM_{10} concentrations may be greater than $50 \mu\text{g}/\text{m}^3$ and therefore, the number of exceedances is within the 35-day compliance limit of the 24-hour mean AQO.

There are predicted to be no exceedances of the annual mean and 24-hour mean PM_{10} AQOs, nor of the WHO guideline for PM_{10} , at any proposed sensitive receptor on ground, first and second floor of the Amended Proposed Development. As such, no mitigation measures are required.

6.2.3 $\text{PM}_{2.5}$

Annual mean $\text{PM}_{2.5}$ concentrations were predicted for the year of 2023 and are summarised in Table 14 below.

Table 14 Predicted concentrations of $\text{PM}_{2.5}$ in 2023 at proposed sensitive receptors.

Receptor	Level Height (m)	Total Conc. ($\mu\text{g}/\text{m}^3$)	Total Conc. Expressed as % of the AQO	Total Conc. Expressed as % of the WHO guideline
1 - G	1.5	12.3	49	123
2 - G	1.5	12.4	50	124
3 - G	1.5	12.2	49	122
4 - G	1.5	12.4	49	124
5 - G	1.5	12.3	49	123
6 - G	1.5	12.2	49	122
7 - G	1.5	12.2	49	122
8 - G	1.5	12.1	49	121
9 - G	1.5	12.1	49	121

Receptor	Level Height (m)	Total Conc. ($\mu\text{g}/\text{m}^3$)	Total Conc. Expressed as % of the AQO	Total Conc. Expressed as % of the WHO guideline
10 - G	1.5	12.3	49	123
11 - G	1.5	12.1	48	121
12 - G	1.5	12.1	48	121
13 - G	1.5	12.1	48	121
14 - G	1.5	12.1	48	121
1 - 1	5.7	12.2	49	122
2- 1	5.7	12.2	49	122
3- 1	5.7	12.2	49	122
4- 1	5.7	12.2	49	122
5- 1	5.7	12.2	49	122
6- 1	5.7	12.2	49	122
7- 1	5.7	12.1	49	121
8- 1	5.7	12.1	48	121
9- 1	5	12.1	48	121
10- 1	5	12.2	49	122
11- 1	5	12.1	48	121
12- 1	5	12.1	48	121
13- 1	5	12.1	48	121
14- 1	5	12.1	48	121
1 - 2	9	12.2	49	122
2- 2	9	12.1	49	121
3- 2	9	12.1	49	121
4- 2	9	12.1	48	121
5- 2	9	12.1	48	121
6- 2	9	12.1	49	121
7- 2	9	12.1	48	121
8- 2	8.9	12.1	48	121
9- 2	8.2	12.1	48	121
10- 2	8.2	12.1	48	121
11- 2	8.2	12.1	48	121
12- 2	8.2	12.1	48	121
13- 2	8.2	12.1	48	121
14- 2	8.2	12.1	48	121

* Percentages shown in bold indicate an exceedance of the respective guideline/objective

The maximum annual mean PM_{2.5} concentration was recorded at R2-G and was modelled to be 12.4 $\mu\text{g}/\text{m}^3$, which represents 50% of the annual mean PM_{2.5} AQO and 124% of the WHO guideline for PM_{2.5}. Therefore, the annual mean PM_{2.5} AQO is likely to be met. However, the modelled PM_{2.5} concentrations at all heights at each proposed sensitive receptor are in exceedance of the WHO guideline for PM_{2.5}.

There are predicted to be no exceedances of the annual mean AQO for PM_{2.5} at any proposed sensitive receptor on ground, first and second floor of the Amended Proposed Development. However, exceedances of the WHO guideline for PM_{2.5} are predicted at all modelled proposed sensitive receptors. Exceedances of the WHO guideline for PM_{2.5} are not as a result of the operation of the Amended Proposed Development, but instead a borough-wide (and London wide) issue, with monitoring data, Defra predicted background concentrations, and LAEI

modelled concentrations of PM_{2.5} all showing exceedances of the WHO guideline for PM_{2.5} in the vicinity of the Site.

6.2.4 Significance of Air Quality Impacts

To determine the significance of predicted air quality impacts based upon a Site Suitability Assessment, such as that undertaken as part of this assessment, the EPUK and IAQM guidance states:

“Where the air quality is such that an air quality objective at the building façade is not met, the effect on residents or occupants will be judged as significant, unless provision is made to reduce their exposure by some means.”

With regards to the Amended Proposed Development, the unmitigated impact significance associated with the Amended Proposed Development has been predicted in accordance with the stated assessment methodology. The following factors have been considered when providing justification:

- The Amended Proposed Development will not introduce any new sensitive receptor into an area of exceedance of the annual mean or 1-hour mean NO₂ AQOs, the WHO guideline for NO₂, the annual or 24-hour mean PM₁₀ AQOs, the WHO guideline for PM₁₀, nor the annual mean PM_{2.5} AQO, based upon detailed dispersion modelling; and
- The Amended Proposed Development may introduce new sensitive receptor exposure into an area of exceedance of the WHO guideline for PM_{2.5}, based upon detailed dispersion modelling. However, exceedances of the WHO guideline for PM_{2.5} are not as a result of the operation of the Amended Proposed Development, but instead a borough-wide (and London wide) issue, with monitoring data, Defra predicted background concentrations, and LAEI modelled concentrations of PM_{2.5} all showing exceedances of the WHO guideline for PM_{2.5} in the vicinity of the Site.

Based on recent advice from the GLA, mitigation measures against PM concentrations are not recommended for the purposes of meeting the WHO guidelines. This is due to the energy penalties associated with the installation, operation and maintenance of this filtration which, in the absence of any other objective exceedances, is not considered to be appropriate. PM concentrations exceed the WHO guideline across London and regional measures to reduce concentrations (being principally delivered by the GLA are considered more appropriate than mitigation at individual developments.

Based on the results of the above assessment, mitigation measures are not required for the operational phase of the Amended Proposed Development. As such, the overall effect is not considered to be significant.

6.3 Air Quality Neutral Assessment

6.3.1 Building Emissions

At the time of writing, the primary energy strategy for the Amended Proposed Development is expected to be all electric and therefore the Amended Proposed Development is considered to be air quality neutral for building emissions in line with the Air Quality Neutral LPG²⁵.

6.3.2 Transport Emissions

The input data for the calculation of the Total Benchmark Trip Rate is shown in Table 15.

Table 15: Calculation of Total Benchmark Trip Rate

Description		Value	Unit
A	Annual trip generation of the Amended Proposed Development for 'Residential' Use	168,995	Trips per year
B	Benchmark Trip Rate for 'Residential' Use- Outer London	447	Trips per year/m ²
C	Number of residential units	453	Units
D	Annual trip generation of the Amended Proposed Development for the 'Retail' use	78,840	Trips per year
E	Benchmark Trip Rate for 'Retail' Use- Outer London	216	Trips per year/m ²
F	Floor Area for 'Retail' Use	495	m ²
G	Total Benchmark Trip Rate	309,411	Trips per year
Total Annual Trip Rate for the Amended Proposed Development = A + D		247,835	Trips per year

Given that the total annual trip rate for the Amended Proposed Development is below the total benchmark trip rate, the Amended Proposed Development is considered to be air quality neutral in line with the Air Quality Neutral LPG²⁵.

Furthermore, given that the Amended Proposed Development will result in a net reduction in traffic when compared to the previous use of the Site, the Amended Proposed Development is likely to have a beneficial impact on local air quality.

7. Mitigation.

7.1 Construction Phase.

To mitigate the potential impacts during the construction phase it is recommended that mitigation measures as detailed in the GLA guidance are implemented. These mitigation measures have been carefully selected for the Amended Proposed Development and are based upon the dust risk categories outlined in Table 11 of this report.

It is recommended that LBRuT approve an Air Quality Dust Management Plan (AQDMP) prior to works commencing on site, and that this is implemented using an appropriately worded planning condition. Table 16 below details the measures that should be incorporated in the AQDMP. For general mitigation measures, which excludes those specifically targeted towards demolition, earthworks, construction and trackout (which are given towards the end of the table), medium risk measures have been applied as these represent the highest risk category determined in Table 11. This approach is consistent with the GLA guidance.

Table 16: Mitigation Measures

Issue	Mitigation Measure
Site Management	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
	Develop a Dust Management Plan.
	Display the name and contact details of person(s) accountable for air quality pollutant emissions and dust issues on the site boundary.
	Display the head or regional office contact information.
	Record and respond to all dust and air quality pollutant emissions complaints
	Make a complaints log available to the local authority when asked.
	Carry out regular site inspections to monitor compliance with air quality and dust control procedures, record inspection results, and make an inspection log available to the local authority when asked.
	Record any exceptional incidents that cause dust and air quality pollutant emissions, either on or off the site, and the action taken to resolve the situation is recorded in the log book.
	Increase the frequency of site inspections by those accountable for dust and air quality pollutant emissions issues when activities with a high potential to produce dust and emissions and dust are being carried out, and during prolonged dry or windy conditions.
Preparing and maintaining the site	Plan site layout: machinery and dust causing activities should be located away from receptors
	Erect solid screens or barriers around dust activities or the site boundary that are, at least, as high as any stockpiles on site.
	Fully enclosure site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
	Avoid site runoff of water or mud.
	Install green walls, screens or other green infrastructure to minimise the impact of dust and pollution.
	Keep site fencing, barriers and scaffolding clean using wet methods.

Issue	Mitigation Measure
	<p>Remove materials from site as soon as possible.</p> <p>Cover, seed or fence stockpiles to prevent wind whipping.</p> <p>Carry out regular dust soiling checks of buildings within 100 m of site boundary and cleaning to be provided if necessary</p> <p>Agree monitoring locations with the Local Authority.</p> <p>Where possible, commence baseline monitoring at least three months before phase begins.</p> <p>Put in place real-time dust and air quality pollutant monitors across the site and ensure they are checked regularly.</p>
Operating vehicle/ machinery and	<p>Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone</p> <p>Ensure all non-road mobile machinery (NRMM) comply with the standards set within this guidance.</p> <p>Ensure all vehicles switch off engines when stationary – no idling vehicles.</p> <p>Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where possible.</p> <p>Impose and signpost a maximum-speed-limit of 10mph on surfaced haul routes and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).</p> <p>Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.</p> <p>Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).</p>
Operations	<p>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.</p> <p>Ensure an adequate water supply on the site for effective dust/PM mitigation (using recycled water where possible).</p> <p>Use enclosed chutes, conveyors and covered skips</p> <p>Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.</p> <p>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.</p>
Waste management	<p>Avoid bonfires and burning of waste materials.</p> <p>Reuse and recycle waste to reduce dust from waste materials.</p>

Issue	Mitigation Measure
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.
	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.
	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.
	For smaller supplies of fine powder, materials ensure bags are sealed after use and stored appropriately to prevent dust.
Trackout	Regularly use a water-assisted dust sweeper on the access and local roads, as necessary, to remove any material tracked out of the site.
	Avoid dry sweeping of large areas.
	Ensure vehicles entering and leaving sites are securely covered to prevent escape of materials during transport.
	Record all inspections of haul routes, which are regularly damped down with fixed or mobile sprinkler systems and regularly cleaned.
	Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems and regularly cleaned.
	Inspect 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.
	Apply dust suppressants to locations where a large volume of vehicles enter and exit the construction site.

Potential dust effects during the construction phase are considered to be temporary in nature. The impacts are determined to be temporary as they will only potentially occur throughout the construction phase and short-

term because these will only arise at particular times when certain activities and meteorological conditions for creating the level of magnitude predicted combine.

However, with the application of the above dust control and mitigation measures, it is considered that impacts at all receptors will be 'not significant' in accordance with the GLA guidance.

7.1.1 Construction Phase Road Traffic Emissions

Potential air quality impacts associated with construction phase road traffic emissions, principally HDV movements, have been screened out for further assessment with associated impacts on air quality predicted to result in an 'insignificant' effect. Therefore, mitigation measures are not considered to be required.

7.1.2 Construction Phase NRMM Emissions

In accordance with Part 4 of the IAQM Control of Dust and Emissions guidance, all NRMM would need to adhere to the emissions standards for NO₂ and PM₁₀ set out for NRMM. It is therefore considered the likely effects of construction plant on local air quality would be insignificant.

7.2 Operational Phase.

7.2.1 Road Traffic Emissions

Potential air quality impacts associated with operational phase development trips have been screened out from further assessment as 'the impacts [on air quality from operational phase movements] can be considered to have insignificant effects' in accordance with the EPUK and IAQM Guidance. Although the effect is considered 'insignificant', owing to a net reduction in traffic as a result of the Amended Proposed Development when compared to its previous use, the impact on local air quality is likely to be beneficial. Therefore, mitigation measures such as a sustainable travel plan are not considered to be required.

Although no measures are required to mitigate the impacts of the air quality from the Amended Proposed Development, electric vehicle charge points will be provided as part of the scheme in line with the draft London Plan. This will require provision of active charging at 20% of parking spaces and passive provision at the remaining 80% of parking spaces.

7.2.2 Site Suitability Assessment

There are not expected to be any exceedances of the relevant AQOs at any proposed sensitive receptor at ground floor, first floor and second floor within the Site and therefore no mitigation is required.

There are also not expected to be exceedances of the WHO guidelines for NO₂ and PM₁₀ at any of the proposed sensitive receptors modelled and therefore no mitigation is required.

Exceedance of the WHO guideline for PM_{2.5} is predicted at every modelled proposed sensitive receptor, at all heights considered. Exceedances of the WHO guideline for PM_{2.5} are not as a result of the operation of the Amended Proposed Development, but instead a borough-wide (and London wide) issue, with monitoring data, Defra predicted background concentrations, and LAEI modelled concentrations of PM_{2.5} all showing exceedances of the WHO guideline for PM_{2.5} in the vicinity of the Site. Furthermore, based on recent advice from the GLA, mitigation measures against PM concentrations are not recommended for the purposes of meeting the WHO guidelines.

7.2.3 Air Quality Neutral Assessment

The Amended Proposed Development is considered air quality neutral with respect to both building and transport emissions, in line with the Air Quality Neutral LPG²⁵.

Furthermore, given that the Amended Proposed Development will result in a net reduction in traffic when compared to the previous use of the Site, the Amended Proposed Development is likely to have a beneficial impact on local air quality.

7.3 Cumulative Impacts

7.3.1 During Construction

There are not expected to be any cumulative impacts from construction activities and therefore no mitigation is required further to that set out in Table 16, which have been selected based on the highest risk category. It is assumed that all other committed developments will mitigate their own impacts from construction activities.

7.3.2 During Operation

There are not expected to be any cumulative impacts during the operational phased of the Amended Proposed Development and therefore no mitigation is required.

8. Summary and Conclusions.

This report details the potential air quality impacts associated with the construction and operation of a proposed residential-led development at the Homebase store at 84 Manor Road, North Sheen, Richmond, TW9 1YB.

The findings of the assessment are as follows:

- A qualitative assessment of the potential dust impacts during the construction of the Amended Proposed Development has been undertaken. Through good practice and implementation of appropriate mitigation measures, it is expected that the release of dust would be effectively controlled and mitigated, with resulting impacts considered to be 'not significant'. All dust impacts are considered to be temporary and short-term in nature;
- The energy strategy for the Amended Proposed Development is to be all electric and therefore a detailed assessment of impacts of combustion emissions from the energy plant has been screened out of this assessment;
- The results of the operational phase traffic screening assessment indicate that the Amended Proposed Development will generate a net reduction in traffic on the local road network and as such, the Amended Proposed Development is likely to result in an improvement to local air quality. As such, the impact of the operational road traffic is therefore considered to be beneficial and the effects can be considered 'insignificant';
- The Amended Proposed Development is considered air quality neutral according to the Air Quality Neutral LPG methodology with regard to both building and transport emissions. Therefore, no mitigation is considered to be required; and
- Exposure of future users of the Amended Proposed Development to concentrations of NO₂, PM₁₀ and PM_{2.5} was modelled using ADMS-Roads and there are predicted to be no exceedances of any relevant AQO for the pollutants modelled. Although exceedances of the WHO guideline for PM_{2.5} have been predicted, based on recent advice from the GLA, mitigation measures against PM concentrations are not recommended for the purposes of meeting the WHO guidelines.

Based on the information above, it is considered that air quality should not be viewed as a constraint to planning and the Amended Proposed Development conforms to the principles of National Planning Policy Framework, the London Plan and the LBRuT Local Plan.

9. Glossary of Terms.

AADT	Annual Average Daily Traffic
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
AQO	Air Quality Objective
ASR	Annual Status Report
AURN	Automatic Urban and Rural Network
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
EPUK	Environmental Protection UK
GLA	Greater London Authority
HDV	Heavy Duty Vehicles (> 3.5 tonnes gross vehicle weight)
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
LBRuT	London Borough of Richmond upon Thames
LBH	London Borough of Hounslow
LAEI	London Atmospheric Emissions Inventory
LES	London Environment Strategy
LLAQM.TG	London Local Air Quality Management Technical Guidance
LDV	Light Duty Vehicles (\leq 3.5 tonnes gross vehicle weight)
$\mu\text{g}/\text{m}^3$	Micrograms per cubic metre
MAQS	Mayor's Air Quality Strategy
NGR	National Grid Reference
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides (taken to be $\text{NO}_2 + \text{NO}$)
NPPF	National Planning Policy Framework
NRMM	Non-Road Mobile Machinery
Objectives	A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date. There are also vegetation-based objectives for sulphur dioxide and nitrogen oxides
PM_{10}	Particulate matter with an aerodynamic diameter less than 10 micrometres
$\text{PM}_{2.5}$	Particulate matter with an aerodynamic diameter less than 2.5 micrometres
PPG	Planning Practice Guidance
SPD	Supplementary Planning Document
SPG	Supplementary Planning Guidance
Standards	A nationally defined set of concentrations for nine pollutants below which health effects do not occur or are minimal
TfL	Transport for London
Trackout	The transport of dust and dirt from the construction / demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when heavy duty vehicles (HDVs) leave the construction / demolition site with dusty materials, which may then spill onto the road, and/or when HDVs transfer dust and dirt onto the road having travelled over muddy ground on site
WHO	World Health Organisation

References.

- ¹ Defra (2018) Local Air Quality Management Technical Guidance (TG16) - [online], (Last accessed: 07/02/2023), Available: <https://laqm.defra.gov.uk/documents/LAQM-TG16-February-18-v1.pdf>
- ² Defra (2022) Local Air Quality Management Technical Guidance (TG22) – [online] (Last accessed: 07/02/2023), Available at: <https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-TG22-August-22-v1.0.pdf>
- ³ The Stationery Office (1995) The Environment Act 1995 (Part IV), London
- ⁴ Defra (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland – [online] (Last accessed: 07/02/2023), Available at: www.gov.uk/government/publications/the-air-quality-strategy-for-england-scotland-wales-and-northern-ireland-volume-1
- ⁵ The Stationery Office (2000) Statutory Instrument 2000, No 928, The Air Quality (England) Regulations 2000, London
- ⁶ The Stationery Office (2002) Statutory Instrument 2002, No 3043, The Air Quality (England) (Amendment) Regulations 2002, London
- ⁷ Greater London Authority (2019) London Local Air Quality Management Technical Guidance (LLAQM.TG19) – [online] (Last accessed: 07/02/2023), Available at: www.london.gov.uk/sites/default/files/laqm_technical_guidance_2019.pdf
- ⁸ The Stationery Office (2010) Statutory Instrument 2010, No 1001, The Air Quality Standards Regulations 2010, London
- ⁹ WHO (2005) Air Quality Guidelines – [online], (Last accessed: 07/02/2023), Available: https://apps.who.int/iris/bitstream/handle/10665/69477/WHO_SDE_PHE_OEH_06.02_eng.pdf;jsessionid=66E22FDBE284CBF2CA8161756C3FF958?sequence=1
- ¹⁰ The Stationery Office (2021) Statutory Instrument 2021, The Environment Act 2021, London
- ¹¹ Defra (2022) Update on progress Environmental Targets – [online], (Last accessed: 07/02/2023), Available at: <https://www.gov.uk/government/news/update-on-progress-on-environmental-targets>
- ¹² UKAIR (2022) Air Quality Targets in the Environment Act – [online] (Last Accessed: 07/02/2023), Available at: [https://uk-air.defra.gov.uk/library/air-quality-targets#:~:text=The%20Environment%20Act%202021%20establishes,Environment%20Act%20\(Part%201\).](https://uk-air.defra.gov.uk/library/air-quality-targets#:~:text=The%20Environment%20Act%202021%20establishes,Environment%20Act%20(Part%201).)
- ¹³ The Stationery Office (1990) Environmental Protection Act 1990 - [online] (Last accessed: 07/02/2023), Available at: legislation.gov.uk/ukpga/1990/43/part/III
- ¹⁴ Defra (2019) The Clean Air Strategy – [online] (Last accessed: 07/02/2023) Available at: www.gov.uk/government/publications/clean-air-strategy-2019
- ¹⁵ HMSO (2021). The Building Regulations 2021. Approved Document Part F: Ventilation
- ¹⁶ Ministry of Housing, Communities & Local Government (2021) National Planning Policy Framework, Department for Communities and Local Governments, London
- ¹⁷ Ministry of Housing, Communities & Local Government (2019) Planning Practice Guidance, London
- ¹⁸ London Plan (2021) – [online], Last accessed: 07/02/2023) Available: https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf
- ¹⁹ Greater London Authority (2018) London Environment Strategy – [online] (Last accessed: 07/02/2023), Available at: www.london.gov.uk/sites/default/files/london_environment_strategy_0.pdf
- ²⁰ The London Borough of Richmond upon Thames Local Plan (2018), - [online] (Last accessed: 07/02/2023), Available at: https://www.richmond.gov.uk/media/15935/adopted_local_plan_interim.pdf
- ²¹ The London Borough of Richmond upon Thames Draft Local Plan (2021), - [online] (Last accessed: 07/02/2023), Available at: https://www.richmond.gov.uk/media/22984/draft_local_plan_low_resolution.pdf
- ²² Richmond Air Quality Action Plan (2019) – [online], (last accessed: 07/02/2023), available at: https://www.richmond.gov.uk/media/19151/air_quality_action_plan_2020-_to_2025.pdf
- ²³ Environmental Protection UK and Institute of Air Quality Management (2017), Land-Use Planning & Development Control: Planning For Air Quality v1.2 – [online] (Last accessed: 07/02/2023), Available at: iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf
- ²⁴ Greater London Authority (2014), The Control of Dust and Emissions During Construction and Demolition Supplementary Planning Guidance – [online] (Last accessed: 07/02/2023), Available at: www.london.gov.uk/sites/default/files/gla_migrate_files_destination/Dust%20and%20Emissions%20SPG%208%20July%202014.pdf
- ²⁵ Air Quality Neutral London Plan Guidance (2023), (last accessed: 08/02/2023), Available at: <https://www.london.gov.uk/sites/default/files/2023-02/Air%20Quality%20Neutral%20LPG.pdf>
- ²⁶ GLA (2014) Sustainable Design and Construction Supplementary Planning Guidance – [online], (Last accessed: 07/02/2023), Available: https://www.london.gov.uk/sites/default/files/osd34_sustainable_design_construction_spg.pdf
- ²⁷ The London Borough of Richmond upon Thames Supplementary Planning Document (2019) - [online] (Last accessed: 07/02/2023), Available at: <https://www.richmond.gov.uk/media/19206/air-quality-spd-june-2020.pdf>
- ²⁸ Richmond upon Thames air Quality Annual Status Report (2019) – [online], (last accessed: 07/02/2023), Available at: https://www.richmond.gov.uk/media/17479/air_quality_annual_status_report_2019.pdf
- ²⁹ Richmond upon Thames air Quality Annual Status Report (2020) – [online], (last accessed: 07/02/2023), Available at: <https://www.richmondshire.gov.uk/media/11982/2020-air-quality-annual-status-report.pdf>
- ³⁰ Richmond upon Thames air Quality Annual Status Report (2021) – [online], (last accessed: 07/02/2023), Available at: https://www.richmond.gov.uk/media/21482/annual_status_report_2021.pdf
- ³¹ Richmond upon Thames air Quality Annual Status Report (2022) – [online], (last accessed: 07/02/2023), Available at: https://www.richmond.gov.uk/media/25357/annual_status_report_2022.pdf
- ³² Hounslow Air Quality Annual Status Report (2020) – [online], (last accessed: 07/02/2023), Available at: https://www.hounslow.gov.uk/downloads/file/3303/2020_annual_status_report_published_2021
- ³³ Defra (2014) UK Pollutant Release and Transfer Register – [online], (Last accessed: 07/02/2023), Available at: www.gov.uk/guidance/uk-pollutant-release-and-transfer-register-prtr-data-sets
- ³⁴ Defra (2020) Background Pollution Maps – 2018 – [online], (Last accessed: 07/02/2023), Available at: uk-air.defra.gov.uk/data/laqm-background-maps?year=2018
- ³⁵ Environment Agency (2020) Pollution Inventory – [online], (Last accessed: 07/02/2023), Available at: data.gov.uk/dataset/cfd94301-a2f2-48a2-9915-e477ca6d8b7e/pollution-inventory
- ³⁶ Defra (n.d) UK Ambient Air Quality Interactive Map – [online], (Last accessed: 07/02/2023), Available at: uk-air.defra.gov.uk/data/gis-mapping

³⁷ Institute of Air Quality Management (2016) Guidance on the assessment of dust from demolition and construction v1.1 – [online], (Last accessed: 07/02/2023), Available at: iaqm.co.uk/text/guidance/construction-dust-2014.pdf

³⁸ Air Dispersion Modelling Software for Roads, v4.1.1.0, Cambridge Environmental Research Consultants Ltd.

³⁹ Greater London Authority (2016) London Atmospheric Emissions Inventory Air Quality Focus Areas – [online] (Last accessed: 07/02/2023), Available at: data.london.gov.uk/dataset/london-atmospheric-emissions-inventory--laei--2016-air-quality-focus-areas

⁴⁰ Greater London Authority (2019) London Atmospheric emissions Inventory Concentration Maps – [online] (Last accessed: 07/02/2023), Available at: <https://data.london.gov.uk/dataset/london-atmospheric-emissions-inventory--laei--2019>

⁴¹ Cranfield Soil and Agrifood Institute Soilscales map – [online], (last accessed: 07/02/2023), Available at: <http://www.landis.org.uk/soilscales/>

Appendix 1 - EHO Consultation.

Andy Day

From: Carol Lee (Regulatory Services) <CarolM.Lee@merton.gov.uk>
Sent: 15 July 2020 12:48
To: Andy Day
Subject: RE: Manor Road Richmond - EHO telephone follow up - air quality assessment approach

[External email]

Hi Andy

Thank you for your email.

Yes I am the best person and apologies for bounce back – we have requested an out of office with new email but to no avail. The London Borough of Richmond upon Thames has now merged with LB Merton and LB Wandsworth, hence new email.

My comments from 2018 stand. Good news on proposed emissions from transport and buildings. Electrically powered air source heat pumps and no combustion plant are particularly welcome and will help future proof the development (ensure noise insulation is secured). As advised previously, car free would be ideal.

We now have an updated, adopted AQAP and an AQ SPD:
https://www.richmond.gov.uk/services/environment/pollution/air_pollution/air_quality_reports/progress_reports_and_air_quality_action_plans and
<https://www.richmond.gov.uk/media/19206/air-quality-spd-june-2020.pdf>

If you require any further information, please do not hesitate to get in touch.

Kind regards

Carol

Carol Lee
Senior Environmental Health Pollution Practitioner (Air Quality)
Regulatory Services Partnership
London Boroughs of Richmond upon Thames, Merton and Wandsworth
1st Floor Civic Centre, 44 York Street, Twickenham TW1 3BZ

Tel 07917 307 206

e-mail: carol.lee@merton.gov.uk

From: Andy Day <AndyDay@hoarelea.com>
Sent: 15 July 2020 12:24
To: Carol Lee (Regulatory Services) <CarolM.Lee@merton.gov.uk>
Subject: FW: Manor Road Richmond - EHO telephone follow up - air quality assessment approach

Hi Carole,

I tried to send the below to your Richmond email address but it bounced back, I found this Merton address in the Richmond ASR.

Are you able to advise on the below please? Are you still the best person to send this to, if not, can you please advise who it should be sent to?

Many thanks,

Andy Day
Air Quality Consultant

DDI +44 20 3668 7289
Tel +44 20 3668 7100
Mob +44 7384 548 115
Email andyday@hoarelea.com



From: Andy Day
Sent: 15 July 2020 12:20
To: Carol Lee <Carol.Lee@richmond.gov.uk>
Subject: RE: Manor Road Richmond - EHO telephone follow up - air quality assessment approach

Hi Carole,

I am following up the below as the application is being resubmitted for the below development.

I would like to clarify our assessment approach and provide another opportunity to address any comments you may have.

Our proposed approach for the air quality assessment for the development is set below –

- The assessment of baseline air quality will draw on the Council's air quality data and Defra's local background data, this will use 2019 monitoring data from the 2020 annual status report.
- The assessment of the impact of emissions from existing road traffic at proposed receptors will be undertaken using dispersion modelling.
- There will be a reduction in traffic generated by the proposed development compared to the existing site and therefore impacts from road traffic generated will be screened against the EPUK/IAQM guidance criteria.
- Energy provision for the proposed development will be from electrically powered air source heat pumps and there will be no combustion plant included as part of the development, as such an assessment of impacts from combustion plant will not be included.

- The air quality assessment will include an assessment of construction impacts on air quality and dust using the IAQM methodology, in compliance with London's SPG on 'The Control of Dust and Emissions During Construction and Demolition (2014)'.
- An air quality neutral assessment will also be undertaken.

As you flagged in the below, the slowing of traffic along manor road as a result of the level crossing will be considered within the dispersion modelling.

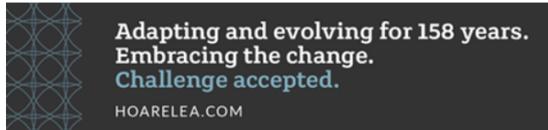
If you have any comments on the above please do let me know.

Many thanks,

Andy Day
Air Quality Consultant

DDI +44 20 3668 7289
Tel +44 20 3668 7100
Mob +44 7384 548 115
Email andyday@hoarelealea.com

HOARE LEA 



From: Carol Lee <Carol.Lee@richmond.gov.uk>
Sent: 26 July 2018 13:24
To: Chris Rush <ChrisRush@hoarelealea.com>
Subject: RE: Manor Road Richmond - EHO telephone follow up - air quality assessment approach

Hi Chris

Thank you for your email and sincere apologies for the delay in getting back to you. Unfortunately your email coincided with the start of my main annual holiday.

I have pleasure in attaching our 2018 ASR with full data sets for 2017, going back 7 years. There is no tube on Manor Rd but sites 18 and 26 are closeby on the A316 and Sth Circular respectively and sites 19, 44, 42, 17, Rut 2, 52 and 50 are all nearby. 2017 appears to be a lower than average year, so please proceed with caution. We run a background site at Wetlands; you are welcome to use this data, included in the ASR.

Air Quality needs to be a consideration in this development. There is concern on the impact of the development, its location and the nature of the development.

Your proposed approach is good but I would like to add a few comments.

The whole of the London Borough of Richmond upon Thames is an AQMA and Manor Road lies between the A316 - the main road into London, and link for M3 and M4 - and the South Circular both of which are high traffic roads with exceedences of EU limit values of 40 µg/m³ for NO₂ for at least the last 15 years.

Manor Road is also the location of a major level crossing for the main South West train line into central London. Down time at the level crossing at peak hours is currently 44 minutes in the hour. This results in long tailbacks at the level crossing which regularly back onto both the South Circular and the A316. At peak hours traffic is already over capacity and queues past this site with lots of stop/start motoring. Please be aware of this – it may be difficult to fully represent in modelling. Any addition to traffic at peak hours would be of concern.

The site is very close to North Sheen station, with regular direct trains to Waterloo and close to bus stops with good bus services. This will give a good PTAL rating and a car free development should be encouraged.

If you require any further information, please do not hesitate to get in touch.

Kind regards

Carol

Carol Lee
Senior Environmental Health Pollution Practitioner (Air Quality)
Regulatory Services Partnership
London Boroughs of Richmond upon Thames, Merton and Wandsworth
2nd Floor Civic Centre, 44 York Street, Twickenham TW1 3BZ

Tel 020 8891 7729

e-mail carol.lee@richmond.gov.uk



From: Chris Rush [<mailto:ChrisRush@hoarelealea.com>]
Sent: 10 July 2018 10:53
To: Carol Lee
Cc: Mark Harber; Thomas Cox
Subject: Manor Road Richmond - EHO telephone follow up - air quality assessment approach

Hi Carol,

We are progressing with an air quality assessment for a planning application of a development for a mixed use (including residential) proposal at a site that is currently used for commercial use located on Manor Road in Richmond (approximate postcode TW9 4QE - see below figure showing approximate site boundary marked with red line).



I called earlier and left a message and thought an email may be easier for you to pick up.

I am getting in contact to provide detail on the proposed approach for the air quality assessment for the development as set below –

- The assessment of baseline air quality will draw on the Council's air quality data and Defra's local background data.
- The assessment of the impact of emissions from existing road traffic at proposed receptors will be undertaken using dispersion modelling.
- We are currently in contact with the transport consultant and working to ascertain the traffic change as a result of the development. If the traffic generated by the development results in a change of less than 100 annual average daily traffic (AADT) for light duty vehicles (LDV) then impacts on existing receptors will be scoped out inline with the EPUK/IAQM document 'Land-Use Planning & Development Control: Planning for Air Quality' January 2017. If this change exceeds 100 AADT then the impacts will be assessed.
- The assessment will be undertaken in line with the EPUK/IAQM document 'Land-Use Planning & Development Control: Planning for Air Quality' January 2017.
- We are currently in discussions with the project engineers to ascertain if there are any gas fired boilers and or combined heat and power energy combustion systems and what data is available at this stage. These will be assessed if data is available at this early design stage. If sufficient data is not available at this design stage then detail of the likely plant proposed will be provided with a detailed assessment potentially conditioned.

Appendix 2 - Amended Proposed Development Plans.

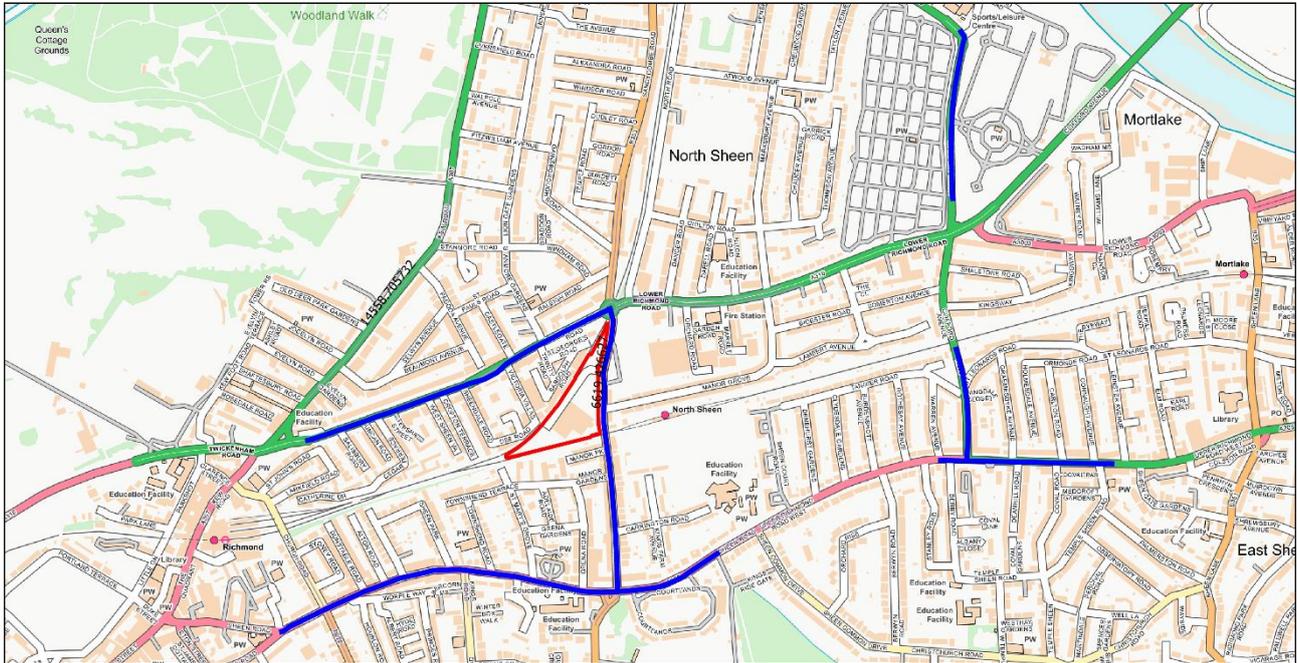
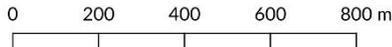


Figure 11: Proposed site plan (indicative only). Manor Road, Richmond. Source document: Assael. Drawing No.: MNR-AA-ALL-GF-DR-A-2000 Date: July 2020.

Appendix 3 - Road Traffic Model Input Data.

Table 17: Model Input Parameters

Parameter	Description	Input Variable
Surface Roughness	Surface roughness of the modelling domain as a function of land use	A roughness length z0 of 0.5m was used within the assessment area of this dispersion modelling study. This value is for 'open suburbia' and therefore considered appropriate for the surface roughness of the dispersion modelling assessment area.
Road Source Emissions	Source of the emission factors used	EFT v.9.0.1
Emission Year	Modelling year used to factor the traffic emissions	2019 for the verification year and future years.
NO _x to NO ₂ Conversion	Conversion from NO _x concentrations to NO ₂ concentrations	NO _x to NO ₂ calculator v7.1. General inputs – 2019, Richmond upon Thames London Borough, All London traffic.
Road Type	Road type within the EFT emission database	London (outer)
Elevation of Road	Height of the road link above ground level	0m no elevation – roads are at ground level
Road Width	Width of the road link	Road width obtained from Google Street View
Road Speed	Road speed in km/h	Variable based on posted limit and adjustment for road geometry in line with LLAQM.TG(19) ⁷ .
Meteorology	Representative hourly sequential meteorological data	Heathrow Airport 2019
Background	Background pollutant concentration considered during the modelling	See Table 19. Defra 2019 background maps 1km x 1km grid squares
Output	Output as gridded or specified points	At specified points as detailed in Table 3
Pollutant Output	Pollutants modelled and averaging time	NO ₂ , PM ₁₀ and PM _{2.5} annual mean



Legend

Approximate Site Boundary — Roads Modelled

Figure 12: Modelled roads. Contains Ordnance Survey data © Crown copyright and database right 2022.

Table 18: Summary of traffic data used in the assessment. Traffic flows are given in annual average daily traffic (AADT).

Road Name	LDV		HDV		Speed (km/h)	Data Source
	2019	2023	2019	2023		
Lower Mortlake Rd	1428	1411	85	83	32	DfT (2018)
Manor Rd	310	306	4	4	20	DfT (2018)
Sheen Road	521	543	41	42	26	LAEI (2016)
Upper Richmond Road	903	-	65	-	20	DfT (2018)
Mortlake Road	772	-	48	-	32	DfT (2018)
Clifford Avenue	814	-	35	-	20	DfT (2018)

The average speed along Manor Road takes in to account the level crossing by the North Sheen train station and the build-up of traffic along Manor Road.

Background Concentrations

Background concentrations have been assumed to be the same as those published by Defra. These cover the whole country on a 1 km by 1 km grid and are published for each year from 2017 to 2030. The current maps have been verified against measurements undertaken during 2017.

Background concentrations at the Site are provided in Table 19.

Table 19 Annual Mean Background Concentrations at the Site ($\mu\text{g}/\text{m}^3$)

Grid Square	NO ₂		PM ₁₀	PM _{2.5}
	2019	2023	2019	2019
518500,175500	23.1	19.3	17.1	11.9

Verification

Background Concentrations

The verification process seeks to minimise uncertainties associated with the air quality model by comparing the model output with locally measured concentrations. The verification methodology is described in subsequent sections.

Background concentrations at the monitoring sites in the verification year (2019) have been assumed to be the same as those published by Defra and are shown in Table 20.

Table 20 Annual Mean Background Concentrations at the Monitoring Sites ($\mu\text{g}/\text{m}^3$)

Grid Square	NO ₂ 2019
518500,175500	35.5
519500,175500	34.3
519500,176500	32.7

NO₂

Most NO₂ is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions of nitrogen oxides (NO_x = NO + NO₂). The model has been run to predict the 2019 annual mean NO_x concentrations at the diffusion tube monitoring sites DT 18, DT 26, DT 44, DT 50 and DT 55.

The model output of road-NO_x has been compared with the ‘measured’ road-NO_x, calculated from the measured annual mean NO₂ concentrations and the background concentrations using the NO_x from NO₂ calculator v7.1 published by Defra.

The slope of the best-fit line between the ‘measured’ road-NO_x contribution and the model derived road-NO_x contribution, forced through zero, has been used to determine a primary adjustment factor). This factor has then been applied to the modelled road-NO_x concentration for each receptor to provide adjusted modelled road-NO_x concentrations. The NO_x to NO₂ calculator has then been used to determine total NO₂ concentrations from the adjusted modelled road-NO_x concentrations and the background NO₂ concentrations.

The following adjustment factor has been applied to all modelled nitrogen dioxide data:

adjustment factor: 2.4222

The results imply that the model has under-predicted the road-NO_x contribution. This is a common experience with this and most other models.

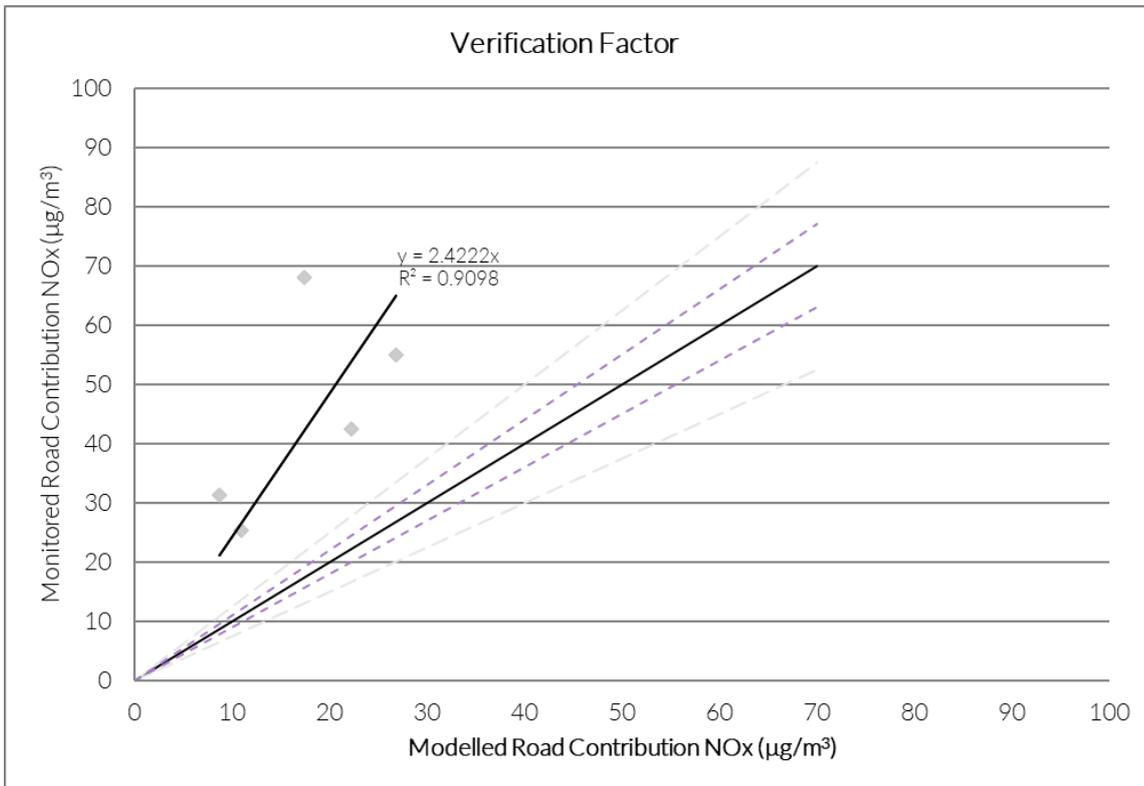


Figure 13 Comparison of measured road NO_x to unadjusted modelled road NO_x concentrations.

Table 20 provides the inputs for the comparison of the adjusted modelled NO₂ and monitored NO₂, which are used to calculate the adjustment factor.

Table 20 Comparison of Modelled and Monitored NO₂ Concentrations.

Monitoring Location	Modelled NO _x Road Contribution (µg/m ³)	Monitored NO _x Road Contribution (µg/m ³)	Adjusted Modelled NO _x Road Contribution (µg/m ³)	Monitored Total NO ₂ Concentration (µg/m ³)	Adjusted Modelled Total NO ₂ Concentration (µg/m ³)	Difference (%)
DT26	11.0	59.7	26.6	34.0	34.5	1.5
DT18	26.8	90.5	65.0	46.0	49.6	7.7
DT44	8.7	66.9	21.2	37.0	32.8	-11.4
DT50	17.5	102.3	42.3	50.0	40.8	-18.4
DT55	22.3	75.1	54.0	40.0	44.4	11.0
Adjustment Factor	2.4222					

Statistical Analysis of Model Performance

LLAQM.TG (19)⁷ recommends three statistical procedures that should be applied to evaluate model performance and assess the overall uncertainty. These are:

- Root mean square error (RMSE) defines the average error or uncertainty of the model. Ideally a RMSE within 10% of the air quality objective which is being assessed would be derived (for the annual mean NO₂ objective the ideal RMSE would be < 4 µg/m³). Where the RMSE is greater than 25% of the

- objective being assessed (i.e. 10 µg/m³ for the annual mean NO₂ objective) it is advised to revisit the model parameters and verification;
- Fractional bias identifies whether the model has a tendency to under-predict (positive value) or over-predict (negative value). The ideal value is zero but may range from +2 to -2; and
 - Correlation coefficient provides a measure of the linear relationship between modelled and measured data. Values range between zero (no relationship) and 1 (perfect relationship).

The values for each of these methods are provided in Table 21.

Table 21 Statistical analysis of model verification.

Method	Value
RMSE	4.741
Fractional Bias	0.796
Correlation Coefficient	0.644

PM₁₀ and PM_{2.5}.

There are no PM₁₀ or PM_{2.5} monitors within the study area; therefore, the model outputs of road-PM have been adjusted by applying the primary adjustment factor calculated for road NO_x, in line with LLAQGM.TG(19)⁷.

Sensitivity Analysis.

There is some uncertainty with regard to future reductions in road traffic NO_x emissions used in the EFT and the background maps. Therefore, a sensitivity analysis has been undertaken which assumes that there are no reductions in emission factors for road traffic from the base year.

The model inputs are as described above; however, emission factors from the base year (2019) have been used with the future year traffic data to predict 'no emissions reduction' NO₂ concentrations. Background concentrations have also been held at the base year for the sensitivity test.

For PM, there is no strong evidence that Defra's predictions are unrealistic and so the year-specific mapped concentrations have been used.

Appendix 4 - Professional Experience.

Kathryn Woolley (Hoare Lea), BSc (Hons), AMIEnvSc, MIAQM

Kathryn is a Senior Associate of the Air Quality team with Hoare Lea. She is an Associate Member of the Institution of Environmental Sciences and a Full Member of the Institute of Air Quality Management.

She has a diverse portfolio of experience and has worked on a range of projects from initial site feasibility, through planning and development to construction and operation. Kathryn's expertise covers planning, and air quality, specifically in relation to residential developments, industrial fixed installations such as district heating networks. Kathryn has completed over 60 EIA in the past 9 years throughout the UK and abroad including; St Johns Masterplan in Manchester (residential led), Leicester City Football club training facility north of Leicester (sports use), 1-5 Grosvenor Place, Westminster (mixed use residential, retail and hotel site), and Chestnut Avenue in Eastleigh (residential and community use).

Andy Day (Hoare Lea), BSc (Hons), MSc, AMIEnvSc, MIAQM

Andy is a Senior Air Quality Consultant with Hoare Lea. He is an Associate Member of the Institute of Environmental Sciences and a full Member of the Institute of Air Quality Management. He is a chemistry graduate with a Master's specialising in the catalysed removal of harmful volatile organic compounds (VOCs) often generated from the combustion of fuel in car engines.

Andy has worked on a range of projects of varying size across a number of different sectors. His experience focusses on work up to and through planning for air quality assessments and environmental impact assessments. Andy also has experience in detailed dispersion modelling of road traffic and energy combustion plant, emission mitigation statements, damage cost calculations, indoor and outdoor air quality monitoring and assessing the air quality impact at ecologically sensitive sites.

Andy has a particular interest in reducing emissions for the benefit of human health and the environment through the life cycle of a building.

Lauren Buchanan (Hoare Lea), MSc, BSc (Hons), AMIEnvSc, MIAQM

Lauren is a Senior Air Quality Consultant at Hoare Lea. She is an Associate Member of the Institution of Environmental Sciences and a Member of the Institute of Air Quality Management. She has worked on a range of projects gaining experience in many different aspects of air quality assessment, including monitoring and detailed dispersion modelling of dust, odour, roads and industrial emissions for a variety of sectors and to fulfil Local Air Quality Management (LAQM) duties on behalf of Local Authorities. Lauren has undertaken air quality assessments for permit requirements and planning applications, including stand-alone reports, Environmental Impact Assessments, Habitats Regulations Assessments and Development Consent Orders.

Ellie Drage (Hoare Lea), MEarthSci, AMIEnvSc, AMIAQM

Ellie is an Air Quality Consultant with Hoare Lea. She graduated from the University of Oxford with an Earth Sciences degree focusing on Climate and Ocean Systems. Ellie's MEarthSci project involved reconstructing ocean circulation, climate, and the carbon cycle approximately 100 million years ago, to better understand Earth's past environment.

Ellie has worked on a range of projects across various sectors including residential, industrial, office, education, commercial and laboratory. Ellie has experience preparing air quality assessments for planning including detailed assessment using dispersion modelling. Ellie has also completed Environmental Impact Assessments, indoor air quality plans for both BREEAM and WELL accreditation, odour risk assessments for kitchen extract systems, and has undertaken outdoor air quality monitoring within London and Oxford. Ellie's interests lie in the mitigation of pollution and air quality control.

Bhajan Chatha (Hoare Lea), MEng (Hons), AMIEnvSc, AMIAQM

Bhajan is a Graduate Air Quality Consultant with Hoare Lea. He is a MEng Chemical Engineering Graduate from the University of Aberdeen. During his MEng, Bhajan developed his understanding of air pollution, environmental impacts and toxicology throughout multiple modules. He also studied air pollutants, air pollution control equipment, air pollution monitoring and dispersion modelling during his degree. Within air quality, Bhajan's interests lie in air pollution control equipment and human health impacts.

Bhajan has worked on projects across multiple sectors including residential, commercial and industrial sectors. He has experience preparing air quality screening reports, environmental impact assessments, and indoor air quality plans.



KATHRYN WOOLLEY
SENIOR ASSOCIATE

+44 20 3668 7233
kathrynwoolley@hoarelea.com

HOARELEA.COM

Western Transit Shed
12-13 Stable Street
London
N1C 4AB
England

