Royal Mail Group

PATCHAM COURT FARM

Air Quality Assessment

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Royal Mail Group

PATCHAM COURT FARM

Air Quality Assessment

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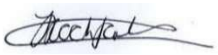
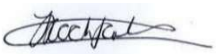
Signature				
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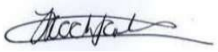
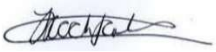
Signature				
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EXECUTIVE SUMMARY

WSP has been commissioned by Royal Mail Group (RMG) to undertake an air quality assessment to support the planning application for the proposed development of RMG's first Net Zero Carbon (NZC) Delivery Office.

This report presents the findings of the assessment, which addresses the potential air quality impacts during both the construction and operational phases of the proposed development. For both phases the type, source and significance of potential impacts were identified, and the measures that should be employed to minimise these proposed. The methodology followed in this study was discussed and agreed with the Senior Air Quality Advisor at Brighton and Hove City Council.

The assessment of construction phase impacts associated with fugitive dust and fine particulate matter (PM_{10} and $PM_{2.5}$) emissions has been undertaken in line with the relevant Institute of Air Quality Management guidance. This identified that there is a Low to High Risk of dust soiling impacts (depending on the phase of construction with the greatest risk likely to occur due to earthworks) and a Negligible to Low Risk of increases in particulate matter concentrations due to construction activities. However, through good site practice and the implementation of suitable mitigation measures, the effect of dust and PM_{10} releases would be significantly reduced. The residual effects of dust and PM_{10} generated by construction activities on air quality are therefore considered to be insignificant. The residual effects of emissions to air from construction vehicles and plant on local air quality are considered to be negligible.

The assessment of the potential air quality impacts associated with traffic generated by the operational phase of the proposed development has been completed in line with published methodologies and technical guidance. The pollutants considered in this part of the assessment were nitrogen dioxide (NO_2), PM_{10} and $PM_{2.5}$. Reference has also been given to the 2021 World Health Organisation (WHO) guideline values for particulate matter (PM_{10} and $PM_{2.5}$).

The assessment concluded that the AQS objectives for NO_2 will be exceeded in 2024 at some receptors, the anticipated opening year of the Proposed Development, both without and with the Proposed Development. The predicted changes in NO_2 concentrations as a result of the operation of the Proposed Development are all less than or equal to 1% of the relevant AQS. The AQS objectives for PM_{10} and $PM_{2.5}$ will be met in 2024, the anticipated opening year of the Proposed Development, both without and with the Proposed Development. The predicted changes in PM_{10} and $PM_{2.5}$ concentrations as a result of the operation of the Proposed Development are all less than or equal to 1% of the relevant AQSs. Therefore, according to the assessment significance criteria, the residual effects will be negligible.

An assessment of the potential for future occupants (future RMG employees) of the Proposed Development to be exposed to poor air quality, given the proximity of Site to A27 and A23, has also been undertaken.

Concentrations of concerned pollutants were below the short-term objectives on the Application Site, and therefore future RMG employees will not be exposed to poor air quality.

The Emissions Mitigation (Damage Cost) Calculation has been undertaken in line with BHCC's Air Quality and Emission Mitigation Guidance, with reference to the DEFRA Air Quality Appraisal:

Damage Cost Guidance. The damage cost value associated with the Proposed Development was calculated to be in a range of £32,205 to £33,626 (central present value).

Based on the assessment results, it is considered that the development proposals comply with national and local policy for air quality.

1. INTRODUCTION

1.1.1. WSP has been commissioned by Royal Mail Group (RMG) to carry out an assessment of the potential air quality impacts arising from the proposed development at Patcham Court Farm, hereafter referred to as the 'Proposed Development' or 'Application Site'.

1.1.2. The Application Site lies within the administrative boundary of Brighton & Hove City Council (BHCC) and is situated to the north of Brighton City. It comprises an abandoned agricultural farm of circa 14,600 m^2 in size. It is bordered to the north by A27, to the east by Patcham Court Allotments and to the south by Vale Avenue.

1.1.3. The proposals are for the redevelopment of the Application Site to provide RMG's first Net Zero Carbon (NZC) Delivery Office. The Proposed Development will replace RMG's existing depot within the centre of Brighton. The Proposed Development will comprise:

'Demolition of existing buildings, and erection of storage and distribution building (Use Class B8) with associated access, parking, landscaping, re-grading of land, enclosures, and infrastructure works including two substations and an express vehicle maintenance facility'.

1.1.4. This report presents the findings of an assessment of the potential air quality impacts of the Proposed Development during both the construction and operational phases. For both phases, the type, source and significance of potential impacts are identified, and the measures that should be employed to minimise these described.

1.1.5. This report also considers the potential exposure of future RMG employees to poor air quality given the location of the Application Site within an urban setting surrounded by heavily traffic roads, including the A27.

1.1.6. A glossary of terms used in this report is provided in Appendix A.

2. LEGISLATION, POLICY & GUIDANCE

2.1. AIR QUALITY LEGISLATION & POLICY

2.1.1. A summary of the relevant air quality legislation and policy is provided below.

UK AIR QUALITY STRATEGY

2.1.2. The Government's policy on air quality within the UK is set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (AQS)[1]. The AQS provides a framework for reducing air pollution in the UK with the aim of meeting the requirements of European Union legislation[2].

2.1.3. The AQS also sets standards and objectives for nine key air pollutants to protect health, vegetation and ecosystems. These are benzene (C_6H_6), 1,3 butadiene (C_4H_6), carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$), sulphur dioxide (SO_2), ozone (O_3), and polycyclic aromatic hydrocarbons (PAHs). The standards and objectives for the pollutants considered in this assessment are given in Appendix B.

2.1.4. The air quality standards are levels recommended by the Expert Panel on Air Quality Standards (EPAQS) and the World Health Organisation (WHO) with regards to current scientific knowledge about the effects of each pollutant on health and the environment.

2.1.5. The air quality objectives are policy based targets set by the Government, which take into account economic efficiency, practicability, technical feasibility and timescale. Some objectives are equal to the EPAQS recommended standards or WHO guideline limits, whereas others involve a margin of tolerance, i.e. a limited number of permitted exceedances of the standard over a given period.

2.1.6. For the pollutants considered in this assessment, there are both long-term (annual mean) and short-term standards. In the case of NO_2, the short-term standard is for a 1-hour averaging period, whereas for PM_{10} it is for a 24-hour averaging period. These periods reflect the varying impacts on health of differing exposures to pollutants, for example temporary exposure on the pavement adjacent to a busy road, compared with the exposure of residential properties adjacent to a road.

2.1.7. The AQS contains a framework for considering the effects of a finer group of particles known as '$PM_{2.5}$' as there is increasing evidence that this size of particles can be more closely associated with observed adverse health effects than PM_{10}. However, there is no statutory objective given in the AQS for $PM_{2.5}$.

[1] Department for Environment, Food and Rural Affairs (Defra) and the Devolved Administrations (2007). The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2)

[2] The UK formally left the EU on 31st January 2020 and new air quality legislation for the UK will be brought forward in due course. The Air Quality (Miscellaneous Amendment and Revocation of Retained Direct EU Legislation) (EU Exit) Regulations 2018 (SI 2018/1407) (see Regulation 5) makes changes to retained direct EU legislation relating to air quality, to ensure that it continues to operate effectively.

AIR QUALITY REGULATIONS

2.1.8. Many of the objectives in the AQS have been made statutory in England with the Air Quality (England) Regulations 2000[3] and the Air Quality (England) (Amendment) Regulations 2002[4] for the purpose of Local Air Quality Management (LAQM).

2.1.9. These Regulations require that likely exceedances of the AQS objectives are assessed in relation to:

"…the quality of air at locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present…"

2.1.10. The Air Quality Standards Regulations 2010[5] transpose the European Union Ambient Air Quality Directive (2008/50/EC) into law in England. This Directive sets legally binding limit values for concentrations in outdoor air of major air pollutants that impact public health such as PM_{10}, $PM_{2.5}$ and NO_2. The limit values for NO_2 and PM_{10} are the same concentration levels as the relevant AQS objectives and the limit value for $PM_{2.5}$ is a concentration of 25µg/m^3. However, Regulation 2 of the Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020[6] updates the Air Quality Standards Regulations 2010 to include a limit value for $PM_{2.5}$ from 2020 of 20µg/m^3. At the time that the Air Quality Standards Regulations 2010 were made the limit value for this pollutant was under review by the European Commission.

2.1.11. In line with consultation comments received from Samuel Rouse, Senior Air Quality Advisor at BHCC, the 2021 World Health Organisation (WHO) guidelines for PM_{10} and $PM_{2.5}$ have also been referred to within the assessment.

CLEAN AIR STRATEGY

2.1.12. Defra published the Government's Clean Air Strategy in 2019[7]. This sets out measures, which aim to reduce emissions from all sources of air pollution, making air healthier to breathe, protecting nature and boosting the economy. The Strategy also proposes tough new goals to cut public exposure to airborne particulate matter, as per the recommendation made by the WHO.

2.1.13. Furthermore, the Strategy confirms that the Government will set new legislation to 'create a stronger and a more coherent framework for action to tackle air pollution. This will be underpinned by new England-wide powers to control major sources of air pollution, in line with the risk they pose to public health and the environment, plus new local powers to take action in areas with an air pollution problem. These will support the creation of Clean Air Zones to lower emissions from all sources of

[3] The Air Quality (England) Regulations 2000 - Statutory Instrument 2000 No.928

[4] The Air Quality (England) (Amendment) Regulations 2002- Statutory Instrument 2002 No.3043

[5] The Air Quality Standards Regulations 2010 - Statutory Instrument 2010 No. 1001

[6] The Environmental (Miscellaneous Amendments) (EU Exit) Regulations 2020 - Statutory Instrument 2020 No.000

[7] Defra (January, 2019). Clean Air Strategy 2019.

air pollution, backed up with clear enforcement mechanism.' New enforcement powers will also be given at a national and local level, across all sectors of society.

ENVIRONMENTAL PROTECTION ACT 1990 - CONTROL OF DUST AND PARTICULATES ASSOCIATED WITH CONSTRUCTION

2.1.14. Section 79 of the Environmental Protection Act 1990 gives the following definitions of statutory nuisance relevant to dust and particles:

"Any dust, steam, smell or other effluvia arising from industrial, trade or business premises or smoke, fumes or gases emitted from premises so as to be prejudicial to health or a nuisance"; and

"Any accumulation or deposit which is prejudicial to health or a nuisance".

2.1.15. Following this, Section 80 says that where a statutory nuisance is shown to exist, the local authority must serve an abatement notice. Failure to comply with an abatement notice is an offence and if necessary, the local authority may abate the nuisance and recover expenses.

2.1.16. There are no statutory limit values for dust deposition above which 'nuisance' is deemed to exist. Nuisance is a subjective concept and its perception is highly dependent upon the existing conditions and the change which has occurred.

ENVIRONMENT ACT 1995

2.1.17. Under Part IV of the Environment Act 1995[8], local authorities must review and document local air quality within their area by way of staged appraisals and respond accordingly, with the aim of meeting the air quality objectives defined in the Regulations. Where the objectives are not likely to be achieved, an authority is required to designate an Air Quality Management Area (AQMA). For each AQMA the local authority is required to draw up an Air Quality Action Plan (AQAP) to secure improvements in air quality and show how it intends to work towards achieving air quality objectives in the future.

ENVIRONMENT ACT 2021

2.1.18. The Environment Act 2021[9], published in November 2021, provides a new framework for environmental protection within the UK. It aims to ensure that environmental standards are maintained and that improvements are achieved (specifically in relation to air quality, water, waste and resources, nature and biodiversity) and bridges the gaps in legislation resulting from the UK's departure from the EU. The Environment Act 2021 does not replace the Environment Act 1995, but it does make amendments in order to strengthen environmental protections. In relation to air quality, the Environment Act 2021 includes a legally binding duty on Government to bring forward at least two new air quality targets for $PM_{2.5}$ into secondary legislation by 31 October 2022.

2.1.19. Target objectives under consideration for air quality include:

[8] UK Government (1995) Environment Act 1995. [Online] https://www.legislation.gov.uk/ukpga/1995/25/contents

[9] UK Government (2021) Environment Act 2021. [Online] https://www.legislation.gov.uk/ukpga/2021/30/contents

- Reducing the annual mean concentrations of $PM_{2.5}$ in ambient air; and
- Reducing population exposure to $PM_{2.5}$.

2.2. PLANNING POLICY

2.2.1. A summary of the national and local planning policy relevant to the Proposed Development and air quality is provided below.

NATIONAL PLANNING POLICY

National Planning Policy Framework

2.2.2. The Government's overall planning policies for England are described in the National Planning Policy Framework[10]. The core underpinning principle of the Framework is the presumption in favour of sustainable development, defined as:

- *'… meeting the needs of the present without compromising the ability of future generations to meet their own needs'.*

2.2.3. One of the three overarching objectives of the NPPF is that the planning system should seek '*to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.*'

2.2.4. In relation to air quality, the following paragraphs in the document are relevant:

- Paragraph 55, which states '*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 104, which relates to the need to consider transport related issues at the earliest stages of plan making and development proposals, so that *'…c) opportunities to promote walking, cycling and public transport use are identified and pursued; d) the environmental impacts of traffic and transport infrastructure can be identified, assessed and taken into account – including appropriate opportunities for avoiding and mitigating any adverse effects, and for net environmental gains...*';
- Paragraph 105, which states '…*Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health….'*;
- Paragraph 174, which states '*Planning policies and decisions should contribute to and enhance the natural and local environment by: …e) 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*

[10] Ministry of Housing, Communities and Local Government (July 2021) *National Planning Policy Framework*.

possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans...';

- Paragraph 185, which states '*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, which states '*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.*'; and
- Paragraph 188, which states '*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.'*

LOCAL PLANNING POLICY

Brighton & Hove Local Plan Adopted 2005

2.2.5. The Brighton & Hove Local Plan[11] was adopted in July 2005. In relation to air quality, Policy SU Pollution and Nuisance Control in this document states that:

"Development that may be liable to cause pollution and / or nuisance to land, air or water will only be permitted where:

a) human health and safety, amenity, and the ecological well-being of the natural and built environment is not put at risk;

b) it does not reduce the planning authority's ability to meet the Government's air quality and other sustainability targets; and

c) it does not negatively impact upon the existing pollution and nuisance situation.

[11] Brighton & Hove City Council (2005). Brighton & Hove Local Plan 2005 https://www.brighton-hove.gov.uk/sites/default/files/migrated/article/inline/Saved%20Adopted%20Local%20Plan%20as%20at%20March%202016%20compressed.pdf

All proposed developments that have a potential to cause pollution and / or nuisance, will be required to incorporate measures to minimise the pollution / nuisance and may invoke the need for an Environmental Impact Assessment. Where appropriate, planning conditions will be imposed and / or a planning obligation sought in order to secure the necessary requirements.

Planning permission will only be granted for development on a site adjacent to an existing pollution / nuisance generating use and / or within an air quality 'hotspot' or potential 'hot spot' where:

i. the effect on the proposed development, its occupiers and users will not be detrimental; and

ii. the proposed development will not make the pollution and / or nuisance situation worse and where practicable, helps to alleviate the existing problem(s).

In applying this policy, particular attention will be given to a proposal's location and its impact on other development, land uses and nature conservation."

Brighton & Hove City Plan Part One 2016

2.2.6. The Brighton & Hove City Plan[12] was adopted in March 2016 and provides the overarching strategy and spatial vision for Brighton & Hove up to 2030. The City Plan Part One forms part of the Development Plan and sets out policies that guide decisions on planning applications.

2.2.7. In relation to air quality, CP18 Heathy City states:

"Planning will support programmes and strategies which aim to reduce health inequalities and promote healthier lifestyles through the following

1. *Carry out health impact assessments (HIA or incorporated into a sustainability appraisal) on all planning policy documents.*
2. *Require HIA on all strategic developments in the city.*
3. *Require larger developments to demonstrate how they minimise negative impacts and maximise positive impacts on health within the development or in adjoining areas (where the benefits of new development can be maximised).*
4. *Encourage development that works towards Lifetime Neighbourhood[13] principles; promotes health, safety and active living for all age groups, including healthy living options for older people (see also CP12 and CP13), active space for children and encourages physically active modes of transport.*

[12] Brighton & Hove City Council (2016). Brighton & Hove City Plan Part One 2016 https://www.brighton-hove.gov.uk/sites/default/files/migrated/article/inline/FINAL%20version%20cityplan%20March%202016compreswith%20forward_0.pdf

[13] The CLG (Lifetime Neighbourhoods - December 2011) has recognised the importance of neighbourhood as a determinant of well-being in later life and its crucial role in supporting older people's independence. The main components that make up a lifetime neighbourhood includes: supporting residents to develop lifetime neighbourhoods – especially resident empowerment; access, services and amenities, built and natural environments, social networks/well-being and housing.

5. *Recognise, safeguard and encourage the role of allotments; garden plots within developments; small scale agriculture and farmers markets in providing access to healthy, affordable locally produced food options.*
6. *Joint working with health providers to help deliver and protect a sub regional network of critical care hospitals and a citywide integrated network of health facilities that is within reasonable walking distance of public transport.*
7. *Through the City Plan Part 2 appropriate sites for health use with good access will be identified and safeguarded taking into account future growth and demand for health services in the city"*

Brighton & Hove City Plan Part Two 2020

2.2.8. The Brighton & Hove City Plan Part Two[14] was submitted for examination in May 2021. The City Plan Part Two will support the implementation and delivery of the City Plan Part One and will complement the strategic policy framework; identify and allocate additional development sites and set out a detailed development management policy framework to assist in the determination of planning applications.

2.2.9. In relation to air quality, Policy DM35 Travel Plans and Transport Assessments states:

1. *"Transport Statements, Transport Assessments, Construction and Environmental Management Plans and Travel Plans are required to support planning applications for all developments that are likely to generate significant amounts of movement/travel in line with the NPPF or any subsequent national or locally derived standards and guidance.*
2. *Larger developments requiring Transport Assessments should also consider the cumulative transport impacts arising from other committed or planned developments (i.e. development that is permitted or allocated and there is a reasonable degree of certainty delivery will occur). Development will not be permitted where the residual cumulative impact of the development is severe, unless provision is made for appropriate mitigation.*
3. *A Transport Statement or Transport Assessment (as appropriate) is also required for all major developments within AQMAs so that the potential impact of traffic on air quality can be adequately considered within a separate Air Quality Assessment (AQA). Where Transport Statements or Transport Assessments are required for developments elsewhere, as set out in criterion (1), traffic impacts within AQMAs should be considered to inform decisions about whether an AQA is required.*
4. *All development proposals should include appropriate measures to ensure that journeys by private car are minimised and to make the greatest possible use of sustainable travel in order to deliver the objectives for sustainable transport set out in Policy CP9 of the City Plan*

[14] Brighton & Hove City Council (2020). Brighton & Hove City Plan Part Two 2020 https://www.brighton-hove.gov.uk/sites/default/files/migrated/article/inline/Proposed%20Submission%20City%20Plan%20Part%20Two%20April%2025%202020%20PRINTERSa.pdf

Part One. Where necessary, planning obligations will be sought to facilitate or support such measures.

5. *Proposals that could cause significant noise or air quality impacts or create significant disturbance or intrusion during the demolition and construction processes will be required to submit a Construction & Environmental Management Plan."*

2.2.10. In addition, DM40 Protection of the Environment and Health – Pollution and Nuisance states:

"Planning permission will be granted for development proposals that can demonstrate they will not give rise nor be subject to material nuisance and/or pollution that would cause unacceptable harm to health, safety, quality of life, amenity, biodiversity and/or the environment (including air, land, water and built form). Proposals should seek to alleviate existing problems through their design.

Proposals liable to cause or be affected by pollution and/or nuisance will be required to meet all the following criteria:

a) be supported by appropriate detailed evidence that demonstrates:

i. the site is suitable for the proposed use and will not compromise the current or future operation of existing uses;

ii. pollution and/or nuisance will be minimised;

iii. appropriate measures can and will be incorporated to attenuate/mitigate existing and/or potential problems in accordance with national and local guidance; and

iv. appropriate regard has been given to the cumulative impact of all relevant committed developments as well as that of the proposal and/or effect of an existing pollution/nuisance source.

b) support the implementation of local Air Quality Action Plans and help support the local authority meet the Government's air quality and other sustainability targets;

c) provide, when appropriate, an Air Quality Impact Assessment to consider both the exposure of future and existing occupants to air pollution, and, the effect of the development on air quality. Air quality improvements and/or mitigation must be included wherever possible;

d) have a positive impact, where practicable, on air quality when located within or close to an Air Quality Management Area and not worsen the problem;

e) particular regard must be given to the impacts of emissions from transport, flues, fixed plant, and, heat and power systems;

f) new biomass combustion and CHP plants associated with major developments will not be acceptable in or near an Air Quality Management Area and sensitive receptors such as the Royal Sussex County Hospital due to the need to comply with nitrogen dioxide limits; and

g) ensure outdoor lighting is well designed; low impact; efficient; the minimum necessary with an appropriate balance between intensity, fittings, height and structures; and, not cause unacceptable detriment to public and highway safety, biodiversity, in particular priority habitat and species, the night sky and the South Downs National Park International Dark Sky Reserve.

When a proposal, including the remediation measures, invokes the need for an Environmental Impact Assessment the findings of the assessment must be appropriately taken into account."

2.3. GUIDANCE

2.3.1. A summary of the publications referred to in the undertaking of this assessment is provided below.

Local Air Quality Management Review and Assessment Technical Guidance

2.3.2. The Department for Environment, Food and Rural Affairs (Defra) has published technical guidance for use by local authorities in their review and assessment work[15]. This guidance, referred to in this document as LAQM.TG(16), has been used where appropriate in the assessment presented herein.

Land-use Planning & Development Control: Planning for Air Quality

2.3.3. Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) have published guidance[16] that offers comprehensive advice on: when an air quality assessment may be required; what should be included in an assessment; how to determine the significance of any air quality impacts associated with a development; and, the possible mitigation measures that may be implemented to minimise these impacts.

Guidance on the Assessment of Dust from Demolition and Construction

2.3.4. This document[17] published by the IAQM was produced to provide guidance to developers, consultants and environmental health officers on how to assess the impacts arising from construction activities. The emphasis of the methodology is on classifying sites according to the risk of impacts (in terms of dust nuisance, PM_{10} impacts on public exposure and impact upon sensitive ecological receptors) and to identify mitigation measures appropriate to the level of risk identified.

Planning Practice Guidance – Air Quality

2.3.5. This guidance[18] provides a number of guiding principles on how the planning process can take into account the impact of new development on air quality, and explains how much detail air quality assessments need to include for proposed developments, and how impacts on air quality can be mitigated. It also provides information on how air quality is taken into account by Local Authorities in

[15] Defra (2021) Part IV The Environment Act 1995 and Environment (Northern Ireland) Order 2002 Part III, Local Air Quality Management Technical Guidance LAQM.TG(16)

[16] Environmental Protection UK and Institute of Air Quality Management (Version 1.2 Updated January 2017). Land Use Planning & Development Control: Planning for Air Quality

[17] Institute of Air Quality Management (Version 1.1 Updated June 2016). Guidance on the Assessment of Dust from Demolition and Construction

[18] Ministry of Housing, Communities & Local Government (June 2021). Planning Practice Guidance https://www.gov.uk/guidance/air-quality--3

both the wider planning context of Local Plans and neighbourhood planning, and in individual cases where air quality is a consideration in a planning decision.

Air Quality and Emissions Mitigation Guidance

2.3.6. This guidance[19] published by the Sussex-Air Air Quality Partnership was developed in response to changes in national planning policy and provides:

-
- Advice for developers and their consultants on how to assess and mitigate the impact that new developments may have on local air quality; and
- A consistent approach to be applied by developers and Local Planning Authorities (LPAs) to:
  - address impacts on local air quality
  - ensure optimum scheme design to reduce emissions and/or exposure; and
  - avoid unnecessary delays in the planning process.

2.3.7. The guidance also provides a methodology to quantify the monetised health damage value associated with transport emissions from a development.

[19] Sussex-Air Air Quality Partnership (2021). Air Quality and Emission Guidance for Susses

3. SCOPE & METHODOLOGY

3.1. SCOPE

3.1.1. The scope of the assessment has been determined in the following way:

- Consultation with the Environmental Health Officer (EHO) at BHCC to agree the scope of the assessment and the methodology to be applied;
- Review of BHCC's latest review and assessment reports[20] and air quality data for the area surrounding the Application Site, including data from Defra[21] and the Environment Agency (EA)[22];
- Desk study to confirm the locations of nearby existing receptors that may be sensitive to changes in local air quality, and a review of the masterplan for the Proposed Development to establish the location of new sensitive receptors within the Application Site itself; and
- Review of the traffic data provided by Project's Transport Consultant, Mott MacDonald.

3.1.2. The scope of the assessment includes consideration of the potential impacts on local air quality resulting from:

- dust and particulate matter generated by on-site activities during the construction phase;
- increases in pollutant concentrations as a result of exhaust emissions arising from construction traffic and plant; and
- increases in pollutant concentrations as a result of exhaust emissions arising from traffic generated by the Proposed Development once operational.

3.1.3. The Proposed Development will be RMG's first Net Zero Carbon facility, therefore, the increases in pollutant concentrations as a result of emissions to air from the development proposals is scoped out in the assessment. In addition, the potential exposure of future RMG employees to pollution concentrations given the location of the Application Site within an urban setting surrounded by heavily traffic roads including the A27.

3.2. METHODOLOGY

CONSTRUCTION PHASE

3.2.1. Dust comprises particles typically in the size range 1-75 micrometres (μm) in aerodynamic diameter and is created through the action of crushing and abrasive forces on materials. The larger dust particles fall out of the atmosphere quickly after initial release and therefore tend to be deposited in close proximity to the source of emission. Dust therefore, is unlikely to cause long-term or widespread changes to local air quality; however, its deposition on property and cars can cause

[20] Brighton & Hove City Council (2021) Air Quality Status Report https://www.brighton-hove.gov.uk/sites/default/files/2021-12/ASR%20Brighton%20%20Hove%20Nov%202021%20%28005%29.pdf

[21] Defra Local Air Quality Management (LAQM) Support Pages. Available at: http://laqm.defra.gov.uk/ Accessed on July 2022

[22] https://data.gov.uk/dataset/cfd94301-a2f2-48a2-9915-e477ca6d8b7e/pollution-inventory Accessed on July 2022

'soiling' and discolouration. This may result in complaints of nuisance through amenity loss or perceived damage caused, which is usually temporary.

3.2.2. The smaller particles of dust (less than 10µm in aerodynamic diameter) are known as particulate matter (PM_{10}) and represent only a small proportion of total dust released; this includes a finer fraction, known as $PM_{2.5}$ (with an aerodynamic diameter less than 2.5µm). As these particles are at the smaller end of the size range of dust particles they remain suspended in the atmosphere for a longer period of time than the larger dust particles, and can therefore be transported by wind over a wider area. PM_{10} and $PM_{2.5}$ are small enough to be drawn into the lungs during breathing, which in sensitive members of the public could have a potential impact on health. However, it is worth noting that, according to the IAQM guidance, the majority of fugitive particulate emissions arising from construction sites are expected to relate to the coarser fractions (i.e. $PM_{2.5-10}$) with just 10-15% expected to comprise $PM_{2.5}$. The IAQM guidance therefore focusses on PM_{10} for the purposes of assessment.

3.2.3. An assessment of the likely significant impacts on local air quality due to the generation and dispersion of dust and PM_{10} during the construction phase has been undertaken using: the relevant assessment methodology published by the IAQM; the available information for this phase of the Proposed Development provided by the Client and Project Team; and, professional judgement.

3.2.4. The IAQM methodology assesses the risk of potential dust and PM_{10} impacts from the following four sources: demolition; earthworks; general construction activities and track-out. It takes into account the nature and scale of the activities undertaken for each source and the sensitivity of the area to an increase in dust and PM_{10} levels to assign a level of risk. Risks are described in terms of there being a low, medium or high risk of dust impacts. Once the level of risk has been ascertained, then site specific mitigation proportionate to the level of risk is identified, and the significance of residual effects determined. A summary of the IAQM assessment methodology is provided in Appendix C.

3.2.5. In addition to impacts on local air quality due to on-site construction activities, exhaust emissions from construction vehicles and plant may have an impact on local air quality adjacent to the routes used by these vehicles to access the Application Site and in the vicinity of the Application Site itself. As information on the number of vehicles and plant associated with the construction phase was not available at the time of writing, a qualitative assessment of their impact on local air quality has been undertaken using professional judgement and by considering the following:

- The number and type of construction traffic and plant likely to be generated by the Proposed Development;
- The number and proximity of sensitive receptors to the Application Site and along the likely routes to be used by construction vehicles; and
- The likely duration of the construction and the nature of the construction activities undertaken.

OPERATIONAL PHASE

3.2.6. Of the pollutants included in the AQS, concentrations of NO_2 and particulate matter (PM_{10} and $PM_{2.5}$) have been considered in this assessment as road traffic is a major source of these pollutants and their concentrations tend to be close to, or in exceedance of, the objectives in urban locations such as the Application Site.

3.2.7. For the prediction of impacts due to emissions arising from road traffic during the operation of the Proposed Development, the dispersion model ADMS Roads (version 5.0.0.1) has been used. This

model uses detailed information regarding traffic flows on the local road network, surface roughness, and local meteorological conditions to predict pollutant concentrations at specific receptor locations, as determined by the user.

3.2.8. Meteorological data, such as wind speed and direction, is used by the model to determine pollutant transportation and levels of dilution by the wind. Meteorological data used in the model was obtained from the Met Office observing station at Shoreham for 2019. This station is located approximately 11km south west of the Application Site and is considered to provide representative data for the assessment. Its use within the detailed dispersion modelling was agreed during consultation with Samuel Rouse, Senior Air Quality Advisor at BHCC.

3.2.9. A summary of the traffic data and pollutant emission factors used in the assessment can be found in Appendix D. It includes details of the Annual Average Daily Traffic (AADT) flows, vehicle speeds (kph) and the percentage of Heavy Duty Vehicles (HDVs) for the local road network in all assessment years considered. Traffic speeds were reduced at junctions in line with guidance provided in LAQM.TG(16), and using professional judgement.

3.2.10. For the assessment, three scenarios were modelled, as follows:

- 2019 – Model Verification and Baseline;
- 2024 – Without Development; and
- 2024 – With Development.

3.2.11. 2019 is the most recent year for which monitoring data and meteorological data are both available to enable verification of the model results, and so this year has been used as the baseline year for this assessment. 2024 is the anticipated opening year of the Proposed Development.

3.2.12. The traffic flows for the 'without development' scenarios include flows for committed developments in the locality of the Application Site but do not include any contribution to road traffic from the Proposed Development itself. The traffic flows for the 'with development' scenarios contributions to road traffic from the Proposed Development itself and the nearby committed developments.

Vehicle Emission Factors

3.2.13. Vehicle emission factors for use in the assessment have been obtained using the Emission Factor Toolkit (EFT) version 11 (published in November 2021) available on the Defra website[23]. The EFT allows for the calculation of emission factors arising from road traffic for all years between 2018 and 2050. However, the outputs for 2031-2050 are limited to England (excluding London) only and are provided in support of climate assessments and appraisals only. For the predictions of future year emissions, the toolkit takes into account factors such as anticipated advances in vehicle technology and changes in vehicle fleet composition, such that vehicle emissions are assumed to reduce over time.

[23] https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html

Selection of Background Concentrations

3.2.14. Background concentrations for the study area have been taken from the continuous urban background monitoring site at Preston Park (530524, 106225), which is located approximately 3km south of the Site and which forms part of Defra's AURN monitoring network. The concentrations measured at the monitoring station will include a contribution from vehicles using some of the roads modelled within the assessment and, therefore, their use will provide a worst case assessment. Annual mean oxides of nitrogen (NO_x) and NO_2 concentrations have been obtained from this monitoring station for 2019. Their use within the assessment was requested during consultation with Samuel Rouse, Senior Air Quality Advisor at BHCC.

3.2.15. The monitoring data for Preston Park AURN for the period 2012 to 2019 indicates that there has been no significant change in NO_x and NO_2 concentrations monitored at this station over this time period. Therefore, 2019 measured concentrations of NO_X and NO_2 have been utilised within the assessment for all scenarios (rather than applying a reduction in concentrations year on year in line with Defra's estimated background concentration mapping).

3.2.16. Background PM_{10} and $PM_{2.5}$ concentrations used in the assessment have been taken from the national maps provided on the Defra website[24], where background concentrations of those pollutants included within the AQS have been mapped at a grid resolution of 1x1km for the whole of the UK. Estimated concentrations are available for all years between 2018 and 2030. As noted above, the maps assume that background concentrations will improve (i.e. reduce) over time, in line with the predicted reduction in vehicle emissions and emissions from other sources. However, in line with the trend data from Preston Park AURN, 2019 background concentrations of PM_{10} and $PM_{2.5}$ have been utilised within the assessment for all scenarios. This is likely to represent a conservative approach.

3.2.17. It should be noted that for PM_{10} and $PM_{2.5}$, the background maps present both the 'total' estimated background concentrations and the individual contributions from a range of emission sources (for example, motorways, aircraft, domestic heating etc.). When detailed modelling of an individual sector is required as part of an air quality assessment, the respective contribution can be subtracted from the overall background estimate to avoid the potential for 'double-counting'. However, as the available transport data did not cover all roads within each of the grid squares/areas from which background concentrations were obtained, removal of specific sectors has not taken place. Again, reiterating that the approach applied for PM_{10} and $PM_{2.5}$ is likely to be conservative.

3.2.18. Further details on the background concentrations are provided in Section Four of this report.

Model Verification and Processing of Results

3.2.19. The ADMS Roads dispersion model has been widely validated for this type of assessment and is considered to be fit for purpose. Model validation undertaken by the software developer will not have included validation in the vicinity of the Proposed Development.

[24]https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html

3.2.20. To determine the performance of the model at a local level, a comparison of modelled results with the results of monitoring carried out within the study area was undertaken. This process of verification aims to minimise modelling uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results, and was carried out following the methodology specified in Chapter 7, Section 4, of LAQM.TG(16).

3.2.21. Details of the verification factor calculations are presented in Appendix E. A factor of 4.0 was obtained during the verification process. This factor was applied to the model road-NO_x outputs prior to conversion to annual mean NO_2 concentrations utilising the NO_x to NO_2 calculator (version 8.1, released August 2020) provided by Defra[25].

3.2.22. As local roadside monitoring data are not available for PM_{10} or $PM_{2.5}$, the modelled road-PM_{10} and road-$PM_{2.5}$ components have been adjusted by the verification factor obtained for NO_x before adding to the appropriate background concentration. The number of days with PM_{10} concentrations greater than 50µg/m^3 was then estimated using the relationship with the annual mean concentration described in LAQM.TG(16).

3.2.23. LAQM.TG(16) advises that exceedances of the 1 hour mean NO_2 objective are unlikely to occur where annual mean concentrations are below 60µg/m^3, and it provides guidance on the approach that should be taken if either measured or predicted annual mean NO_2 concentrations are 60µg/m^3 or above.

3.2.24. Once processed, the predicted concentrations were compared against the relevant AQS objective levels for NO_2, PM_{10} and $PM_{2.5}$ set out in Appendix B.

Selection of Sensitive Receptors

3.2.25. Sensitive locations are places where the public or sensitive ecological habitats may be exposed to pollutants resulting from activities associated with the Proposed Development. These will include locations sensitive to an increase in dust deposition and PM_{10} exposure as a result of on-site construction activities, and locations sensitive to exposure to gaseous pollutants emitted from the exhausts of construction and operational traffic associated with the Proposed Development

CONSTRUCTION PHASE

3.2.26. The IAQM assessment is undertaken where there are: ‘human receptors’ within 350m of the site boundary, or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s); and/or ‘ecological receptors’ within 50m of the site boundary, or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s). It is within these distances that the impacts of dust soiling and increased particulate matter in the ambient air will have the greatest impact on local air quality at sensitive receptors.

OPERATIONAL PHASE

3.2.27. In terms of locations that are sensitive to pollutants emitted from engine exhausts, these will include places where members of the public are likely to be regularly present over the period of time

[25] https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc

prescribed in the AQS. For instance, on a footpath where exposure will be transient (for the duration of passage along that path) comparison with a short-term standard (i.e. 15 minute mean or 1 hour mean) may be relevant. At a school or adjacent to a private dwelling, where exposure may be for longer periods, comparison with a long-term standard (such as 24 hour mean or annual mean) may be more appropriate. Box 1.1 of LAQM.TG(16) provides examples of the locations where the air quality objectives should/should not apply.

3.2.28. To complete the assessment of operational phase impacts, a number of 'receptors' representative of locations of relevant public exposure were identified at which pollution concentrations were predicted. Receptors have been located adjacent to the roads that are likely to experience the greatest change in traffic flows or composition, and therefore NO_2 and particulate matter concentrations, as a result of the Proposed Development.

3.2.29. To complete the exposure assessment, pollution concentrations were also predicted at a number of locations within the Application Site. The receptors have been positioned at the façade of the Proposed Development in locations where relevant exposure is considered to occur.

3.2.30. In terms of ecological receptors, paragraph 1.3.1 of the IAQM[26] guidance defines the type of designated habitats that require consideration and when, which depends on whether or not they lie within 200m of an 'affected road' as determined by specific changes to the traffic flow and composition on a road due to a proposal. There are no international/national/local designated sites located within 200m of an "affected road", based on the extend of the road network provided with traffic data.

3.2.31. The locations of the assessment receptors are shown on Figure 1 and listed in Table 1 below.

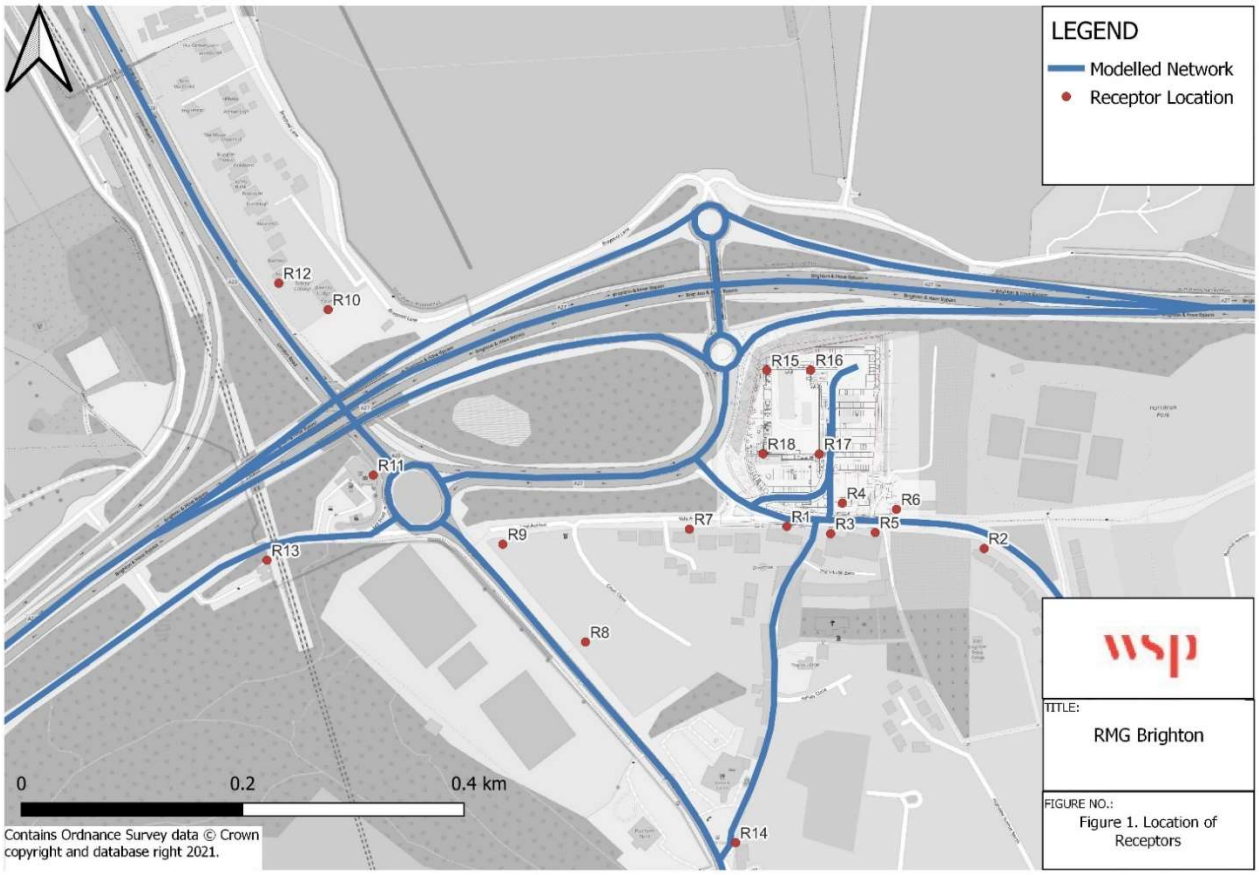
Table 1 - Receptor Locations Used in the Assessment

Receptor	Description/ Address	Grid Reference		Height above Ground Level (m)
		X	Y	
R1	Patcham Court Farmhouse	530192	109170	1.5
R2	101 Vale Avenue	530370	109150	1.5
R3	14 Church Hill	530232	109164	1.5
R4	134 Vale Avenue	530242	109191	1.5
R5	8 Church Hill	530272	109165	1.5
R6	124 Vale Avenue	530291	109186	1.5

[26] IAQM (2020). A guide to the assessment of air quality impacts on designated nature conservation sites, May 2020

Receptor	Description/ Address	Grid Reference		Height above Ground Level (m)
		X	Y	
R7	143 Vale Avenue	530104	109168	1.5
R8	16 Court Close	530010	109066	1.5
R9	151 Vale Avenue	529935	109154	1.5
R10	Collifields Braypool Lane	529777	109366	1.5
R11	Petrol station (commercial)	529818	109216	1.5
R12	Braypool Lane	529733	109390	1.5
R13	Mill Road (commercial)	529722	109140	1.5
R14	4 Church Hill	530146	108885	1.5
R15	New office	530174	109311	1.5
R16	New office	530214	109311	1.5
R17	New office	530221	109236	1.5
R18	New office	530170	109236	1.5

Figure 1 – Location of Receptors



3.3. SIGNIFICANCE CRITERIA

CONSTRUCTION PHASE

3.3.1. The IAQM assessment methodology recommends that significance criteria are only assigned to the identified risk of dust impacts occurring from a construction activity with appropriate mitigation measures in place. For almost all construction activities, the application of effective mitigation should prevent any significant effects occurring to sensitive receptors and therefore the residual effect will normally be negligible.

3.3.2. For the assessment of the impact of exhaust emissions from plant used on-site and construction vehicles accessing and leaving the Site on local concentrations of NO_2 and particulate matter, the significance of residual effects have been determined using professional judgement and the principles outlined in the EPUK/IAQM guidance, which are described below.

OPERATIONAL PHASE

3.3.3. The approach provided in the EPUK/IAQM guidance has been used within this assessment to assist in describing the air quality effects of additional emissions from traffic generated by the Proposed Development once operational.

3.3.4. This guidance recommends that the degree of an impact is described by expressing the magnitude of incremental change in pollution concentration as a proportion of the relevant assessment level

and examining this change in the context of the new total concentration and its relationship with the assessment criterion, as summarised in Table 2.

Table 2 - Impact Descriptors for Individual Receptors

Long term average concentration at receptors in assessment year	% Change in Concentration Relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

Notes

AQAL = Air Quality Assessment Level, which for this assessment related to the UK Air Quality Strategy objectives.

Where the %change in concentrations is <0.5%, the change is described as 'Negligible' regardless of the concentration.

When defining the concentration as a percentage of the AQAL, 'without scheme' concentration should be used where there is a decrease in pollutant concentration and the 'with scheme;' concentration where there is an increase.

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

3.3.5. The EPUK/IAQM guidance notes that the criteria in Table 2 should be used to describe impacts at individual receptors and should be considered as a starting point to make a judgement on significance of effects, as other influences may need to be accounted for. The EPUK/IAQM guidance states that the assessment of overall significance should be based on professional judgement, taking into account several factors, including:

- The existing and future air quality in the absence of the development;
- The extent of current and future population exposure to the impacts; and
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

3.3.6. The EPUK/IAQM guidance states that for most road transport related emissions, long-term average concentrations are the most useful for evaluating the impacts. The guidance does not include criteria for determining the significance of the effect on hourly mean NO_2 concentrations or daily mean PM_{10} concentrations. The significance of effects of hourly mean NO_2 and daily mean PM_{10} concentrations

arising from the operational phase have therefore been determined qualitatively using professional judgement and the principles described above.

3.3.7. The EPUK/IAQM guidance says that *'Where the air quality is such that an air quality objective at the building facade 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. For people working at new developments in this situation, the same will not be true as occupational exposure standards are different, although any assessment may wish to draw attention to the undesirability of the exposure.'*

3.4. EMISSIONS MITIGATION ASSESSMENT

3.4.1. An Emissions Mitigation Assessment has been undertaken following the methodology detailed within BHCC's Air Quality and Emission Mitigation Guidance[27], with reference to Defra's Air Quality Appraisal: Damage Cost Guidance[28], as the Proposed Development is classified as a 'major development' based on criteria within the guidance.

3.4.2. The purpose of an Emissions Mitigation Assessment is to calculate the estimated monetary value of damage from a proposed development caused by the following pollutants: PM and NOx. This is the minimum sum of money that must be spent on practical mitigation measures to secure improvements in air quality. The developer is subsequently responsible for implementing the identified mitigation measures following their agreement with the local planning authority (LPA).

3.5. LIMITATIONS & ASSUMPTIONS

3.5.1. As suitable information for the construction phase of the Proposed Development was not available professional judgement has been used in the completion of this part of the assessment.

3.5.2. There are uncertainties associated with both measured and predicted concentrations. The model (ADMS Roads) used in this assessment relies on input data (including predicted traffic flows), which also have uncertainties associated with them. The model itself simplifies complex physical systems into a range of algorithms. In addition, local micro-climatic conditions may affect the concentrations of pollutants that the ADMS Roads model will not take into account.

3.5.3. In order to reduce the uncertainty associated with predicted concentrations, model verification has been carried out following guidance set out in LAQM.TG(16). Due to limited air quality monitoring in the vicinity of the Application Site, only one monitoring site, E02-2009 located approximately 2.6km from the Application Site, has been selected for the verification process, also taking into account the availability of suitable traffic data. This urban location is not considered entirely representative of conditions within the vicinity of the Application Site (which is close to two major A-Roads but located outside of the Brighton City Centre itself). Furthermore, wherever possible more than one monitoring location should be used for model verification with the verification factor being the line of best fit between the 'measured' road contribution and the model derived road contribution, forced through zero. This helps provide an overall factor for the study area and allows statistical analysis such as

[27] BHCC Air Quality and Emissions mitigation guidance for Sussex (2021).

[28] https://www.gov.uk/government/publications/assess-the-impact-of-air-quality/air-quality-appraisal-damage-cost-guidance

the Root Mean Square Error (RMSE) to be calculated which has not been possible in this instance due to the use of just one diffusion tube.

3.5.4. Notwithstanding the above, the verification factor applied (of 4.03) is considerably higher than atypical verification factor derived for locations in a setting similar to the Application Site. Therefore, the verification factor of 4.03 is likely to significantly over-adjust the modelled road-NO_x outputs and, therefore, both the total pollutant concentrations (NO_2, PM_{10} and $PM_{2.5}$) and the change in concentrations predicted due to the Proposed Development are considered to be 'worst case' and highly conservative.

3.5.5. Furthermore, due to the uncertainty surrounding the accuracy of future year background concentrations, a precautionary approach has been taken whereby for the future scenario, an assumption of no improvement in background concentrations has been adopted. This approach is also considered to provide a conservative assessment, particularly given that there was a reduction in NO_2 concentrations monitored by BHCC between 2018 and 2019, albeit it there is no suitable data for 2020 and 2021 (that is not affected by the COVID 19 pandemic) to support whether these reductions are likely to continue long-term.

3.5.6. RMG also have aspirations for their fleet to be 100% electric vehicles. Therefore, it is only staff trips and trips by members of the public to collection post that will generate emissions to air as a result of the Proposed Development. The modelling does not take into account RMG's aspirations with respect to EVs and, therefore, is again considered to be conservative and 'worst case'.

3.5.7. It should also be noted that the Proposed Development will be replacing the existing RMG depot within Brighton City Centre where pollutant concentrations are most likely higher and where an AQMA has been designated due to exceedances of the AQS objectives for annual and hourly mean NO_2. Therefore, there will be an improvement in air quality on roads leading to and from the existing RMG depot as a result of the Proposed Development replacing the existing depot. It has not been possible to quantify these improvements within Brighton City Centre but it is important to consider these overall changes when considering the modelling results presented herein (i.e. impacts are being displaced from Brighton City Centre to an out of town location).

4. BASELINE CONDITIONS

4.1. BRIGHTON AND HOVE COUNCIL'S REVIEW & ASSESSMENT OF AIR QUALITY

4.1.1. BHCC has designated six AQMAs within its administrative area as a consequence of its Review and Assessment work. The Application Site lies outside of these AQMAs. The nearest AQMA to the Application Site, Brighton & Hove AQMA 5, is located approximately 2.8km to the south and has been designated due to exceedances of the AQS objective for annual NO_2 concentrations.

4.1.2. BHCC published its Air Quality Action Plan (AQAP) in 2011 and an updated AQAP (draft) in 2022. The 2011 AQAP detailed a number of measures proposed to reduce concentrations of NO_2 and particulate matter (PM_{10} and $PM_{2.5}$) within its administrative area/within the AQMA.

4.1.3. BHCC has developed a suite of recommended low emission mitigation measures that may be implemented, as part of the development planning process, to secure scheme acceptability. In considering appropriate measures, BHCC has taken into consideration:

- The development location, timescales and likely impact;
- The potential that development scheme types have for assisting market innovation and transformation;
- Balancing short term emission benefits with those that may accrue over the longer term;
- Technology and uptake incentive feasibility;
- Technology emission profiles;
- Technology road maps and readiness;
- The desirability to promote key technologies in line with other, locally integrated, residual road transport emission reduction strategies; and
- Potential economic development associated with technology and incentive options.

4.2. LOCAL EMISSION SOURCES

4.2.1. The Application Site is located in an area where air quality is mainly influenced by emissions from road transport using the local road network including Vale Avenue, the A27 (Brighton and Hove Bypass), A23 (Patcham Bypass/London Road) and Carden Avenue.

4.2.2. There are four industrial air pollution sources within 2km of the Application Site. These are Malthrust Petroleum Limited located 430m to the west of the Application Site, a service station operated by ESSO located 530m to the south of the Application Site, Patcham dry cleaners located 600m to the south east of the Application Site and a service station operated by ASDA located 1.68km to the east of the Application Site. Operations at these sites will not have a significant influence on air quality at the Application Site given the distance between these sites and the Application Site and the scale of operations at these sites. There are no Part A1 processes in the vicinity of the Application Site.

4.3. BACKGROUND AIR QUALITY DATA

4.3.1. Table 3 summarises the background pollutant concentrations of NO_2, PM_{10} and $PM_{2.5}$ for 2019 that were utilised in the assessment. All of the annual mean background concentrations are well below the relevant AQS objectives. Estimated background concentrations of PM_{10} and $PM_{2.5}$ exceed the 2021 WHO guideline values of 15µg/m^3 and 5µg/m^3, respectively.

Table 3 - Background Concentrations (µg/m^3)

Grid Square (centre on O.S. Grid Reference)	NO_2 (µg/m^3)	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)
530500,109500	15.6*	15.2	10.2

*Background concentration of NO_2 obtained for 2019 from Preston Park AURN.

4.4. LOCAL AUTHORITY AIR QUALITY MONITORING DATA

4.4.1. Concentrations of NO_2 measured in the 3km of the Application Site by BHCC are provided in Table 4 below.

Table 4 - Local Authority Air Quality Monitoring Data – NO_2

Site Name	Site Type	Distance to Site (km)	Annual Mean NO_2 Concentration (µg/m^3)*					
			2015	2016	2017	2018	2019	2020
E02-09	Roadside	2.7	39.0	**41.3**	**40.3**	**41.4**	34.7	31.4
E02-12	Roadside	2.8	**41.5**	**42.2**	**44.4**	**44.7**	39.8	35.7

* BHCC, LAQM Annual Status Report 2021

Bold = Exceedance of the relevant AQS objective

4.4.2. The nearest NO_2 monitoring stations (both roadside monitoring stations) are located approximately 2.8km to the south of the Application Site. The results from these two monitoring stations (2015 – 2020) indicate that concentrations exceeded or were close to exceeding the AQS objective for annual mean NO_2 concentrations (of 40µg/m^3) in all years (2015 – 2018). In 2019, concentrations had reduced substantially from 2018 levels and the relevant AQS objective was met at both of the monitoring sites. In 2020, the two monitoring sites experienced a further drop in NO_2 concentrations however this is most likely attributable to the 2020 COVID 19 lockdown (rather than being reflective of a long-term trend).

4.4.3. There are no PM_{10} monitoring stations operated by BHCC. The nearest $PM_{2.5}$ monitoring stations are located approximately 3km (BH0, urban background) to the south and 4km (BH6, roadside) to the south east of the Application Site. Concentrations of $PM_{2.5}$ measured in the vicinity of the Application Site by BHCC are provided in Table 5.

Table 5 - Local Authority Air Quality Monitoring Data – $PM_{2.5}$

Site Name	Site Type	Distance to Site (km)	Annual Mean $PM_{2.5}$ Concentration (µg/m^3)					
			2015	2016	2017	2018	2019	2020
BH0	Urban Background	3.0	9.3	9.0	8.9	8.9	N/A	N/A
BH6	Roadside	4.0	6.8	7.2	6.4	5.8	5.7	5.5

4.4.4. Monitored $PM_{2.5}$ concentrations indicate that the limit value for $PM_{2.5}$ (a concentration of 20µg/m^3) was met in all years 2015 – 2020, with a slight overall improvement in concentrations recorded since 2015. Monitored $PM_{2.5}$ concentrations meet the 2015 WHO guideline values but exceed the 2021 guideline value of 5µg/m^3.

4.5. DEFRA POLLUTION CLIMATE MAPPING

4.5.1. Defra's Pollution Climate Mapping[29] (PCM) model is a collection of models designed to fulfil part of the UK's EU Directive (2008/50/EC) requirements to report on the concentrations of particular pollutants in the atmosphere. The PCM provides outputs on a 1x1 km grid of background conditions plus around 9,000 representative roadside values.

4.5.2. Projections for concentrations of nitrogen dioxide (NO_2) and oxides of nitrogen (NO_x) across the UK in the years 2019 - 2030 inclusive, have been calculated as part of a PCM model assessment. Projections for particulate matter ($PM_{2.5}$ and PM_{10}) have also been calculated across the UK in the years 2020, 2025 and 2030.

4.5.3. The PCM modelled roadside NO_2 concentration at A23 London Road (CENSUS ID 802048748), the nearest PCM link to the Application Site, for 2019 is 26.6µg/m^3, which is below the AQS objective.

4.5.4. The PCM modelled roadside PM_{10} and $PM_{2.5}$ concentrations at A23 London Road (CENSUS ID 802078238) for 2020 are 17.9µg/m^3 and 11.7µg/m^3, respectively. Both projected concentrations are below the relevant AQS objectives but exceed the 2021 WHO guideline values.

4.5.5. The PCM modelled roadside NO_2 concentration at A23 London Road (CENSUS ID 802048748) for 2024 is 20.1µg/m^3, which is below the AQS objective.

4.5.6. The PCM modelled roadside PM_{10} and $PM_{2.5}$ concentrations at A23 London Road (CENSUS ID 802078238) for 2025 are 16.9µg/m^3 and 10.8µg/m^3, respectively. Both projected concentrations are below the relevant AQS objectives but exceed the 2021 WHO guideline values.

4.6. 2019 BASELINE MODELLING

4.6.1. The results of the modelling for the 2019 baseline scenario provide predicted baseline pollution concentrations at locations where existing information(e.g. air quality monitoring) is not available. A summary of these assessment results is provided below.

Annual Mean NO_2 Concentrations

4.6.2. The AQS objective for annual mean NO_2 concentrations is 40µg/m^3. In the 2019 modelled baseline scenario, annual mean NO_2 concentrations exceeded the objective at all modelled existing receptor locations and were close to the objective level at receptors R2, R5 and R6. The highest concentration, of 76.3µg/m^3, is predicted at Receptor 12 (a residential dwelling on Braypool Lane).

4.6.3. The results indicate that exceedances of the AQS objective for annual mean NO_2 concentrations are occurring within the study area. However, these exceedances are likely to be attributable to the high

[29] https://uk-air.defra.gov.uk/research/air-quality-modelling?view=modelling

verification factor applied (see Section 3.5.4). it should be noted that the modelled concentrations of NO_2 are significantly higher than those modelled by Defra's PCM. Namely, the 2019 estimate for London Road (CENSUS ID 802048748).

Hourly Mean NO_2 Concentrations

4.6.4. At the majority of locations, annual mean NO_2 concentrations were below 60µg/m^3 and therefore hourly mean NO_2 concentrations are unlikely to cause a breach of the hourly mean AQS objective. Exceedances of 60µg/m^3 were recorded at three residential properties (R9, R10 and R12); and two commercial locations (R11 and R13).

4.6.5. Therefore, the results indicate that exceedances of the AQS objective for hourly mean NO_2 concentrations may be occurring within the study area. However, as noted above, the verification factor applied (4.03) is much higher than the verification factor typically derived for urban locations within the UK, such as the Application Site. Had a lower more typical factor been derived and applied, exceedances of 60µg/m^3 are considered unlikely.

Annual Mean PM_{10} Concentrations

4.6.6. The AQS objective for annual mean PM_{10} concentrations is 40µg/m^3. In the 2019 modelled baseline scenario, annual mean PM_{10} concentrations meet the objective at all modelled existing receptors. The highest concentration, of 22.3µg/m^3, is predicted at receptor R12 (a residential dwelling on Braypool Lane). The results indicate that no exceedances of the AQS objective for annual mean PM_{10} concentrations are occurring within the study area.

4.6.7. The PM_{10} concentrations at modelled receptors exceed the 2021 WHO guideline value of 15µg/m^3.

Daily Mean PM_{10} Concentrations

4.6.8. The AQS objective for daily mean PM_{10} concentrations is 50µg/m^3 to be exceeded no more than 35 times a year. The modelling indicates that the number of days exceeding 50µg/m^3 in 2019 is a maximum of 12 at R11, which is well below the objective.

4.6.9. The results indicate that no exceedances of the AQS objective for daily mean PM_{10} concentrations are occurring within the study area.

Annual Mean $PM_{2.5}$ Concentrations

4.6.10. The AQS objective for annual mean $PM_{2.5}$ concentrations is 20µg/m^3. In the 2019 modelled baseline scenario, annual mean $PM_{2.5}$ concentrations meet the objective at all of the modelled existing receptors. The highest concentration, of 14.9µg/m^3, is predicted at Receptor 12 on Braypool Lane. The results indicate that no exceedances of the AQS objective for annual mean $PM_{2.5}$ concentrations are occurring within the study area.

4.6.11. The $PM_{2.5}$ concentrations at modelled receptors exceed the 2021 WHO guideline value of 5µg/m^3.

4.7. SUMMARY

4.7.1. The Application Site is located in an area where the main influence on air quality is emissions from road traffic.

4.7.2. The background pollution concentration data, the local authority monitoring data and PCM prediction for 2019 indicate that pollutant concentrations in the vicinity of the Application Site are currently below the AQS objectives.

4.7.3. The baseline modelling results for 2019, however, indicate that pollutant concentrations in the vicinity of the Application Site exceeded the AQS objectives for annual and hourly NO_2 concentrations. As discussed above in Section 3.4, these exceedances are likely attributable to the high verification factor applied.

4.7.4. The modelling results for 2019 also indicate that annual mean PM_{10} and $PM_{2.5}$ concentrations exceeded the 2021 WHO guideline values of 15µg/m^3 and 5µg/m^3, respectively. Whilst the application of a high verification factor is relevant to these results, it is important to note that the guideline values are already exceeded at background locations (i.e. without the significant influence of road traffic emissions) based on Defra's estimated background mapping for 2019.

5. ASSESSMENT OF IMPACTS

5.1. CONSTRUCTION PHASE

DUST AND PM_{10} ARISING FROM ON-SITE ACTIVITIES

5.1.1. Construction activities that have the potential to generate and/or re-suspend dust and PM_{10} include:

- Site clearance and preparation including demolition activities;
- Preparation of temporary access/egress to the Application Site and haulage routes;
- Earthworks;
- Materials handling, storage, stockpiling, spillage and disposal;
- Movement of vehicles and construction traffic within the Application Site;
- Use of crushing and screening equipment/plant;
- Exhaust emissions from site plant, especially when used at the extremes of their capacity and during mechanical breakdown;
- Construction of buildings, roads and areas of hardstanding alongside fabrication processes;
- Internal and external finishing and refurbishment; and
- Site landscaping after completion.

5.1.2. The majority of the releases are likely to occur during the 'working week'. However, for some potential release sources (e.g. exposed soil produced from significant earthwork activities) in the absence of dust control mitigation measures, dust generation has the potential to occur 24 hours per day over the period during which such activities are to take place.

ASSESSMENT OF POTENTIAL DUST EMISSION MAGNITUDE

5.1.3. The IAQM assessment methodology has been used to determine the potential dust emission magnitude for the following four different dust and PM_{10} sources: demolition; earthworks; construction; and, trackout. The findings of the assessment are presented below.

Demolition

5.1.4. The total volume of buildings to be demolished on site is likely to be less than 20,000m^3, with construction material that has a low potential for releasing dust (e.g. metal cladding or timber), and with demolition activities occurring below 10m above ground level. Therefore, the potential dust emission magnitude is considered to be small for demolition activities.

Earthworks

5.1.5. The total area of the Application Site is circa 15,600m^2, which falls within the IAQM's range for a large site (>10,000m^2). The soil type is chalky and therefore potentially dusty, whilst the total material that will be moved is likely to be less than 100,000 tonnes. It is also likely that less than 10 heavy earth moving vehicles will be active at any one time, and that any bunds formed will be less than 4m in height. Therefore, the potential dust emission magnitude is considered to be medium to large for earthwork activities.

Construction

5.1.6. The total Gross Internal Area (GIA) of the building is 4,145m^2, therefore, the volume of buildings to be constructed on the Application Site will likely be less than 100,000m^3 with potentially dusty

construction materials being used. Therefore, the potential dust emission magnitude is considered to be medium for construction activities.

Trackout

5.1.7. Information on the number of HDVs associated with this phase of the Proposed Development is not currently available and therefore professional judgement has been used. It has been assumed that, given the size of the Proposed Development, there will be less than 10 HDV outward movements in any one day, travelling over surface material with a low potential for dust release. As the unpaved road length in the Application Site is likely to be less than 50m, it is considered that the potential dust emission magnitude for trackout is small.

5.1.8. Table 6 provides a summary of the potential dust emission magnitude determined for each construction activity considered.

Table 6 - Potential Dust Emission Magnitude

Activity	Dust Emission Magnitude
Demolition	Small
Earthworks	Medium to Large
Construction Activities	Medium
Trackout	Small

Assessment of Sensitivity of the Study Area

5.1.9. A windrose generated using the meteorological data used for the dispersion modelling of operational phase impacts (2019 data for Shoreham Airport) is provided in Appendix H. The windrose shows that the prevailing wind direction at the Application Site is from the southwest with frequent winds from the north. Therefore, receptors located to the north east and south of the Application Site are more likely to be affected by dust and particulate matter emitted and re-suspended during the construction phase. To the north east of the Application Site are Patcham Court allotments, which are likely to be of low sensitivity to dust and particular matter, whereas the land to the south of the Application Site comprises residential properties along Vale Avenue, which are considered high sensitivity to dust and particular matter based on the IAQM's construction dust guidance.

5.1.10. Under low wind speed conditions, it is likely that the majority of dust would be deposited in the area immediately surrounding the source. There are a number of residential dwellings (approximately 20-25) within 50m of the Application Site, including a number of properties on Vale Avenue. Taking the above into account, the sensitivity of the surrounding area to increases in dust soiling from construction activities is considered to be high.

5.1.11. In addition, receptors located within close proximity to roads being used by construction traffic will also be sensitive to changes in air quality. The proposed access routes for construction traffic have yet to be agreed. However, construction vehicles are likely access the Site via the A27, A23, London Road and Vale Avenue. It is estimated that there are less than 100 properties located within 50m of these roads, up to 50m either side of the proposed site access. Therefore, the sensitivity of the surrounding area to increase in dust soiling from trackout is considered to be medium.

5.1.12. Estimated background concentrations of PM_{10} within the vicinity of the Application Site are considerably below 24µg/m^3. Therefore, the overall sensitivity of the surrounding area to increases in PM_{10} is considered to be low.

5.1.13. There are no international/national/local designated sites within the 50m of the site boundary or 50m of the route used by construction vehicle on the public highway, up to 500m of the site entrance. The nearest designated site is Withdean & Wesdean Woods Local Nature Reserves (LNR) which is located approximately 600m southwest of the Site boundary. Therefore, the impact of construction phase to the ecological receptors is scoped out.

5.1.14. Taking the above into account and following the IAQM assessment methodology, the sensitivity of the area to changes in dust and PM_{10} has been derived for each of the construction activities considered. The results are shown in Table 7.

Table 7 - Sensitivity of the Study Area

Potential Impact	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High	High	High	Medium
Human Health	Low	Low	Low	Low
Ecological	N/A	N/A	N/A	N/A

Risk of Impacts

5.1.15. The predicted dust emission magnitude has been combined with the defined sensitivity of the area to determine the risk of impacts during the construction phase, prior to mitigation. Table 8 below provides a summary of the risk of dust impacts for the Proposed Development. The risk category identified for each construction activity has been used to determine the level of mitigation required.

Table 8 - Summary Dust Risk Table to Define Site Specific Mitigation

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium Risk	High to Medium Risk	Medium Risk	Low Risk
Human Health	Negligible	Low Risk	Low Risk	Negligible
Ecological	N/A	N/A	N/A	N/A

Construction Vehicles & Plant

5.1.16. The greatest impact on air quality due to emissions from vehicles and plant associated with the construction phase will be in the areas immediately adjacent to the site access. It is anticipated that construction traffic will access the site via A27, A23, London Road and Vale Avenue. Due to the size

of the Site, it is considered likely that the construction traffic will be low in comparison to the existing traffic flows on these roads.

5.1.17. Final details of the exact plant and equipment likely to be used on Site will be determined by the appointed contractor, it is considered likely to comprise dump trucks, tracked excavators, diesel generators, asphalt spreaders, rollers, compressors and trucks. The number of plant and their location within the Site are likely to be variable over the construction period.

5.1.18. Based on the current local air quality in the area, the proximity of sensitive receptors to the roads likely to be used by construction vehicles, and the likely numbers of construction vehicles and plant that will be used, the impacts are therefore considered to be of negligible significance according to the assessment significance criteria.

5.2. OPERATION PHASE

5.2.1. Full results of the dispersion modelling are presented in Appendix G and a summary is provided below.

ANNUAL MEAN NO_2 CONCENTRATIONS

5.2.2. The AQS objective for annual mean NO_2 concentrations is 40µg/m^3. In 2024, the opening year of the Proposed Development, the objective is predicted to be met at the majority of existing assessment receptors where the annual mean objective applies, both without and with the Proposed Development. Exceedances of the objective are predicted at receptors R9, R10 and R12 where predicted concentrations are 45.4 µg/m^3, 44.3 µg/m^3 and 55.7µg/m^3 without the Proposed Development; and 45.5µg/m^3, 44.4µg/m^3 and 55.7µg/m^3 with the Proposed Development. As discussed, the exceedances are likely due to the high verification factor. Had a lower more typical factor been derived and applied, exceedances of 40µg/m^3 are considered unlikely.

5.2.3. The Proposed Development is predicted to cause an increase in annual mean NO_2 concentrations at all but one receptor (R12) where no change is predicted. At all the existing assessment receptors, the predicted changes in concentrations were less than or equal to 1.0% of the AQS objective. As a result, at the majority of receptors, the impact of the Proposed Development on annual mean NO_2 concentrations is judged to be negligible in accordance with the impact descriptors contained within the EPUK/IAQM guidance.

HOURLY MEAN NO_2 CONCENTRATIONS

5.2.4. For all residential sensitive receptors, the annual mean NO_2 concentrations predicted by the model were all below 60µg/m^3, and therefore hourly mean NO_2 concentrations are unlikely to cause a breach of the hourly mean AQS objective. The impact of the Proposed Development on hourly mean NO_2 concentrations at existing sensitive residential receptors is considered to be negligible.

5.2.5. The annual mean NO_2 concentrations predicted at R11 (Petrol Station) were marginally above 60µg/m^3 (63.1µg/m^3 and 63.2µg/m^3 without and with the Proposed Development, respectively) and therefore exceedances of the AQS objective for hourly mean NO_2 concentrations could occur at this location. That said, as discussed within Section 3.5, there are a number of worst case assumptions/conservatism built into the modelling results, particularly due to the application of the high verification factor (4.03). In reality it is likely that predicted concentrations at receptor R11 would be lower and likely less than 60µg/m^3. Furthermore, the hourly objective is not considered to apply at

this receptor as it is highly unlikely that users of the petrol station will be present for periods of 1 hour or more.

5.2.6. Taking all of the above into account, the impact of the Proposed Development on hourly mean NO_2 concentrations is judged to be negligible.

ANNUAL MEAN PM_{10} CONCENTRATIONS

5.2.7. The AQS objective for annual mean PM_{10} concentrations is 40µg/m^3. In 2024, the opening year of the Proposed Development, the objective is predicted to be met at all the existing assessment receptors where the objective is considered to apply, both without and with the Proposed Development. The highest concentration is 21.8µg/m^3, predicted at receptor R12, a residential dwelling on Braypool Lane.

5.2.8. The predicted changes in annual mean PM_{10} concentrations are all <0.5% of the relevant AQS objective. Therefore, based on the EPUK/IAQM guidance, the impact of the increased emissions associated with the Proposed Development on annual mean PM_{10} concentrations is considered to be negligible.

DAILY MEAN PM_{10} CONCENTRATIONS

5.2.9. The AQS objective for daily mean PM_{10} concentrations is 50µg/m^3 to be exceeded no more than 35 times a year. In 2024, the number of days of exceedance of 50µg/m^3 is a maximum of 6, both with and without Proposed Development, which meets the objective of no more than 35 days of exceedance. Therefore, the impact of the Proposed Development on daily mean PM_{10} concentrations is also judged to be negligible.

ANNUAL MEAN $PM_{2.5}$ CONCENTRATIONS

5.2.10. Predicted annual mean concentrations of $PM_{2.5}$ are all well below the relevant limit value of 20µg/m^3 in all modelled scenarios. The highest concentration of 14.2µg/m^3 is predicted at receptor R12, both with and without Proposed Development.

5.2.11. The predicted changes in annual mean $PM_{2.5}$ concentrations are all <1.0% of the relevant AQS objective. Therefore, based on the EPUK/IAQM guidance, the impact of the increased emissions associated with the Proposed Development on annual mean $PM_{2.5}$ concentrations is considered to be negligible.

WHO GUIDELINE FOR PM_{10} AND $PM_{2.5}$ CONCENTRATIONS

5.2.12. The WHO guideline concentration for annual mean PM_{10} concentration is 15µg/m^3. In 2024, modelled annual mean concentrations of PM_{10} are all predicted to exceed the guideline value, both with and without the Proposed Development. However, this is largely attributable to existing background concentrations which exceed the objective in 2019 and which have been applied to the future scenarios (which is highly conservative).

5.2.13. Similarly, the WHO guideline concentration for annual mean $PM_{2.5}$ concentration is 5µg/m^3. In 2024, modelled annual mean concentrations of $PM_{2.5}$ are all predicted to exceed the guideline value, both with and without the Proposed Development. However, as with PM_{10}, this is largely attributable to existing background concentrations which exceed the objective in 2019 and which have been applied to the future scenarios (which is highly conservative).

EXPOSURE OF FUTURE OCCUPANTS/USERS

5.2.14. In 2024, the highest predicted annual mean NO_2 concentration within the Application Site at a location where relevant exposure is likely to occur is 52.4µg/m^3 (i.e. below 60µg/m^3 in relation to the hourly mean objective for NO_2), the predicted annual mean PM_{10} concentration is 22.0µg/m^3, with a maximum of 6 days predicted to exceed 50µg/m^3. The highest predicted $PM_{2.5}$ concentration is 14.5µg/m^3.

5.2.15. As a workplace, the predicted concentrations of NO_2 and PM_{10} are all below the relevant short-term objectives at all proposed receptors located along the Application Site boundary.

DAMAGE COST CALCULATION

5.2.16. For the calculation of the emissions associated with the Proposed Development the total two-way Annual Average Daily Traffic (AADT) flow generated by the development was obtained from the Project's Transport Consultant and entered into DEFRA's most recent Emission Factor Toolkit (EFT) v11.0[30] to predict the change in NO_X and $PM_{2.5}$ emissions associated with the operation of the Proposed Development.

5.2.17. The daily flow generated from the Proposed Development is 481 AADT with 5.0% HGV. In the EFT it was assumed that the average speed of the vehicles was 50km/hr and that the vehicles travelled an average distance of 10km.

5.2.18. The emissions mitigation cost is calculated as a total sum over five years. With the anticipated opening year of the Proposed Development being 2024, annual traffic emissions and associated emissions mitigation costs were calculated for the period 2024-2028 inclusive, to provide a five-year cost. The pollutant emissions calculated for the appraisal period are shown in Table 9 below.

Table 9 – Emission Outputs for Damage Cost

Pollutants	Emission Output (tonne / year)				
	2024	2025	2026	2027	2028
NO_X	0.35791	0.32008	0.28696	0.25690	0.23078
$PM_{2.5}$	0.03518	0.03489	0.03468	0.03452	0.03441

5.2.19. Table 9 shows that annual emissions for all pollutants are predicted to decrease from 2024 to 2028. This is expected as the DEFRA EFT[30] predicts that pollutant emissions from vehicles will gradually decrease for with time due to the increased uptake of cleaner, lower emission vehicles[31].

[30] DEFRA Emission Factor Toolkit Version 11.0 [online] https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html

[31] Whilst the EFT tool provides emissions outputs for 2031-2050, it should be noted that the input assumptions embedded within the tool for these years may not fully align with those applied for the purposes of NAEI projections. Therefore, there will be limitations associated with the emissions that have been used to calculate the emissions mitigation costs/damage costs.

5.2.20. The calculated NO_X and $PM_{2.5}$ emissions were the input into the most recent DEFRA Air Quality Appraisal: Damage Costs Toolkit[3], to calculate the associated 'damage cost'.

5.2.21. The damage cost for the Proposed Development is £33,626 (based on the central present value). This represents the minimum sum of money that must be spent on air quality related mitigation measures for the Proposed Development.

5.2.22. It should be noted that this does not take account of RMG's aspiration for 100% of the delivery vehicles to be EV. It is therefore, a sensitive test scenario is undertaken to take into account RMG's aspirations (i.e. 100% RMG fleet to be EV) and provide a more representative damage cost calculation. The damage cost for the Proposed Development is £32,205 (based on the central present value) with 100% RMG fleet to be EV. Details of calculations are provided in Appendix H.

6. MITIGATION & RESIDUAL EFFECTS

6.1. CONSTRUCTION PHASE

MITIGATION

6.1.1. Based on the assessment results, mitigation will be required. Recommended mitigation measures are given below.

General Communication

- A stakeholder communications plan that includes community engagement before work commences on site should be developed and implemented.
- The name and contact details of person(s) accountable for air quality and dust issues should be displayed on the site boundary. This may be the environment manager/engineer or the site manager. The head or regional office contact information should also be displayed.

General Dust Management

- A Dust Management Plan (DMP), which may include measures to control other emissions, in addition to the dust and PM_{10} mitigation measures given in this report, should be developed and implemented, and approved by the Local Authority.

Site Management

- All dust and air quality complaints should be recorded and causes identified. Appropriate remedial action should be taken in a timely manner with a record kept of actions taken including of any additional measures put in-place to avoid reoccurrence.
- The complaints log should be made available to the local authority on request.
- Any exceptional incidents that cause dust and/or air emissions, either on or offsite should be recorded, and then the action taken to resolve the situation recorded in the log book.

Monitoring

- Daily on-site and off-site inspections should be undertaken, where receptors (including roads) are located nearby to monitor dust. The inspection results should be recorded and made available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.
- The frequency of site inspections should be increased when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

Preparing and maintaining the site

- Plan the site layout so that machinery and dust causing activities are located away from receptors, as far as is practicable.
- Where practicable, erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- Where practicable, fully enclose 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.
- Keep site fencing, barriers and scaffolding clean using wet methods.

- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover appropriately.
- Where practicable, cover, seed or fence stockpiles to prevent wind whipping.

Operating vehicle/machinery and sustainable travel

- Ensure all vehicle operators switch off engines when stationary - no idling vehicles.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
- A maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas should be imposed (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).
- A Construction Logistics Plan should be produced to manage the sustainable delivery of goods and materials.
- A Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing) should be considered.

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste management

- Avoid bonfires and burning of waste materials.

Measures Specific to Demolition

- Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In , high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
- Avoid explosive blasting, using appropriate manual or mechanical alternatives.
- Bag and remove any biological debris or damp down such material before demolition.

Measures Specific to Earthworks

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
- Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
- Where practicable, only remove the cover in small areas during work and not all at once.

- Stockpile surface areas should be minimised (subject to health and safety and visual constraints regarding slope gradients and visual intrusion) to reduce area of surfaces exposed to wind pick-up.
- Where practicable, windbreak netting/screening should be positioned around material stockpiles and vehicle loading/unloading areas, as well as exposed excavation and material handling operations, to provide a physical barrier between the Application Site and the surroundings.
- Where practicable, stockpiles of soils and materials should be located as far as possible from sensitive properties, taking account of the prevailing wind direction.
- During dry or windy weather, material stockpiles and exposed surfaces should be dampened down using a water spray to minimise the potential for wind pick-up.

Measures Specific to 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.
- All construction plant and equipment should be maintained in good working order and not left running when not in use.

Measures Specific to Trackout

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being in frequent use.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Record all inspections of haul routes and any subsequent action in a site log-book.
- Where practicable, hard surfaced haul routes should be installed, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- 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 10m from receptors where possible.

6.1.2. Detailed mitigation measures to control construction traffic should be discussed with BHCC to establish the most suitable access and haul routes for the site traffic. The most effective mitigation will be achieved by ensuring that construction traffic does not pass along sensitive roads (residential roads, congested roads, via unsuitable junctions, etc.) where possible, and that vehicles are kept clean (through the use of wheel washers, etc.) and sheeted when on public highways. Timing of large-scale vehicle movements to avoid peak hours on the local road network will also be beneficial.

RESIDUAL EFFECTS

6.1.3. The residual effect of dust and PM_{10} generated by construction activities following the application of the mitigation measures described above and good site practice is considered to be negligible.

6.1.4. The residual effect of emissions to air from construction vehicles and plant on local air quality is also considered to be negligible.

6.2. OPERATIONAL PHASE

MITIGATION

6.2.1. The change in pollutant concentrations attributable to traffic emissions associated with the operation phase of the Proposed Development (i.e. impacts on local air quality) are negligible (themselves not warranting the need for mitigation).

6.2.2. The Proposed Development will include a Framework Travel Plan in support of the planning application. The Framework Travel Plan will aim to reduce the number of single occupancy car journeys to the Site through increasing knowledge and awareness of sustainable travel options available for accessing the Proposed Development. Whilst the Framework Travel Plan will be aimed at both staff and visitors, it must be recognised that the Travel Plan will have primary influence over staff travel.

6.2.3. Furthermore, as noted within Section 3.5, RMG has an aspiration for 100% of the delivery fleet to be EV's. This aspiration has not been reflected within the air quality modelling presented within this report and represents a significant measure in terms of mitigating emissions to air due to future operations at the Application Site.

6.2.4. As the Proposed Development replaces the existing depot within Brighton City Centre, where air quality is arguably worse than within the vicinity of the Application Site and where there is an existing AQMA due to exceedances of the AQS objectives for hourly and annual mean NO_2, the Proposed Development itself could be seen as a proposal which mitigates some of the air quality challenges being experienced within Brighton City Centre, especially taking into account RMG's aspirations regarding the delivery fleet.

RESIDUAL EFFECTS

6.2.5. The Proposed Development is predicted to cause imperceptible increases in NO_2 and PM_{10} and $PM_{2.5}$ concentrations. These increases will be reduced by the implementation of the mitigation measures described above.

6.2.6. Although at the majority of locations concentrations are predicted to exceed the NO_2 objectives both with and without the Proposed Development, the AQS objectives for PM_{10} and $PM_{2.5}$ are predicted to be met. The residual effects of the Proposed Development on air quality are negligible for NO_2, PM_{10} and $PM_{2.5}$ according to the EPUK assessment criteria.

7. CONCLUSIONS

7.1.1. A qualitative assessment of the potential impacts on local air quality from construction activities has been carried out for this phase of the Proposed Development using the IAQM methodology. This identified that there is a Low to High Risk of dust soiling impacts (depending on the phase of construction with the greatest risk likely to occur due to earthworks) and a Negligible to Low Risk of increases in particulate matter concentrations due to construction activities. However, through good site practice and the implementation of suitable mitigation measures, the effect of dust and PM_{10} releases would be significantly reduced. The residual effects of dust and PM_{10} generated by construction activities on air quality are therefore considered to be insignificant. The residual effects of emissions to air from construction vehicles and plant on local air quality is considered to be negligible.

7.1.2. In addition, a quantitative assessment of the potential impacts during the operational phase was undertaken using ADMS Roads to predict the changes in NO_2, PM_{10} and $PM_{2.5}$ concentrations that would occur due to traffic generated by the Proposed Development.

7.1.3. The results show that the AQS objective for NO_2 will be exceeded in 2024, the anticipated opening year of the Proposed Development, both without and with the Proposed Development. The AQS objectives for PM_{10} and $PM_{2.5}$ will be met in 2024. The predicted changes in NO_2, PM_{10} and $PM_{2.5}$ concentrations as a result of the operation of the Proposed Development are all less than or equal to 1% of the relevant AQS. As discussed within Section 3.5, there are a number of worst case assumptions/conservatism built into the modelling results, particularly due to the application of the high verification factor (4.03). In addition, RMG has an aspiration for 100% of the delivery fleet to be EV's. This aspiration has not been reflected within the air quality modelling presented within this report and represents a significant measure in terms of mitigating emissions to air due to future operations at the Application Site. Therefore, according to the assessment significance criteria, the residual effects will be negligible.

7.1.4. Future more, the modelled results demonstrated that the future occupants of the Proposed Development will not be exposed to poor air quality.

7.1.5. The Emissions Mitigation Calculation has been undertaken in line with BHCC's Air Quality and Emission Mitigation Guidance, with reference to the DEFRA Air Quality Appraisal: Damage Cost Guidance. The damage cost value associated with the Proposed Development was calculated to be a range of £32,205 to £33,626 (central present value).

7.1.6. Based on the above, it is considered that the development proposals comply with national and local policy for air quality even with the worst case assumptions and conservative approaches.

Appendix A

GLOSSARY

Term	Definition
AADT Annual Average Daily Traffic	A daily total traffic flow (24 hrs), expressed as a mean daily flow across all 365 days of the year.
Adjustment	Application of a correction factor to modelled results to account for uncertainties in the model
Accuracy	A measure of how well a set of data fits the true value.
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedances within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Ambient air	Outdoor air in the troposphere, excluding workplace air.
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year.
AQMA	Air Quality Management Area.
AURN	Automatic Urban and Rural (air quality monitoring) Network, managed by contractors on behalf of Defra
Conservative	Tending to over-predict the impact rather than under-predict.
Data capture	The percentage of all the possible measurements for a given period that were validly measured.
Defra	Department for Environment, Food and Rural Affairs.
Dust	Dust comprises particles typically in the size range 1-75 micrometres (µm) in aerodynamic diameter and is created through the action of crushing and abrasive forces on materials
Emission rate	The quantity of a pollutant released from a source over a given period of time.
Exceedance	A period of time where the concentrations of a pollutant is greater than the appropriate air quality standard.
Fugitive emissions	Emissions arising from the passage of vehicles that do not arise from the exhaust system.
HDV/HGV	Heavy Duty Vehicle/Heavy Goods Vehicle.
LAQM	Local Air Quality Management.
Minor roads	Non A roads of Motorways.

Term	Definition
Model adjustment	Following model verification, the process by which modelled results are amended. This corrects for systematic error.
NO_2	Nitrogen dioxide.
NO_x	Nitrogen oxides.
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometres.
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5 micrometres.
Ratification (Monitoring)	Involves a critical review of all information relating to a data set, in order to amend or reject the data. When the data have been ratified they represent the final data to be used (see also validation).
Road link	A length of road which is considered to have the same flow of traffic along it. Usually, a link is the road from one junction to the next.
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.
$\mu g/m^3$ micrograms per cubic metre	A measure of concentration in terms of mass per unit volume. A concentration of $1ug/m^3$ means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.
Uncertainty	A measure, associated with the result of a measurement, which characterizes the range of values within which the true value is expected to lie. Uncertainty is usually expressed as the range within which the true value is expected to lie with a 95% probability, where standard statistical and other procedures have been used to evaluate this figure. Uncertainty is more clearly defined than the closely related parameter 'accuracy', and has replaced it on recent European legislation.
Validation (modelling)	Refers to the general comparison of modelled results against monitoring data carried out by model developers.
Verification (modelling)	Comparison of modelled results versus any local monitoring data at relevant locations.
Verification (modelling)	Comparison of modelled results versus any local monitoring data at relevant locations.

Appendix B

RELEVANT UK AIR QUALITY STRATEGY OBJECTIVES AND WHO GUIDELINE VALUES

National Air Quality Objectives and European Directive Limit Values for the protection of human health

Pollutant	Applies to	Objective	Measured as	Date to be achieved by and maintained thereafter	European Obligations	Date to be achieved by and maintained thereafter
Nitrogen dioxide (NO_2)	UK	200µg/m^3 not to be exceeded more than 18 times a year	1 hour mean	31.12.2005	200µg/m^3 not to be exceeded more than 18 times a year	01.01.2010
	UK	40µg/m^3	annual mean	31.12.2005	40µg/m^3	01.01.2010
Particulate Matter (PM_{10}) (gravimetric)[A]	UK (except Scotland)	40µg/m^3	annual mean	31.12.2004	40µg/m	01.01.2005
	UK (except Scotland)	50µg/m^3 not to be exceeded more than 35 times a year	24 hour mean	31.12.2004	50µg/m^3 not to be exceeded more than 35 times a year	01.01.2005
Particulate Matter ($PM_{2.5}$)	UK (except Scotland)	20µg/m^3	annual mean	2020	Target value 25µg/m^3	2010

[A] Measured using the European gravimetric transfer sampler or equivalent

µg/m^3 = microgram per cubic metre

WHO – recommended 2021 Air Quality Guideline (AQG) levels compared to 2005 AQGs

Pollutant	Averaging time	2005 AQGs	2021 AQGs
$PM_{2.5}$ µg/m^3	Annual	10	5
$PM_{2.5}$ µg/m^3	24-hour*	25	15
PM_{10} µg/m^3	Annual	20	15
PM_{10} µg/m^3	24-hour*	50	45

* 99th percentile (i.e. 3–4 exceedance days per year).

Appendix C

IAQM CONSTRUCTION ASSESSMENT METHODOLOGY

STEP 1 – SCREENING THE NEED FOR A DETAILED ASSESSMENT

An assessment will normally be required where there are:

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

Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is "negligible".

STEP 2A – DEFINE THE POTENTIAL DUST EMISSION MAGNITUDE

The following are examples of how the potential dust emission magnitude for different activities can be defined. (Note that not all the criteria need to be met for a particular class). Other criteria may be used if justified in the assessment.

Table 2A: Examples of Human Receptor Sensitivity to Construction Phase Impacts

Dust Emission Magnitude	Activity
Large	Demolition >50,000m^3 building demolished, dusty material (e.g. concrete), on-site crushing/screening, demolition >20m above ground level
	Earthworks >10,000m^2 site area, dusty soil type (e.g. clay), >10 earth moving vehicles active simultaneously, >8m high bunds formed, >100,000 tonnes material moved
	Construction >100,000m^3 building volume, on site concrete batching, sandblasting
	Trackout >50 HDVs out / day, dusty surface material (e.g. clay), >100m unpaved roads
Medium	Demolition 20,000 - 50,000m^3 building demolished, dusty material (e.g. concrete) 10-20m above ground level
	Earthworks 2,500 - 10,000m^2 site area, moderately dusty soil (e.g. silt), 5-10 earth moving vehicles active simultaneously, 4m - 8m high bunds, 20,000 -100,000 tonnes material moved
	Construction 25,000 - 100,000m^3 building volume, dusty material e.g. concrete, on site concrete batching

Dust Emission Magnitude	Activity
	Trackout 10 - 50 HDVs out / day, moderately dusty surface material (e.g. clay), 50 -100m unpaved roads
Small	Demolition <20,000m^3 building demolished, non-dusty material (e.g metal cladding), <10m above ground level, work during wetter months
	Earthworks <2,500m^2 site area, soil with large grain size (e.g. sand), <5 earth moving vehicles active simultaneously, <4m high bunds, <20,000 tonnes material moved, earthworks during wetter months
	Construction <25,000m^3, non-dusty material (e.g. metal cladding or timber)
	Trackout <10 HDVs out / day, non-dusty soil, < 50m unpaved roads

STEP 2B – DEFINE THE SENSITIVITY OF THE AREA

The tables below present the IAQM assessment methodology to determine the sensitivity of the area to dust soiling, human health and ecological impacts respectively. The IAQM guidance provides guidance to allow the sensitivity of individual receptors to dust soiling and health effects to assist in the assessment of the overall sensitivity of the study area.

Table 2Ba: Sensitivity of the Area to Dust Soiling Effects

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

Table 2Bb: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentration ($\mu g/m^3$)	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Table 2Bc: Sensitivity of the Area to Ecological Impacts

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

STEP 2C – DEFINE THE RISK OF IMPACTS

The dust emissions magnitude determined at Step 2A should be combined with the sensitivity of the area determined at Step 2B to determine the risk of impacts without mitigation applied. For those cases where the risk category is 'negligible' no mitigation measures beyond those required by legislation will be required.

Table 2C: Risk of Dust Impacts

Sensitivity of surrounding area	Dust Emission Magnitude		
	Large	Medium	Small
Demolition			
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible
Earthworks and Construction			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible
Trackout			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

STEP 3 –SITE SPECIFIC MITIGATION

Having determined the risk categories for each of the four activities it is possible to determine the site-specific measures to be adopted. These measures will be related to whether the site is considered to be a low, medium or high risk site. The IAQM guidance details the mitigation measures required for high, medium and low risk sites as determined in Step 2C.

STEP 4 – DETERMINE SIGNIFICANT EFFECTS

Once the risk of dust impacts has been determined in Step 2C and the appropriate dust mitigation measures identified in Step 3, the final step is to determine whether there are significant effects arising from the construction phase. For almost all construction activities, the application of effective mitigation should prevent any significant effects occurring to sensitive receptors and therefore the residual effect will normally be negligible.

Appendix D

TRAFFIC DATA

2019 BASELINE

Road Link	Speed (kph)	AADT	% HDV	NO_x Emission Factors (g/km/s)	PM_{10} Emission Factors (g/km/s)	$PM_{2.5}$ Emission Factors (g/km/s)
Model_ID_1	48	3808	1.0	0.014	0.001	0.001
Model_ID_2	40	14098	6.2	0.070	0.004	0.003
Model_ID_3	113	63394	4.7	0.375	0.017	0.012
Model_ID_4	40	12713	6.9	0.064	0.004	0.002
Model_ID_5	81	14882	6.3	0.061	0.004	0.003
Model_ID_6	40	7429	6.4	0.037	0.002	0.001
Model_ID_7	40	6893	6.5	0.034	0.002	0.001
Model_ID_8	40	8191	6.0	0.040	0.002	0.001
Model_ID_9	40	19385	6.5	0.096	0.005	0.004
Model_ID_10	40	16651	6.5	0.083	0.005	0.003
Model_ID_11	40	25204	6.4	0.125	0.007	0.005
Model_ID_12	40	22324	6.4	0.111	0.006	0.004
Model_ID_13	32	0	0.0	0.000	0.000	0.000
Model_ID_14	48	506	0.2	0.002	0.000	0.000
Model_ID_15	40	34614	5.0	0.167	0.009	0.006
Model_ID_16	40	33092	5.1	0.160	0.009	0.006
Model_ID_17	40	29264	5.0	0.141	0.008	0.005
Model_ID_18	40	27413	5.3	0.133	0.007	0.005
Model_ID_19	81	1990	2.5	0.008	0.000	0.000
Model_ID_20	40	7387	1.0	0.029	0.003	0.002
Model_ID_21	48	3893	0.5	0.014	0.002	0.001
Model_ID_22	40	20881	3.3	0.097	0.005	0.003
Model_ID_23	113	54170	4.0	0.320	0.014	0.010
Model_ID_24	81	42238	6.3	0.172	0.011	0.007
Model_ID_25	40	57147	5.5	0.278	0.015	0.010

Model_ID_26	32	20881	3.3	0.107	0.005	0.004
Model_ID_27	64	20881	3.3	0.082	0.005	0.003
Model_ID_28	64	20881	3.3	0.082	0.005	0.003
Model_ID_29	64	20881	3.3	0.082	0.005	0.003
Model_ID_30	64	20881	3.3	0.082	0.005	0.003
Model_ID_31	64	20881	3.3	0.082	0.005	0.003
Model_ID_32	64	20881	3.3	0.082	0.005	0.003
Model_ID_33	64	20881	3.3	0.082	0.005	0.003
Model_ID_34	113	57147	5.5	0.338	0.016	0.011
Model_ID_35	48	3808	1.0	0.014	0.001	0.001
Model_ID_36	81	41862	6.4	0.171	0.011	0.007
Model_ID_37	40	41862	6.4	0.208	0.011	0.008
Model_ID_38	48	7387	1.0	0.027	0.003	0.002
Model_ID_39	113	57147	5.5	0.338	0.016	0.011
Model_ID_40	64	20881	3.3	0.082	0.005	0.003
Model_ID_41	40	3893	0.5	0.015	0.002	0.001
Model_ID_42	40	12599	6.9	0.063	0.003	0.002
Model_ID_43	40	1990	2.5	0.009	0.000	0.000
Model_ID_44	81	14098	6.2	0.057	0.004	0.002
Model_ID_45	81	12713	6.9	0.052	0.003	0.002
Model_ID_46	81	12599	6.9	0.052	0.003	0.002
Model_ID_47	32	4	0.0	0.000	0.000	0.000
Model_ID_48	113	54170	4.0	0.320	0.014	0.010
Model_ID_49	113	54170	4.0	0.320	0.014	0.010

2024 WITHOUT DEVELOPMENT

Road Link	Speed (kph)	AADT	% HDV	NO_x Emission Factors (g/km/s)	PM_{10} Emission Factors (g/km/s)	$PM_{2.5}$ Emission Factors (g/km/s)
Model_ID_1	48	4029	1.0	0.009	0.002	0.001
Model_ID_2	40	14916	6.2	0.042	0.004	0.002
Model_ID_3	113	67072	4.7	0.229	0.016	0.010
Model_ID_4	40	13451	6.9	0.039	0.003	0.002
Model_ID_5	81	15746	6.4	0.037	0.004	0.002
Model_ID_6	40	7860	6.4	0.022	0.002	0.001
Model_ID_7	40	7293	6.5	0.021	0.002	0.001
Model_ID_8	40	8666	6.0	0.025	0.002	0.001
Model_ID_9	40	20509	6.5	0.059	0.005	0.003
Model_ID_10	40	17617	6.5	0.050	0.004	0.003
Model_ID_11	40	26666	6.4	0.076	0.007	0.004
Model_ID_12	40	23619	6.4	0.067	0.006	0.004
Model_ID_13	32	0	0.0	0.000	0.000	0.000
Model_ID_14	48	535	0.2	0.001	0.000	0.000
Model_ID_15	40	36623	5.0	0.103	0.009	0.006
Model_ID_16	40	35011	5.1	0.099	0.008	0.005
Model_ID_17	40	30962	5.0	0.087	0.007	0.005
Model_ID_18	40	29003	5.3	0.082	0.007	0.004
Model_ID_19	81	2105	2.4	0.005	0.000	0.000
Model_ID_20	40	7815	1.0	0.019	0.003	0.002
Model_ID_21	48	4119	0.5	0.009	0.002	0.001
Model_ID_22	40	22093	3.3	0.061	0.005	0.003
Model_ID_23	113	57313	4.0	0.197	0.013	0.008
Model_ID_24	81	44688	6.3	0.106	0.011	0.007
Model_ID_25	40	60463	5.5	0.171	0.014	0.009

Model_ID_26	32	22093	3.3	0.052	0.005	0.003
Model_ID_27	64	22093	3.3	0.052	0.005	0.003
Model_ID_28	64	22093	3.3	0.052	0.005	0.003
Model_ID_29	64	22093	3.3	0.052	0.005	0.003
Model_ID_30	64	22093	3.3	0.052	0.005	0.003
Model_ID_31	64	22093	3.3	0.052	0.005	0.003
Model_ID_32	64	22093	3.3	0.052	0.005	0.003
Model_ID_33	64	22093	3.3	0.052	0.005	0.003
Model_ID_34	113	60463	5.5	0.206	0.014	0.009
Model_ID_35	48	4029	1.0	0.009	0.002	0.001
Model_ID_36	81	44290	6.4	0.105	0.011	0.007
Model_ID_37	40	44290	6.4	0.126	0.011	0.007
Model_ID_38	48	7815	1.0	0.017	0.003	0.002
Model_ID_39	113	60463	5.5	0.206	0.014	0.009
Model_ID_40	64	22093	3.3	0.052	0.005	0.003
Model_ID_41	40	4119	0.5	0.010	0.002	0.001
Model_ID_42	40	13330	6.9	0.038	0.003	0.002
Model_ID_43	40	2105	2.4	0.006	0.000	0.000
Model_ID_44	81	14916	6.2	0.035	0.004	0.002
Model_ID_45	81	13451	6.9	0.032	0.003	0.002
Model_ID_46	81	13330	6.9	0.032	0.003	0.002
Model_ID_47	32	4	0.0	0.000	0.000	0.000
Model_ID_48	113	57313	4.0	0.197	0.013	0.008
Model_ID_49	113	57313	4.0	0.197	0.013	0.008

2024 WITH DEVELOPMENT

Road Link	Speed (kph)	AADT	% HDV	NO_x Emission Factors (g/km/s)	PM_{10} Emission Factors (g/km/s)	$PM_{2.5}$ Emission Factors (g/km/s)
Model_ID_1	48	4174	1.0	0.009	0.002	0.001
Model_ID_2	40	14946	6.2	0.043	0.004	0.002
Model_ID_3	113	67136	4.7	0.230	0.016	0.010
Model_ID_4	40	13483	6.9	0.039	0.003	0.002
Model_ID_5	81	15807	6.3	0.037	0.004	0.002
Model_ID_6	40	7891	6.3	0.022	0.002	0.001
Model_ID_7	40	7318	6.5	0.021	0.002	0.001
Model_ID_8	40	8706	6.0	0.025	0.002	0.001
Model_ID_9	40	20600	6.4	0.059	0.005	0.003
Model_ID_10	40	17678	6.4	0.050	0.004	0.003
Model_ID_11	40	26827	6.4	0.077	0.007	0.004
Model_ID_12	40	23746	6.4	0.068	0.006	0.004
Model_ID_13	32	485	4.9	0.001	0.000	0.000
Model_ID_14	48	551	0.2	0.001	0.000	0.000
Model_ID_15	40	36698	5.0	0.103	0.009	0.006
Model_ID_16	40	35177	5.1	0.099	0.008	0.005
Model_ID_17	40	31141	5.0	0.088	0.007	0.005
Model_ID_18	40	29155	5.3	0.082	0.007	0.004
Model_ID_19	81	2135	2.4	0.005	0.000	0.000
Model_ID_20	40	7977	1.0	0.019	0.003	0.002
Model_ID_21	48	4278	0.8	0.010	0.002	0.001
Model_ID_22	40	22093	3.3	0.061	0.005	0.003
Model_ID_23	113	57372	4.0	0.197	0.013	0.008
Model_ID_24	81	45007	6.3	0.107	0.011	0.007
Model_ID_25	40	60497	5.5	0.171	0.015	0.009

Model_ID_26	32	22093	3.3	0.052	0.005	0.003
Model_ID_27	64	22093	3.3	0.052	0.005	0.003
Model_ID_28	64	22093	3.3	0.052	0.005	0.003
Model_ID_29	64	22093	3.3	0.052	0.005	0.003
Model_ID_30	64	22093	3.3	0.052	0.005	0.003
Model_ID_31	64	22093	3.3	0.052	0.005	0.003
Model_ID_32	64	22093	3.3	0.052	0.005	0.003
Model_ID_33	64	22093	3.3	0.052	0.005	0.003
Model_ID_34	113	60497	5.5	0.206	0.014	0.009
Model_ID_35	48	4174	1.0	0.009	0.002	0.001
Model_ID_36	81	44609	6.4	0.106	0.011	0.007
Model_ID_37	40	44609	6.4	0.127	0.011	0.007
Model_ID_38	48	7977	1.0	0.018	0.003	0.002
Model_ID_39	113	60497	5.5	0.206	0.014	0.009
Model_ID_40	64	22093	3.3	0.052	0.005	0.003
Model_ID_41	40	4278	0.8	0.010	0.002	0.001
Model_ID_42	40	13362	6.9	0.038	0.003	0.002
Model_ID_43	40	2135	2.4	0.006	0.000	0.000
Model_ID_44	81	14946	6.2	0.035	0.004	0.002
Model_ID_45	81	13483	6.9	0.032	0.003	0.002
Model_ID_46	81	13362	6.9	0.032	0.003	0.002
Model_ID_47	32	0	4.9	0.000	0.000	0.000
Model_ID_48	113	57372	4.0	0.197	0.013	0.008
Model_ID_49	113	57372	4.0	0.197	0.013	0.008

Figure D-1 - Modelled Network

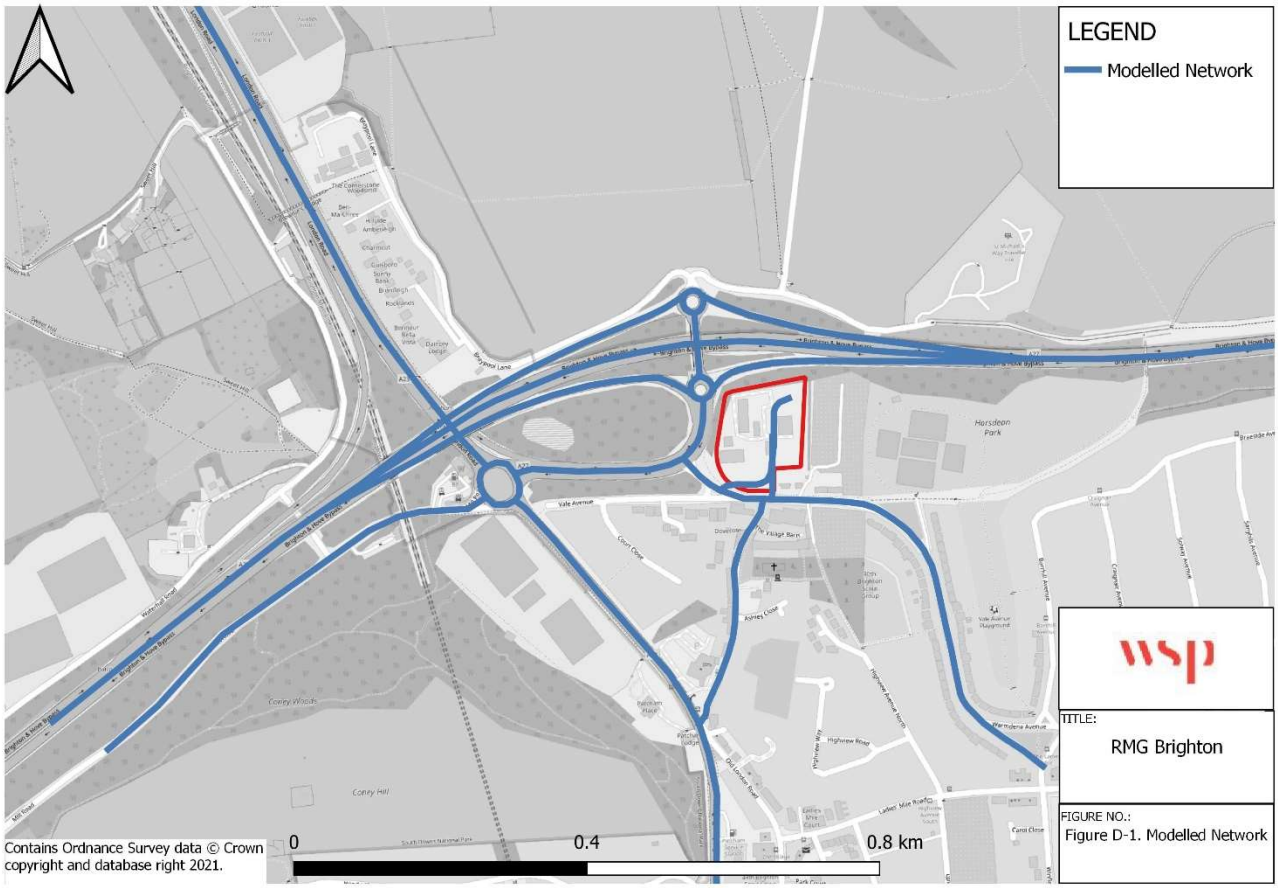


Figure D-2 - Modelled Network (North West)

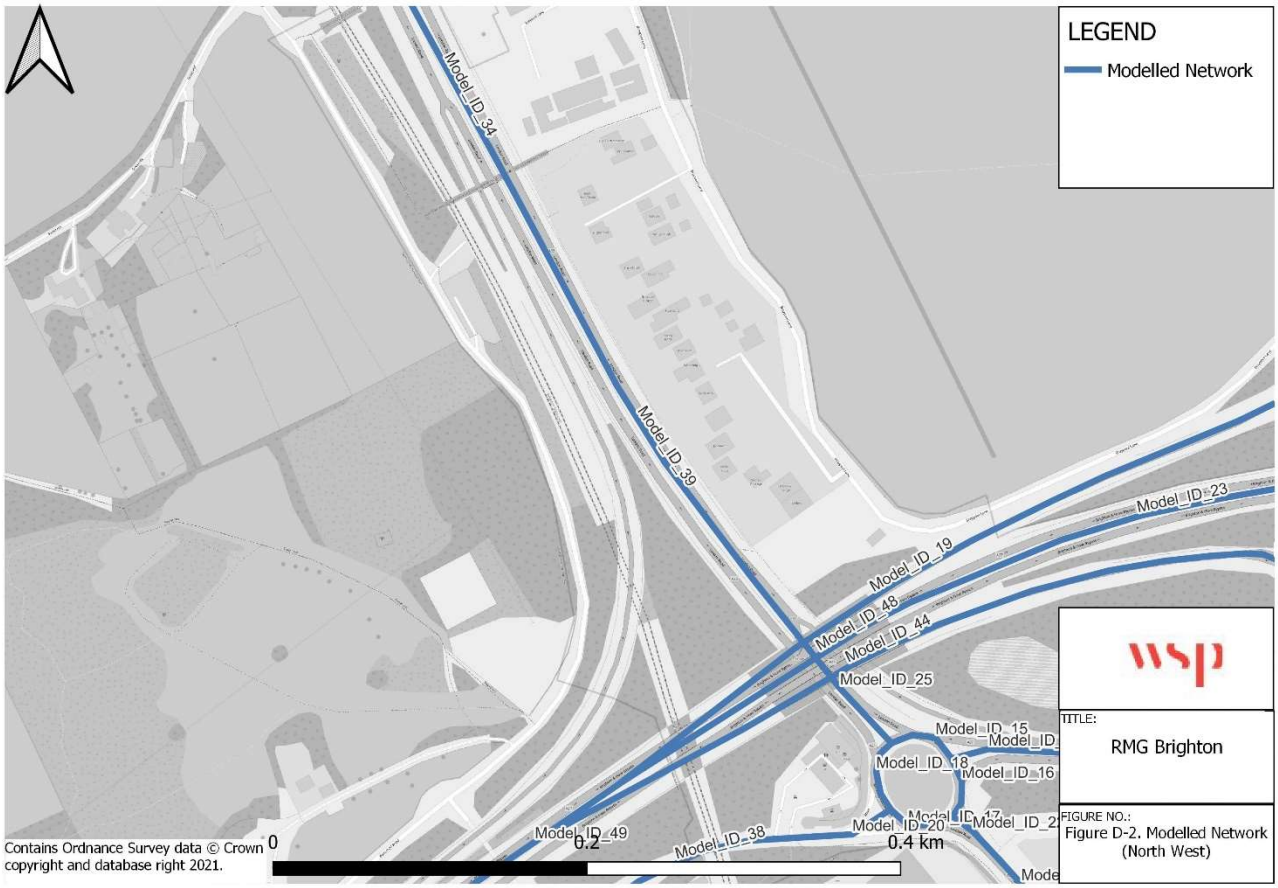


Figure D-3 - Modelled Network (East)

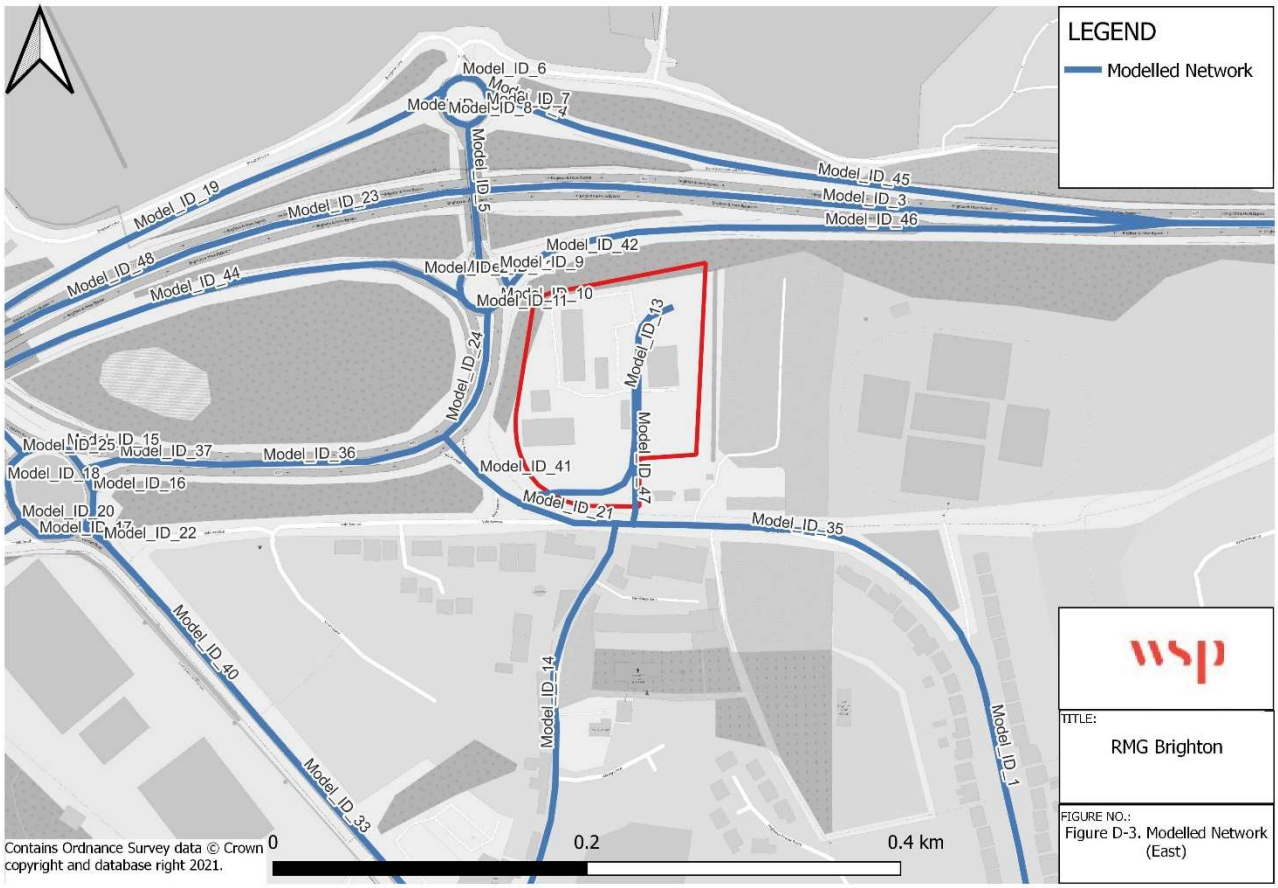
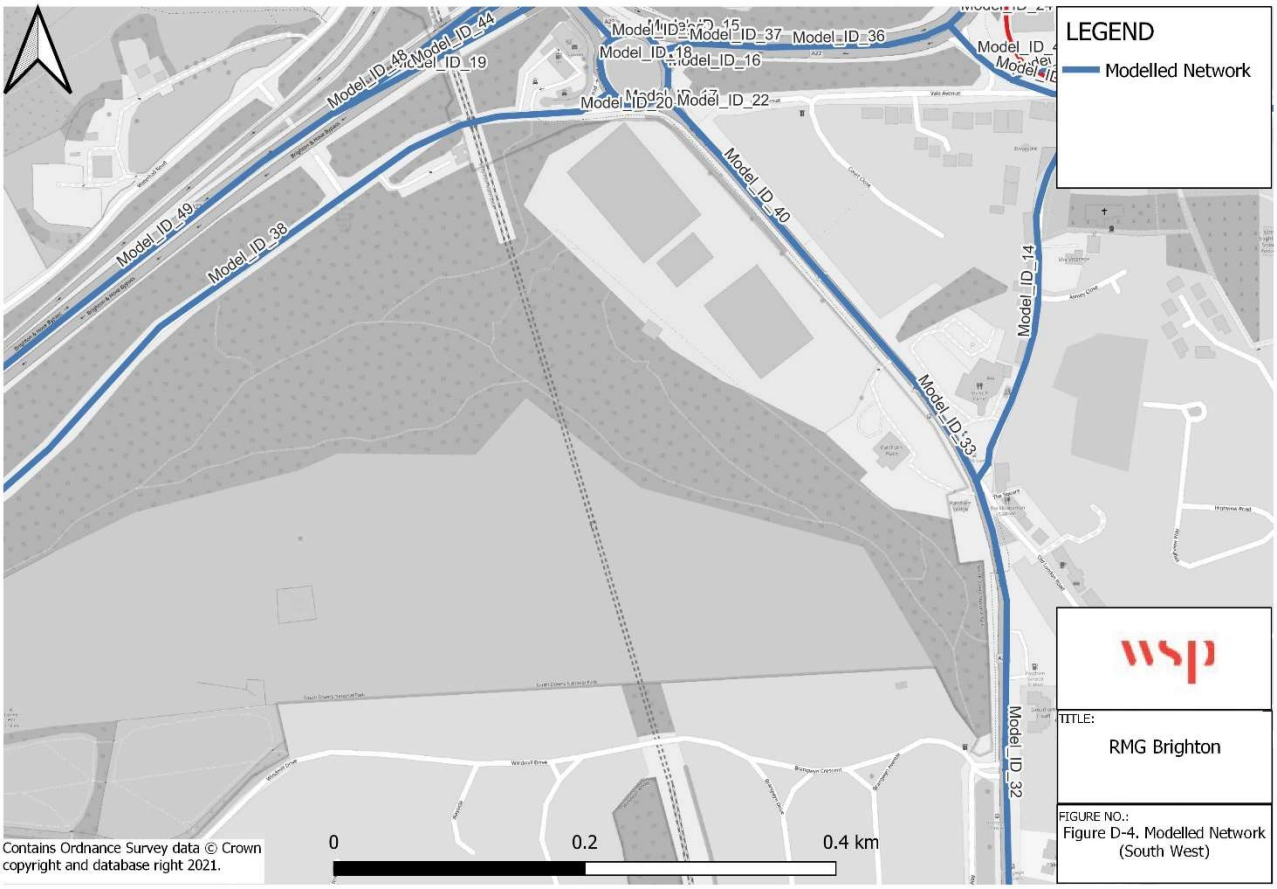


Figure D-4 - Modelled Network (South West)



Appendix E

MODEL VERIFICATION

The comparison of modelled concentrations with local monitored concentrations is a process termed 'verification'. Model verification investigates the discrepancies between modelled and measured concentrations, which can arise due to the presence of inaccuracies and/or uncertainties in model input data, modelling and monitoring data assumptions. The following are examples of potential causes of such discrepancy:

a) Estimates of background pollutant concentrations;

b) Meteorological data uncertainties;

c) Traffic data uncertainties;

d) Model input parameters, such as 'roughness length'; and

e) Overall limitations of the dispersion model.

NITROGEN DIOXIDE

Most nitrogen dioxide is produced in the atmosphere by the reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of the primary pollutant emissions of nitrogen oxides (NO_x = NO + NO_2), in line with the guidance provided within LAQM.TG(16).

There are no NO_2 monitoring site within 2km of the boundary of the Application Site. The nearest monitoring site is E02-2009 located on London Road, Brighton. Therefore, the model has been run to predict the 2019 annual mean road-NO_x contribution at this roadside diffusion tube. The modelled road network has been extended to cover this location.

The model outputs of road-NO_x have been compared with the 'measured' road-NO_x, which was determined from the NO_2 concentration measured at this diffusion tube monitoring location, utilising the NO_x from NO_2 calculator provided by Defra and the NO_2 background concentration obtained from the Preston Park AURN site. Table E1 below present the data used in the verification.

Table E1 – Data used in model verification

Monitoring Site	Measured Annual Mean NO_2 Concentration ($\mu g/m^3$)	Background NO_2 ($\mu g/m^3$)	Measured Road-NO_x ($\mu g/m^3$) (from NO_x:NO_2 calculator)	Modelled Road-NO_x ($\mu g/m^3$)	Ratio
E02-2009	34.7	15.2	38.9	9.7	4.0

The road-NO_x adjustment factor of 4.0 was applied to the modelled road-NO_x concentrations to provide adjusted modelled road-NO_x concentrations. The total nitrogen dioxide concentrations were then determined by inputting the adjusted modelled road-NO_x concentrations and the background NO_2 concentration into the NO_x to NO_2 calculator.

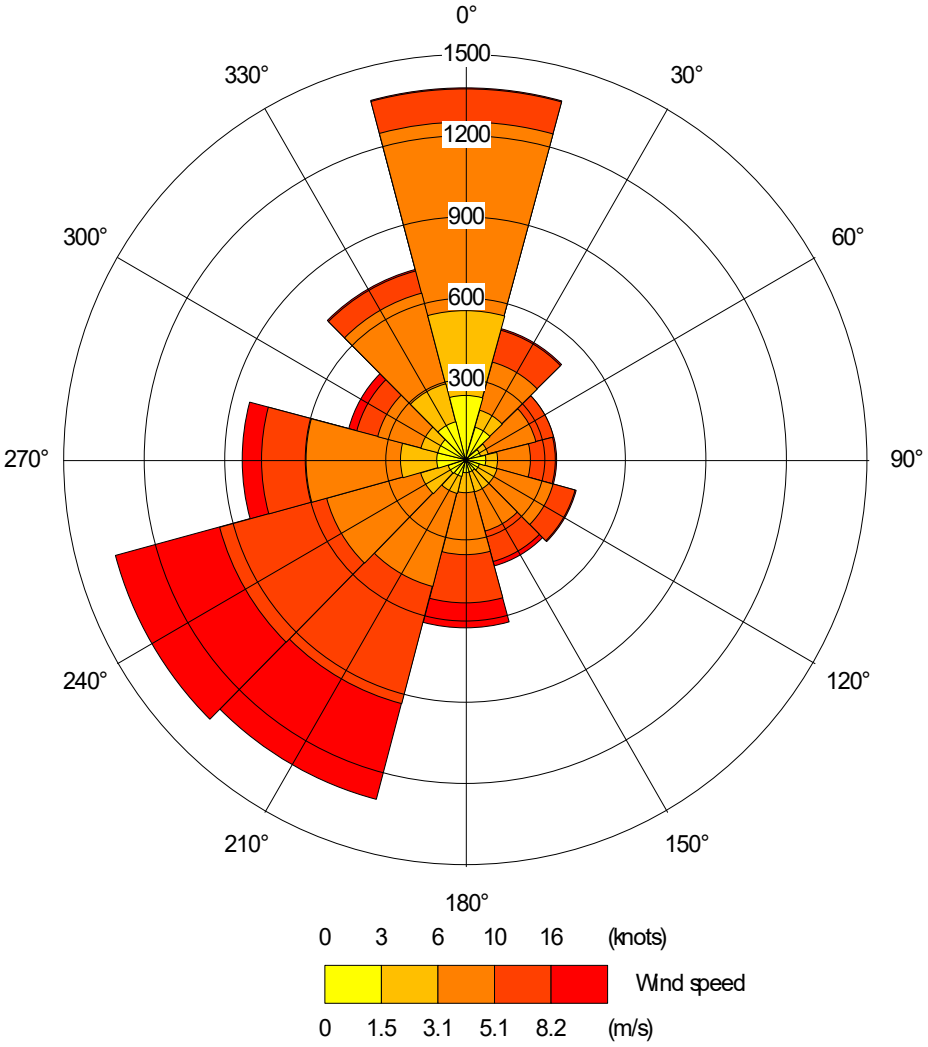
PM_{10} AND $PM_{2.5}$

There are no local PM_{10} or $PM_{2.5}$ monitoring data against which the model could be verified. Consequently, the verification factor determined above for adjusting the road-NO_x contribution has been applied to the predicted road-PM_{10} and road-$PM_{2.5}$ contributions, consistent with guidance set out in LAQM.TG(16).

Appendix F

WIND ROSE

WIND ROSE FOR SHOREHAM 2019



Appendix G

MODEL RESULTS

ANNUAL MEAN NO_2 CONCENTRATIONS ($\mu g/m^3$)

Receptor ID	Receptor Location	Annual Mean NO_2 Concentrations ($\mu g/m^3$)					
		2019 Baseline	2024 Baseline	2024 With Dev	Change ($\mu g/m^3$)	% Change Relative to Objective	Impact
R1	Patcham Court Farmhouse	43.9	33.7	34.1	0.4	1.0	Negligible
R2	101 Vale Avenue	36.1	28.5	28.6	0.1	0.0	Negligible
R3	14 Church Hill	40.3	31.2	31.5	0.3	1.0	Negligible
R4	134 Vale Avenue	41.1	31.7	32.1	0.4	1.0	Negligible
R5	8 Church Hill	39.1	30.5	30.7	0.2	1.0	Negligible
R6	124 Vale Avenue	39.6	30.8	31.0	0.2	1.0	Negligible
R7	143 Vale Avenue	49.1	37.2	37.3	0.1	0.0	Negligible
R8	16 Court Close	47.2	35.9	36.0	0.1	0.0	Negligible
R9	151 Vale Avenue	61.1	45.4	45.5	0.1	0.0	Negligible
R10	Collifields Braypool Lane	59.8	44.3	44.4	0.1	0.0	Negligible
R11	Petrol station	86.2	63.1	63.2	0.1	0.0	-
R12	Braypool Lane	76.3	55.7	55.7	0.0	0.0	Negligible
R13	Mill Road	52.7	39.9	40.1	0.2	1.0	-
R14	4 Church Hill	42.3	32.7	32.8	0.1	0.0	Negligible

Results rounded to 1.d.p

ANNUAL MEAN PM_{10} CONCENTRATIONS ($\mu g/m^3$)

Receptor ID	Receptor Location	Annual Mean PM_{10} Concentrations ($\mu g/m^3$)					
		2019 Baseline	2024 Baseline	2024 With Dev	Change ($\mu g/m^3$)	% Change Relative to Objective	Impact
R1	Patcham Court Farmhouse	19.0	18.8	18.9	0.1	0.0	Negligible
R2	101 Vale Avenue	17.8	17.7	17.7	0.0	0.0	Negligible
R3	14 Church Hill	18.4	18.3	18.3	0.0	0.0	Negligible
R4	134 Vale Avenue	18.4	18.2	18.3	0.1	0.0	Negligible
R5	8 Church Hill	18.3	18.1	18.2	0.1	0.0	Negligible
R6	124 Vale Avenue	18.3	18.1	18.1	0.0	0.0	Negligible
R7	143 Vale Avenue	19.4	19.2	19.2	0.0	0.0	Negligible
R8	16 Court Close	19.1	18.9	18.9	0.0	0.0	Negligible
R9	151 Vale Avenue	21.1	20.8	20.8	0.0	0.0	Negligible
R10	Collifields Braypool Lane	20.1	19.8	19.8	0.0	0.0	Negligible
R11	Petrol station	24.8	24.4	24.4	0.0	0.0	-
R12	Braypool Lane	22.3	21.8	21.8	0.0	0.0	Negligible

R13	Mill Road	20.4	20.2	20.2	0.0	0.0	-
R14	4 Church Hill	18.6	18.5	18.5	0.0	0.0	Negligible

Results rounded to 1.d.p

DAILY MEAN PM_{10} (NO. OF DAYS OF EXCEEDANCE)

Receptor ID	Receptor Location	Days with PM_{10} Concentrations >50µg/m^3				
		2019 Baseline	2024 Baseline	2024 With Dev	Change (days)	Impact
R1	Patcham Court Farmhouse	2	2	2	0	Negligible
R2	101 Vale Avenue	1	1	1	0	Negligible
R3	14 Church Hill	2	2	2	0	Negligible
R4	134 Vale Avenue	2	2	2	0	Negligible
R5	8 Church Hill	2	1	2	1	Negligible
R6	124 Vale Avenue	2	1	2	1	Negligible
R7	143 Vale Avenue	3	3	3	0	Negligible
R8	16 Court Close	2	2	2	0	Negligible
R9	151 Vale Avenue	5	4	4	0	Negligible
R10	Collifields Braypool Lane	4	3	3	0	Negligible
R11	Petrol station	12	11	11	0	Negligible
R12	Braypool Lane	7	6	6	0	Negligible
R13	Mill Road	4	4	4	0	Negligible
R14	4 Church Hill	2	2	2	0	Negligible

ANNUAL MEAN $PM_{2.5}$ CONCENTRATIONS (µg/m³)

Receptor ID	Receptor Location	Annual Mean $PM_{2.5}$ Concentrations (µg/m³)					
		2019 Baseline	2024 Baseline	2024 With Dev	Change (µg/m³)	% Change Relative to Objective	Impact
R1	Patcham Court Farmhouse	12.7	12.4	12.5	0.1	1.0	Negligible
R2	101 Vale Avenue	11.9	11.7	11.8	0.1	1.0	Negligible
R3	14 Church Hill	12.3	12.1	12.1	0.0	0.0	Negligible
R4	134 Vale Avenue	12.3	12.0	12.1	0.1	1.0	Negligible
R5	8 Church Hill	12.2	12.0	12.0	0.0	0.0	Negligible
R6	124 Vale Avenue	12.2	12.0	12.0	0.0	0.0	Negligible
R7	143 Vale Avenue	13.0	12.7	12.7	0.0	0.0	Negligible
R8	16 Court Close	12.8	12.5	12.5	0.0	0.0	Negligible
R9	151 Vale Avenue	14.0	13.6	13.6	0.0	0.0	Negligible
R10	Collifields Braypool Lane	13.4	13.0	13.0	0.0	0.0	Negligible
R11	Petrol station	16.5	15.9	15.9	0.0	0.0	-

R12	Braypool Lane	14.9	14.2	14.2	0.0	0.0	Negligible
R13	Mill Road	13.4	13.1	13.1	0.0	0.0	-
R14	4 Church Hill	12.9	12.7	12.7	0.0	0.0	Negligible

Results rounded to 1.d.p

ANNUAL MEAN NO_2, PM_{10} AND $PM_{2.5}$ CONCENTRATIONS (µg/m^3) AT FUTURE OCCUPANTS

Receptor ID	Receptor Location	Annual Mean Concentrations (µg/m^3)		
		NO_2	PM_{10}	$PM_{2.5}$
R15	New office	52.4	22.0	14.5
R16	New office	45.0	20.3	13.4
R17	New office	35.0	18.6	12.3
R18	New office	41.3	20.0	13.2

Appendix H

DAMAGE COST SENSITIVITY TEST

DAMAGE COST CALCULATION – Sensitivity Test Scenario

For the calculation of the emissions associated with the Proposed Development the total two-way trip generated by the development was obtained from the Project's Transport Assessment and entered into DEFRA's most recent Emission Factor Toolkit (EFT) v11.0 to predict the change in NO_X and $PM_{2.5}$ emissions associated with the operation of the Proposed Development.

The daily flow generated from the Proposed Development is 264 trips for staff, and 280 trips for fleet (100% EV) and 24 trips for HGVs. HGV. In the EFT it was assumed that the average speed of the vehicles was 50km/hr and that the vehicles travelled an average distance of 10km.

The emissions mitigation cost is calculated as a total sum over five years. With the anticipated opening year of the Proposed Development being 2024, annual traffic emissions and associated emissions mitigation costs were calculated for the period 2024-2028 inclusive, to provide a five-year cost. The pollutant emissions calculated for the appraisal period are shown in Table H1 below.

Table H1 – Emission Outputs for Damage Cost

Pollutants	Emission Output (tonne / year)				
	2024	2025	2026	2027	2028
NO_X	0.22603	0.20110	0.17989	0.16099	0.14480
$PM_{2.5}$	0.04426	0.04405	0.04390	0.04379	0.04371

The calculated NO_X and $PM_{2.5}$ emissions were the input into the most recent DEFRA Air Quality Appraisal: Damage Costs Toolkit, to calculate the associated 'damage cost'. The damage cost for the Proposed Development is £32,205 (based on the central present value).

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