Cycling and Walking Improvements between Wood Lane and Notting Hill Gate

Air Quality and Noise Modelling

Transport for London

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Glossary

AADT	Annual Average Daily Traffic
AAWT	Annual Average Weekday Traffic
ADMS	Air Dispersion Modelling System
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQS	Air Quality Strategy
ASR	Annual Status Report
BID	Business Improvement District
CAFE	Clean Air for Europe
CERC	Cambridge Environmental Research Consultants
C	Carbon
CO_2	Carbon Dioxide
CRTN	Calculation of Road Traffic Noise
dB	Decibel
Defra	Department for the Environment. Food and Rural Affairs
DfT	Department for Transport
DCLG	Department for Communities and Local Government
DMRB	Design Manual For Roads and Bridges
EC	European Community
EFT	Emissions Factor Toolkit
END	Environmental Noise Directive
EPUK	Environmental Protection UK
EU	European Union
GLA	Greater London Authority
HGV	Heavy Goods Vehicle
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
LGV	Light Goods Vehicle
LIP	Local Implementation Plan
LIP2	Second Local Implementation Plan
LLAQM	London Local Air Quality Management
LOAEL	Lowest Observable Adverse Effect Level
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_X	Nitrogen Oxides
NOAL	No Observed Adverse Effect Level
NOEL	No Observed Effect Level
NPPF	National Planning Policy Framework
NPSE	Noise Policy Statement for England
PM	Particulate Matter (PM_{10} and $PM_{2.5}$)
PPG	Planning Practice Guidance
RMSE	Root Mean Square Error
RTTM	Real Time Traffic Management
SO_2	Sulphur Dioxide
SOAEL	Significant Observed Adverse Effect Level
TfL	Transport for London
UAEL	Unacceptable Averse Effect Level
UK	United Kingdom

Table of Contents

Figures

Tables

Executive Summary

This document reports on an assessment of air quality due to a road transport scheme in the London Borough of Hammersmith and Fulham and Royal Borough of Kensington and Chelsea.

What is the Scheme?

The Scheme proposes to introduce a new healthy streets scheme including cycling facilities, pedestrian improvements and vehicular changes between Acton and Hyde Park. This assessment considers the section along Wood Lane, Shepherd's Bush Green, Holland Park Avenue and Notting Hill Gate.

Is the Scheme part of the Mayor's Transport Strategy?

Yes, the Scheme fits into the Mayor of London's proposals for a healthy streets approach in his transport strategy to design streets with fewer cars and with linked cycle lanes. These types of schemes aim to promote safer walking and cycling to contribute to his Vision Zero to reduce the number of people killed on London streets to zero by 2041.

What are air quality and noise levels like currently around the Scheme?

Levels of the local air pollutant nitrogen dioxide are high and are above health based standards close to busy roads in the area around the Scheme. Noise levels in the area are high and typical for central London. Properties close to and facing the busiest roads experience noise levels of over 70 dB.

Why have we assessed air quality and noise effects?

Air quality and noise effects from changes to road traffic have been assessed for the Scheme to check that the implementation of the Scheme won't have unintended significant air quality effects.

How have we assessed air quality and noise?

We have assessed air quality and noise using computer modelling which allows us to test changes in road layouts and changes in traffic to predict how much air quality and noise levels will change. We also used monitoring data along with modelling to check our predictions.

What locations were assessed for air quality and noise?

We looked at air quality and noise at sensitive locations, such as homes and schools. We studied the buildings that are located close to roads as these are where the greatest changes in pollution are predicted and represent impacts at other properties along the same stretch of road.

What has the assessment found?

We found that annual mean nitrogen dioxide concentrations are predicted to be above the health based standard at many of the selected roadside receptor locations with or without the Scheme in place in the future opening year of 2021. The Scheme was not found to lead to further exceedances of the annual mean NO_2 standard.

There were no exceedances of the standards for small particulates in 2021 (i.e. no new locations where the standard is exceeded).

The vast majority of changes in air quality and noise due to the Scheme were either minor or very small.

Overall the Scheme has a negligible effect on road traffic noise exposure in most locations, with a few beneficial and adverse impacts expected. There are some slight beneficial effects at selected receptor locations along the proposed route as a result of lower traffic volumes and, in the case for one selected receptor, the cycle facilities moving some of the traffic further from adjacent building façades.

There is predicted to be one moderate adverse impact, on Lansdowne Walk and minor adverse impacts along Holland Park and Ladbroke Road, all as a result of an increase in local traffic.

What does this mean?

Overall, the impact of the Scheme on air quality and noise was found to be not significant across the study area and the Scheme is consistent with relevant planning policy. The Scheme could therefore proceed, without the need for further air quality assessment or mitigation.

1. Introduction

AECOM Limited (AECOM) has been appointed by Transport for London (TfL) to support a detailed study into the creation of the Proposed Improvements between Wood Lane and Notting Hill Gate. This support is in the form of a strategic assessment of the potential impact of changes on existing traffic noise levels and air pollutant concentrations.

This report presents the results of the assessment, the scope of which is as follows:

- Identify a selection of potentially sensitive receptors in the vicinity of the proposed route for the scheme;

- Predict road traffic noise levels at these identified receptors with and without the scheme;

- Predict concentrations of the main road traffic pollutants nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$) at these identified receptors with and without the proposed scheme; and

- Predict annual emissions of nitrogen oxides (NO_x), particulate matter and carbon dioxide (CO_2) with and without the proposed scheme.

1.1 Background

Cycleways aim to provide a safe space for cycling on some of London's busiest roads. They connect stations, town centres and key destinations, making them more accessible and easier for people to cycle to.

Following the successful delivery of a number of major cycle routes (formerly Cycle Superhighways) in 2016 (including East-West phase 1, North-South phase 1, CS5 inner, CS2 upgrade and CS1) under the previous Mayoralty, The Mayor of London, Sadiq Khan, committed to make cycling safer and easier for every Londoner and has shown this through support for further major routes, now delivered as part of the London-wide Cycleways network. The scheme is a proposed route from North Acton to Hyde Park providing new cycling facilities, which will also deliver improvements for other road users through redesigning the public space with wider footways, new street furniture and upgraded pedestrian crossings.

The scheme directly aligns with the objectives set out in the Mayor's Transport Strategy (Greater London Authority, 2018a). The route will contribute to the key aim of encouraging Londoners to use cars less and walk, cycle and use public transport more often; leading to 80% of journeys being made by sustainable modes by 2041. Furthermore, it has a high potential to increase levels of cycling in London, helping to address the Mayor's ambitious target of 1.5 million cycle journeys per day by 2025/26.

The introduction of the route also aligns with the Healthy Streets approach; an essential part of the Mayor's strategy. Key to addressing the approach is the development of a coherent and extensive cycle network across London that will complement walking and public transport priorities. In addition to this, it is hoped that the implementation of such routes will have wider benefits, helping make London a healthier and greener city, with less traffic on the streets, a more active population and a reduction in the number of people killed or seriously injured on its roads.

1.2 Proposed Scheme

The scheme runs between Acton and Hyde Park, via Shepherds Bush. The scheme has been split in two with Section 1 running along the A40, and Section 2 along Wood Lane (towards Shepherds Bush) and Holland Park Avenue (towards Bayswater). The route will provide 8.4km of new or upgraded cycle track, with an off carriageway cycling facility along the A40, and a segregated carriageway cycle lane along the rest of the route. Section 2 of the scheme is illustrated in Figure 1-1.

This study assesses Section 2 only which lies within the London Borough of Hammersmith and Fulham and the Royal Borough of Kensington and Chelsea. Both Councils have declared an Air Quality Management Area (AQMA) over the entire Borough due to high levels of NO_2 and PM_{10} and the scheme boundary includes several Noise Important Areas, see Section 3.1.2.4.

Figure 1-1: Scheme Boundary

2. Planning Policy and Legislation

2.1 Air Quality Legislation

These sections provide a background to the current environmental and planning policies and legislation for air quality.

2.1.1 European Legislation

In Europe, the Clean Air for Europe (CAFE) programme replaces the EU Framework Directive 96/62/EC (Council of European Communities, 1996) and associated Daughter Directives 1999/30/EC (Council of European Communities, 1999), 2000/69/EC (Council of European Communities, 2000), 2002/3/EC (Council of European Communities, 2002a), and the Council Decision 97/101/EC (Council of European Communities, 1997) with a single legal act; the Ambient Air Quality and Cleaner Air for Europe Directive 2008/50/EC (Council of European Communities, 2008).

Directive 2008/50/EC (Council of European Communities, 2008) is transcribed into UK legislation by the Air Quality Standards Regulations 2010 (H.M. Government, 2010). Limit values are set which are binding on the UK to avoid, prevent or reduce harmful effects on human health and the environment.

2.1.2 National Policy

2.1.2.1 National Air Quality Strategy

The UK National Air Quality Strategy (AQS) (Defra, 2000) was initially published in 2000, under the requirements of the Environment Act 1995 (H.M. Government, 1995). The most recent revision of the Strategy (Defra, 2007) sets objective values to help Local Authorities manage local air quality improvements in accordance with the EU Air Quality Framework Directive. Some of these objective values have been laid out within the Air Quality (England) Regulations 2000 (H.M. Government, 2000) and later amendments (H.M. Government, 2002).

The air quality objective values have been set down in regulation for the purposes of local air quality management (LAQM). Under the LAQM regime, local authorities have a duty to carry out regular assessments of air quality against the objective values and if it is unlikely that the objective values will be met in the given timescale, they must designate an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) with the aim of achieving the objective values. The boundary of an AQMA is set by the local authority to define the geographical area that is to be subject to the management measures to be set out in a subsequent action plan. It is not unusual for the boundary of an AQMA to include within it, relevant locations where air quality is not at risk of exceeding an air quality objective.

The UK's national air quality objective values for the pollutants of relevance to this assessment are displayed in Table 2-1.

Table 2-1: Air Quality Objective Values

Pollutant	Averaging Period	Value	Maximum Permitted Exceedances	Target Date
Nitrogen Dioxide (NO$_2$)	Annual Mean	40 µg/m^3	None	31/12/2005
	Hourly Mean	200 µg/m^3	18 times per year	31/12/2005
Particulate Matter (PM$_{10}$)	Annual Mean	40 µg/m^3	None	31/12/2004
	24-hour	50 µg/m^3	35 times per year	31/12/2004
Fine Particulate Matter (PM$_{2.5}$)	Annual Mean	25 µg/m^3	None	2020

2.1.2.2 Clean Air Strategy

In 2019, the UK government released its much-anticipated Clean Air Strategy 2019 (Defra 2019a), part of its 25 Year Environment Plan (Defra 2018a). The Strategy places greater emphasis on improving air quality in the UK than has been seen before and outlines how it aims to achieve this (including the development of new enabling legislation).

Air quality management focus in recent years has primarily related to one pollutant, NO_2, and its principal source in the UK, road traffic. However, the 2019 Strategy broadens the focus to other areas, including domestic emissions from wood burning stoves and from agriculture.

2.1.2.3 National Planning Policy Framework

The revised National Planning Policy Framework (NPPF) was published in July 2018 (Ministry of Housing, Communities and Local Government, 2018a) and concisely sets out national policies and principles on land use planning. Paragraph 103 of the NPPF states that:

"The planning system should actively manage patterns of growth in support of these objectives. 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."

Air quality is considered as an important element of the natural environment. On conserving and enhancing the natural environment, Paragraph 170 states that:

"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 possible, help to improve local environmental conditions such as air and water quality …"

Air quality in the UK has been managed through the Local Air Quality Management regime using national objectives. The effect of a proposed development on the achievement of such policies and plans are matters that may be a material consideration by planning authorities, when making decisions for individual planning applications. Paragraph 181 of the NPPF states that:

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

2.1.2.4 Planning Practice Guidance (PPG)

The Planning Practice Guidance (PPG) was updated on 24th July 2018 (Ministry of Housing, Communities and Local Government, 2018b), with specific reference to air quality, which was published on 6th March 2014. The PPG states that the planning system should consider the potential effect of new developments on air quality where relevant limits have been exceeded or are near the limit. Concerns also arise where the development is likely to adversely affect the implementation of air quality strategies and action plans and / or, in particular, lead to a breach of EU legislation (including that applicable to wildlife). In addition, dust can also be a planning concern, for example, because of the effect on local amenity.

When deciding whether air quality is relevant to a planning application the PPG states that a number of factors should be taken into consideration including if the development will:

- Significantly affect traffic in the immediate vicinity of the proposed development site or further afield. This could be by generating or increasing traffic congestion; significantly changing traffic volumes, vehicle speed or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; adds to turnover in a large car park; or result in construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more.

- Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; or extraction systems (including chimneys) which require approval under pollution control legislation or biomass boilers or biomass-fuelled CHP plant; centralised

boilers or CHP plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area;

- Expose people to existing sources of air pollutants. This could be by building new homes, workplaces or other development in places with poor air quality.

- Give rise to potentially unacceptable impact (such as dust) during construction for nearby sensitive locations.

- Affect biodiversity. In particular, is it likely to result in deposition or concentration of pollutants that significantly affect a European-designated wildlife site, and is not directly connected with or necessary to the management of the site, or does it otherwise affect biodiversity, particularly designated wildlife sites.

On how detailed an air quality assessment needs to be, the PPG states:

"Assessments should be proportionate to the nature and scale of the development proposed and the level of concern about air quality... Mitigation options where necessary will be locationally specific, will depend on the proposed development and should be proportionate to the likely impact. It is important therefore that local planning authorities work with applicants to consider appropriate mitigation so as to ensure the new development is appropriate for its location and unacceptable risks are prevented."

2.1.3   London Planning Policy

The following regional planning policies apply to air quality in London.

2.1.3.1   The London Plan – Spatial Development Strategy for Greater London

The current London Plan was published by the Mayor of London in March 2016 (Greater London Authority, 2016a). Policy 7.14 Improving Air Quality states that:

"Development proposals should:

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

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

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

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

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

In addition, a new London Plan is currently in draft, covering 2019-2041. Policies SI1 (Improving air quality) SI2 (Minimising greenhouse gas emissions) and SI3 (Energy infrastructure) are directly relevant to air quality and will need to be adhered to if adopted in the current state.

Policy SI1 states that:

A. London's air quality should be significantly improved and exposure to poor air quality, especially for vulnerable people, should be reduced:

1. Development proposals should not:

a) lead to further deterioration of existing poor air quality

b) create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits

c) reduce air quality benefits that result from the Mayor's or boroughs' activities to improve air quality

d) create unacceptable risk of high levels of exposure to poor air quality.

2. Development proposals should use design solutions to prevent or minimise increased exposure to existing air pollution and make provision to address local problems of air quality. Particular care should be taken with developments that are in Air Quality Focus Areas or that are likely to be used by large numbers of people particularly vulnerable to poor air quality, such as children or older people.

3. The development of large-scale redevelopment areas, such as Opportunity Areas and those subject to an Environmental Impact Assessment should propose methods of achieving an Air Quality Positive approach through the new development. All other developments should be at least Air Quality Neutral.

4. Development proposals must demonstrate how they plan to comply with the Non-Road Mobile Machinery Low Emission Zone and reduce emissions from the demolition and construction of buildings following best practice guidance.

5. Air Quality Assessments (AQAs) should be submitted with all major developments, unless they can demonstrate that transport and building emissions will be less than the previous or existing use.

6. Development proposals should ensure that where emissions need to be reduced, this is done on-site. Where it can be demonstrated that on-site provision is impractical or inappropriate, off-site measures to improve local air quality may be acceptable, provided that equivalent air quality benefits can be demonstrated.

2.1.3.2 The Draft New London Plan – Spatial Development Strategy for Greater London

A Draft New London Plan was published in December 2017 which presents new targets and objectives for development in London between 2019 and 2041. This was subject to public consultation until 2nd March 2018 and a Draft New London Plan Showing Minor Suggested Changes (Greater London Authority, 2018c) was published on 13th August 2018.

The Draft New London Plan considers air quality policing policy Sustainable Infrastructure 1 (SI1) 'Improving Air Quality' which states:

A. London's air quality should be significantly improved and exposure to poor air quality, especially for vulnerable people, should be reduced:

1. Development proposals should not:

a) lead to further deterioration of existing poor air quality

b) create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits

c) reduce air quality benefits that result from the Mayor's or boroughs' activities to improve air quality

d) create unacceptable risk of high levels of exposure to poor air quality.

2. Development proposals should use design solutions to prevent or minimise increased exposure to existing air pollution and make provision to address local problems of air quality. Particular care should be taken with developments that are in Air Quality Focus Areas or that are likely to be used by large numbers of people particularly vulnerable to poor air quality, such as children or older people.

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4. Development proposals must demonstrate how they plan to comply with the Non-Road Mobile Machinery Low Emission Zone and reduce emissions from the demolition and construction of buildings following best practice guidance.

5. Air Quality Assessments (AQAs) should be submitted with all major developments, unless they can demonstrate that transport and building emissions will be less than the previous or existing use.

6. Development proposals should ensure that where emissions need to be reduced, this is done on-site. Where it can be demonstrated that on-site provision is impractical or inappropriate, off-site measures to improve local air quality may be acceptable, provided that equivalent air quality benefits can be demonstrated.

One of the suggested minor amendments in the latest draft refers to the Mayor's commitment to making London's air quality the best of any major world city; supported by targets of ultimately achieving more stringent ambient air quality standards as published by the World Health Organisation.

It is noted that the Draft New London Plan is a material consideration in determining planning applications, while it does not yet form part of the development plan under Section 38(6) of the Planning and Compulsory Purchase Act 2004 (H.M. Government, 2004).

2.1.3.3   London Environment Strategy

The Mayor's London Environment Strategy, published in May 2018 (Greater London Authority, 2018b), sets the ambitious target for London to have the best air quality of any major world city by 2050. This supersedes the Mayor's Air Quality Strategy (Greater London Authority, 2010), and therefore requires consideration in future. Chapter 4 of the strategy focuses on air quality and includes measures to tackle NO_2 and particulates by reducing exposure at hotspot locations (e.g. schools) in the short term and working to establish newer tighter targets towards a zero emission London in 2050 from transport and non-transport sources. The strategy also refers to work by Boroughs to improve public realm to encourage walking and cycling and a commitment for modal shift to more sustainable transport.

2.1.3.4   Mayor's Transport Strategy and Transport Action Plan

In 2017, TfL produced 'Healthy Streets for London' (Transport for London, 2017). The Action Plan recognises that poor air quality is an issue particularly in inner London and that road transport is a key source. A range of measures are outlined to improve air quality including bringing forward and expanding the Low Emission Zone, tightening of Low Emission Zone standards for HGVs, buses and coaches, use of hybrid buses and retiring the oldest and most polluting taxis.

The Mayor of London published in 2018 a new Transport Strategy for London (Greater London Authority, 2018a). This strategy is based on a Healthy Streets Approach that prioritises human health by changing the mix of transport in London to encourage walking, cycling and public transport. The Mayor aims for 80% of Londoners' trips to be made by public transport, cycling or walking by 2041.

2.1.4   Local Policy

The route for the proposed scheme runs across both the London Borough of Hammersmith and Fulham and the Royal Borough of Kensington and Chelsea. The latest information on local planning policies and air quality management in both Boroughs is summarised below.

2.1.4.1   Local Implementation Plan

Hammersmith and Fulham's Local Implementation Plan (LIP) sets out how they are implementing the Mayor's Transport Strategy. The latest revised plan outlines their delivery plan from 2011-2031 (Hammersmith and Fulham Council, 2011). LIP Objective 4 is to "Improve air quality in the Borough". A range of projects are currently being pursued to deliver this objective including developing off-street electrical charging points for vehicles, supporting the uptake of cleaner vehicles, school and business travel planning programmes, and road safety education for children to encourage walking.

Kensington and Chelsea's draft LIP, currently in consultation, outlines how they propose to deliver the Mayor's Transport Strategy. It sets out long term goals for the next 20 years and a three-year programme of investment and delivery proposals starting in 2019/2020 (Royal Borough of Kensington and Chelsea, 2018a). LIP Outcome 4 is "London's Streets will be clean and green" and one of the Borough Objectives to achieve this is to reduce transport-related pollution. The delivery plan includes adopting the Green Fleet Strategy to move towards an Ultra-Low Emission Vehicle Council Fleet, planting trees on the public highway, installing 28 additional Source London Electric Vehicle charging points and trialling part time 'school streets' which limit traffic during school arrival and dispersal hours. This will further encourage active journeys to school.

2.1.4.2   Local Plans

Under the Local Development Framework, Hammersmith and Fulham adopted their latest Local Plan in 2018 (Hammersmith and Fulham Council, 2018). There are a number of policies that aim to reduce air pollution to meet air quality objectives:

Policy CC10 Air Quality

"The council will seek to reduce the potential adverse air quality impacts of new developments by:

a. requiring all developments which may be impacted by local sources of poor air quality or may adversely contribute to local air quality to provide an air quality assessment that considers the potential impacts of pollution from the development on the site and on neighbouring areas and also considers the potential for exposure to pollution levels above the Government's air quality objective concentration targets. The assessment should include separate consideration of the impacts of (i) the construction/demolition phase of development and (ii) the operational phase of development with appropriate mitigation measures highlighted for each phase;

b. requiring mitigation measures to be implemented to reduce emissions, particularly of nitrogen oxides and small particles, where assessments show that developments could cause a significant worsening of local air quality or contribute to the exceedances of the Government's air quality objectives;"

Policy T1 Transport:

"ensuring that traffic generated by new development is minimised so that it does not add to parking pressures on local streets or congestion, or worsen air quality"

Policy T3 Increasing and Promoting Opportunities for cycling and walking:

"The council will encourage and support the increasing use of bicycles by requiring:

- *new developments to include the provision of convenient accessible and safe secure cycle parking within the boundary of the site (see appendix 8);*

- *the provision of suitable changing and showering facilities, following the guidance outlined in the Hammersmith and Fulham Cycling Strategy 2015; and*

- *developer contributions for improvements to cycling infrastructure, including contributions to the extension of TfL or other Cycle Hire schemes to mitigate their impact on the existing network."*

Under the Local Development Framework, Kensington and Chelsea adopted their latest Local Plan in 2015 (Royal Borough of Kensington and Chelsea, 2015). There are a number of policies that aim to reduce air pollution to meet air quality objectives:

Policy CE5 Air Quality:

"The Council will carefully control the impact of development on air quality, including the consideration of pollution from vehicles, construction the heating and cooling of buildings. The Council will require development to be carried out in a way that minimises the impact on air quality and mitigates exceedances of air pollutants.

To deliver this the Council will:

a. require an air quality assessment for all major development;

b. require developments to be 'air quality neutral' and resist development proposals which would materially increase exceedances levels of local air pollutants and have an unacceptable impact on amenity or health unless the development mitigates this impact through physical measures or and financial contributions to implement proposals in the Council's Local Air Quality Management Plan"

Policy CT1 Improving alternatives to car use:

"The Council will ensure that there are better alternatives to car use by making it easier and more attractive to walk, cycle and use public transport and by managing traffic congestion and the supply of car parking.

To deliver this the Council will:

g. require improvements to the walking and cycling environment, including securing pedestrian and cycle links through new developments".

2.1.4.3   Local Air Quality Management

Under the requirements of Part IV of the Environment Act (1995), Hammersmith and Fulham and Kensington and Chelsea have carried out a phased review and assessment of local air quality within their Borough.

In 2000, the whole Borough of Hammersmith and Fulham was declared as an AQMA for exceedances of the NO_2 and PM_{10} objectives for both pollutants. Measured annual and hourly mean concentrations of NO_2 at roadside monitoring sites are in excess of the objective values whereas measured PM_{10} concentrations have been below the objectives for the last few years. Six air quality focus areas (AQFA) with both high levels of NO_2 and human exposure have been identified in the borough. The proposed route for this scheme will run through the AQFA in Holland Park Uxbridge Road / Shepherd's Bush Road / Bush Green / Holland Road. The scheme is also 200m away from the edge of the Acton A40 North Acton Rail / Gypsy Corner / Savoy Circus / White City AQFA. These are illustrated in Figure 2-1.

Their latest Annual Status Report publicly available is from 2017 (Hammersmith and Fulham Council, 2017) which provides an update on the progress made towards the completion of 30 actions within the AQAP to improve air quality within the Borough. The report confirms that the vast majority of these actions are not time limited and by their nature are continuous actions. The report also provides an update on new projects including two Low Emission Bus Zones and free permits for fully electric vehicles.

In 2000, the whole Borough of Kensington and Chelsea was also declared as an AQMA for exceedances of the NO_2 and PM_{10}, objectives. The majority of the monitoring network has not experienced a discernible trend in NO_2 concentrations from 2011 through to 2017 and many sites exceed the objectives whereas measured annual mean PM_{10} concentrations have been below the objectives in recent years. There are two AQFAs in the Borough that are near to the scheme: Earl's Court Road / Warwick Road (1km from the scheme) and the A315 from Knightsbridge to Kensington High Street / A4024 Kensington Church Street to Notting Hill Gate. This AQFA does cover an area the scheme runs along and is illustrated in Figure 2-1.

The latest Annual Status Report for the Borough was published in 2018 (Royal Borough of Kensington and Chelsea, 2018b) and provides a summary of the progress the Council has made against the AQAP. Many of the 83 actions outlined in the AQAP are not time limited and the Council will continue to progress with them. Projects completed within 2017 include the new Marlborough Primary School to be performing at a high standard of energy efficiency and encouraging greater use of cycling by offering free cycle training sessions for residents, visitors and workers in the Borough. 1,091 sessions of cycle training took place with adults and 1,600 sessions took place with children in 2017-2018.

The Annual Status reports for both Boroughs outline that, whilst progress is being made, more still needs to be done to improve air quality within the Boroughs and work towards the achievement of the NO_2 objectives.

Figure 2-1: Air Quality Focus Areas Surrounding the Proposed Scheme
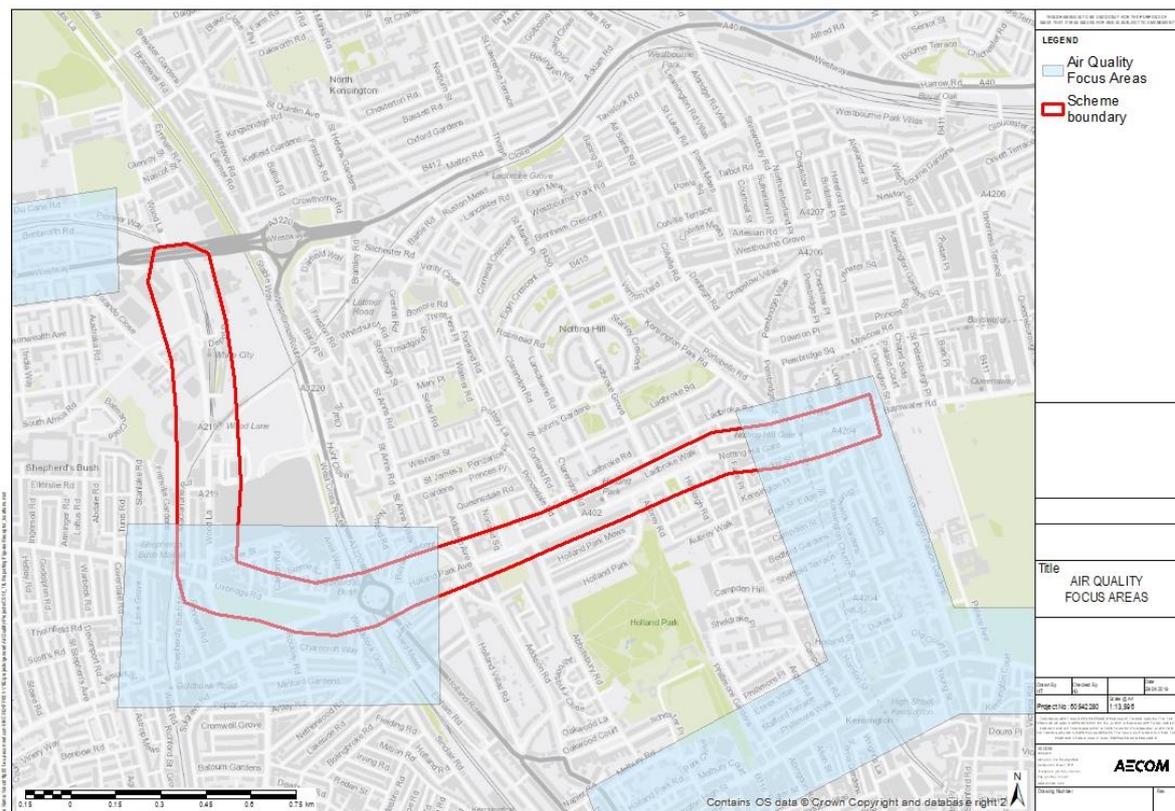
3. Noise Legislation

These sections provide a background to the current environmental and planning policies and legislation for noise.

3.1.1 European Legislation

Directive 2002/49/EC (known as the Environmental Noise Directive – END (Council of the European Communities, 2002b)) is transcribed into UK legislation by the Environmental Noise (England) Regulations (H.M. Government, 2006 as amended 2008, 2009) and involves the strategic noise mapping of major roads, railways, airports and agglomerations across the UK. Results from this mapping highlight certain Noise Important Areas several of which overlap the boundary of the modelling areas (see Figure 3-1).

3.1.2 National Policy

3.1.2.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF) provides the guiding principles for the consideration of mitigating noise and vibration, within the context of sustainable development.

As referenced in Section 2.1.2.2, paragraph 170 of the revised National Planning Policy Framework states that:

"*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 possible, help to improve local environmental conditions such as air and water quality".

Paragraph 180 also advises of the need to:

(a) *"…mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life.*

(b) *identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.."*

3.1.2.2 Planning Practice Guidance (PPG)

In March 2014, the Department for Communities and Local Government (Department for Communities and Local Government, 2014) released its PPG web-based resource to support the NPPF.

With regard to noise the guidance advises that local planning authorities' should consider:

- whether or not a significant adverse effect is occurring or likely to occur;

- whether or not an adverse effect is occurring or likely to occur; and

- whether or not a good standard of amenity can be achieved.

This guidance introduced the concepts of NOAEL (No Observed Adverse Effect Level), and UAEL (Unacceptable Adverse Effect Level).

Factors to be considered in determining if noise is a concern are identified including the absolute noise level of the source, the existing ambient noise climate, time of day, frequency of occurrence, duration, character of the noise and cumulative impacts.

3.1.2.3 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) (Defra, 2010) sets out the long term vision of the government's noise policy, which is to *"promote good health and a good quality of life through the effective management of noise within the context of policy on sustainable development"*.

This long term vision is supported by three aims:

- *"avoid significant adverse impacts on health and quality of life;*

- *mitigate and minimise adverse impacts on health and quality of life; and*

- *where possible, contribute to the improvements of health and quality of life."*

The long term policy vision and aims are designed to enable decisions to be made regarding what is an acceptable noise burden to place on society.

The 'Explanatory Note' within the NPSE provides further guidance on defining 'significant adverse effects' and 'adverse effects' using the following concepts:

- No Observed Effect Level (NOEL) - the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established;

- Lowest Observable Adverse Effect Level (LOAEL) - the level above which adverse effects on health and quality of life can be detected; and

- Significant Observed Adverse Effect Level (SOAEL) - the level above which significant adverse effects on health and quality of life occur.

The three aims can therefore be interpreted as follows:

- the first aim is to avoid noise levels above the SOAEL.

- the second aim considers situations where noise levels are between the LOAEL and SOAEL. In such circumstances, all reasonable steps should be taken to mitigate and minimise the effects. However this does not mean that such adverse effects cannot occur.

- the third aim seeks, where possible, to positively improve the health and quality of life through the pro-active management of noise whilst also taking account of the guiding principles of sustainable development. It is considered that the protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.

The NPSE recognises that it is not possible to have single objective noise-based measures that define the SOAEL, LOAEL and NOEL that is applicable to all sources of noise in all situations. The levels are likely to be different for different noise sources, receptors and at different times of the day.

3.1.2.4   Noise Important Areas

As part of the Environmental Noise Directive (END), strategic noise mapping of major roads, railways, airports and agglomerations has been completed across the UK, including London. In Defra's subsequent Draft Noise Action Plan 2013, it was decided that Noise Important Areas, with respect to noise from major roads, would be defined as the location of the 1% of the population affected by the highest noise levels from major roads according to the strategic mapping. The document states that *"…it is anticipated that the relevant highway authority will examine each Important Area having regard to any ongoing noise mitigation initiatives, schemes and plans"*. The results of round 2 of the noise mapping process were released by Defra in late 2015; the results of round 3 produced in 2017 have not yet been published. The locations of Noise Important Areas near to the proposed scheme are shown in Figure 3-1.

Figure 3-1: Location of Noise Important Areas
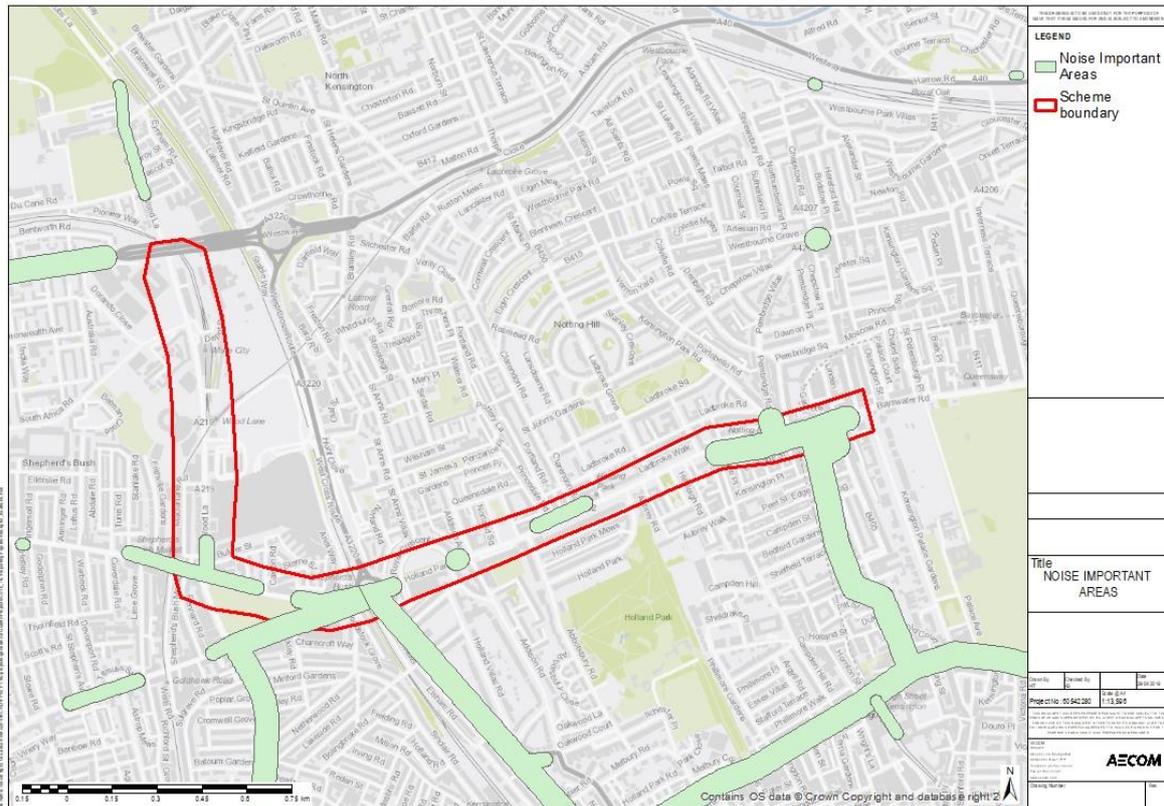
3.1.3   London Policy

3.1.3.1   The London Plan – Spatial Development Strategy for Greater London

The current London Plan was published by the Mayor of London in March 2016 (Greater London Authority, 2016a). Policy 7.15 Reducing Noise and Enhancing Soundscapes states that development proposals should seek to reduce noise by:

- *"Minimising the existing and potential adverse impacts of noise on, from, within, or in the vicinity of, development proposals;*

- *Separating new noise sensitive development from major noise sources wherever practicable through the use of distance, screening, or internal layout in preference to sole reliance on sound insulation; and*

- *Promoting new technologies and improved practices to reduce noise at source".*

In addition, a new London Plan is currently in draft, covering 2019-2041. Noise is integrated into many of the policies therein, such as Policy D7 which states that development proposals should:

"*…[include] design that reduces the impact of traffic noise and encourages appropriate vehicle speeds…".*

Policy D13 deals specifically with noise and states that:

"*In order to reduce, manage and mitigate noise to improve health and quality of life, residential and other non-aviation development proposals should manage noise by:*

1) avoiding significant adverse noise impacts on health and quality of life

2) reflecting the Agent of Change principle to ensure measures do not add unduly to the costs and administrative burdens on existing noise generating uses

3) mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on development

4) improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity)

5) separating new noise-sensitive development from major noise sources (such as road, rail, air transport and some types of industrial use) through the use of distance, screening or internal layout – in preference to sole reliance on sound insulation

6) where it is not possible to achieve separation of noise-sensitive development and noise sources without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through applying good acoustic design principles

7) promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver.

Boroughs, and others with relevant responsibilities, should identify and nominate new Quiet Areas and protect existing Quiet Areas in line with the procedure in Defra's Noise Action Plan for Agglomerations."

3.1.3.2 London Environment Strategy
Chapter 9 of the Mayor of London's Environment Strategy (Greater London Authority, 2018b) deals with ambient noise from road traffic and non-road traffic sources as well as promoting good acoustic design and quieter spaces.

3.1.3.3 Mayor's Transport Strategy and Transport Action Plan
TfL's Healthy Streets for London (Transport for London, 2017),recognises that noise is an issue particularly in inner London. It is highlighted that road traffic contributes to the noise levels and has a negative impact on health.

The Mayor's Transport Strategy (Greater London Authority, 2018a) is based on a Healthy Streets Approach that prioritises human health by changing the mix of transport in London to encourage walking, cycling and public transport. Key proposals impacting traffic noise include reducing traffic volumes and speeds, low-noise road surfacing where appropriate, monitoring noise levels close to major road corridors, facilitating quiet deliveries and working with DfT to reduce noise from the loudest vehicles.

3.1.4   Local Policy

The latest information on local planning policies related to noise in London Borough of Hammersmith and Fulham and the London Borough of Kensington and Chelsea are summarised below.

3.1.4.1   Local Implementation Plan

Hammersmith and Fulham's LIP outlines Hammersmith and Fulham's contribution to meeting Mayor's Transport Strategy goals including "enhancing the quality of life for all Londoners", in which "improving noise impacts" is listed as one of the challenges. Noise mitigation measures are suggested for areas with highest levels of transport noise including installing acoustic barriers and resurfacing roads as well as greater use of electric vehicles, walking and cycling.

Kensington and Chelsea's draft Third LIP, as outlined in Section 2.1.4.1, considers the reduction of transport-related noise pollution in Outcome 4. Disturbance from aircraft noise from Heathrow airport affects residents in the south of the borough, particularly at night and in the early morning. The Borough also welcome Proposal 48f of the MTS which states that TfL will work with the Department for Transport to investigate ways of reducing noise from the loudest vehicles such as some types of supercars and motorcycles, a problem particularly around the Knightsbridge area.

3.1.4.2   Local Plans

The Hammersmith and Fulham Local Plan includes Policy T3 "Increasing and Promoting Opportunities for cycling and walking" outlined in Section 2.1.4.2 and the following policy relating to noise:

Policy CC11 Noise

"Noise (including vibration) impacts of development will be controlled by implementing the following measures:

a. noise and vibration sensitive development should be located in the most appropriate locations and protected against existing and proposed sources of noise and vibration through careful design, layout and use of materials, and by ensuring adequate insulation of the building envelope and internal walls, floors and ceilings as well as protecting external amenity areas;

b. housing, schools, nurseries, hospitals and other noise-sensitive development will not normally be permitted where the occupants/users would be affected adversely by noise, both internally and externally, from existing or proposed noise generating uses. Exceptions will only be made if it can be demonstrated that adequate mitigation measures will be taken, without compromising the quality of the development; and

c. noise generating development will not be permitted, if it would be liable to materially increase the noise experienced by the occupants/users of existing or proposed noise sensitive uses in the vicinity.

Where necessary, applicants will be expected to carry out noise assessments and provide details of the noise levels on the site. Where noise mitigation measures will be required to enable development to take place, an outline application will not normally be acceptable."

Kensington and Chelsea Local Plan includes Policy CT1 "Improving alternatives to car use" outlined in Section 2.1.4.2 and the following policy relating to noise:

Policy CE6 Noise and Vibration:

"The Council will carefully control the impact of noise and vibration generating sources which affect amenity both during the construction and operational phases of development. The Council will require new noise and vibration sensitive developments to mitigate and protect occupiers against existing sources of noise and vibration.

To deliver this the Council will:

a. require that noise and vibration sensitive development is located in the most appropriate location and, wherever located, is protected against existing sources of noise and vibration, through careful design, layout and use of materials to ensure adequate insulation from sound and vibration;

b. resist developments which fail to meet adopted local noise and vibration standards;

c. resist all applications for noise and vibration generating development and plant that would have an unacceptable noise and vibration impact on surrounding amenity;

d. require that development protects, respects and enhances the special significance of the borough's tranquil areas."

4.   Methodology

4.1   Summary

The following sections provide details of the approach taken to conduct the air quality and noise assessment for the study. The methodology employed by AECOM to convert the modelled traffic data provided by TfL into the format required for noise and air quality modelling is outlined, and technical details of the setup of both the noise and air quality models used are discussed in turn. The section also outlines the methodology used to determine if there are significant changes to air quality and traffic noise levels with the proposed scheme in place at selected receptors.

4.2   Traffic Data

Both the noise and air quality predictions are based on forecast traffic flows and speeds within the study area from TfL's ONE model (VISUM).

Morning (AM (08:00-09:00)) and Evening (PM (17:00-18:00)) peak hour data in the form of traffic flows, composition (light vehicles (e.g. cars, taxis and light goods vehicles (LGVs), heavy goods vehicles (HGVs) and buses) and speed have been provided for the following scenarios:

- 2016 Network with 2016 traffic data – Base – existing situation;
- 2021 Network with 2021 traffic data – Future Base (Without Scheme) – contains all planned and committed Schemes for the area;
- 2021 Network with 2021 traffic data - Future Proposed (With Scheme)

The peak hour data has been converted to 24 hour Annual Average Daily Traffic (AADT), as required by the AECOM Traffic Team. The conversion method is based on a standardised approach which has been agreed with TfL. It uses factors from Automatic Traffic Counters (ATCs) to convert AM and PM peak hour data into estimates of 24 hour AADT flows and speeds and includes the following:

- Factors to convert AM and PM peak hour model outputs for Lights (cars, taxi, LGV) to 24 hour AADT;
- Factors to convert AM and PM peak hour model outputs for HGVs to 24 hour AADT; and
- Factors to convert average peak hour model speeds to 18 hour weekday and 24 hour daily average speeds.

Factors have been derived from traffic data collected on the following links:

- A219 Wood Lane North;
- A219 Wood Lane South; and
- Bayswater Road.

For local links where specific traffic data was unavailable to derive a conversion factor, an average factor was derived from the available traffic data in the study area and subsequently applied.

4.3   Receptors

The concentration of road traffic emitted pollutants at the roadside or at sensitive receptors is influenced by a number of factors. These include background pollution levels and the amount of traffic emissions, which is dictated by traffic flow rates, composition and speed. Local road traffic noise levels are also determined by traffic conditions and can be impacted by surrounding buildings, which may act as reflectors or barriers, and, for high speed roads, the type of road surface.

The air quality objective values for pollutants associated with road traffic were set by the Expert Panel of Air Quality Standards (and subsequently adopted as UK Air Quality Objectives) at a level below the lowest concentration at which the more sensitive members of society have been observed to be adversely affected by exposure to each pollutant. Therefore, all receptors that represent exposure of the public are of equal sensitivity as any member of the public could be present at those locations.

Commercial properties are not considered sensitive to changes in ambient pollutant concentrations or traffic noise levels and are legislated separately as part of health and safety regulations. These are therefore not included in the assessment and the focus is on proposed and existing residential buildings and sensitive receptors such as schools and hospitals as these are most sensitive to the annual mean objective values and to noise.

The air quality and traffic noise predictions have been completed for a selection of receptors close to the roadside on sensitive buildings within the proposed scheme extent and within the wider study area likely to be affected traffic re-routing. The receptors have been selected from the current AddressBase ordnance survey data in conjunction with a review of aerial photography and publicly available mapping. There are several new committed developments including Shepherd's Building on Charecroft Way and Silchester, next to Latimer Road Underground Station in the study area, but these locations are represented by a nearby existing property. Each of the receptors chosen represents the maximum level of exposure that could be experienced at other receptors in their vicinity.

The selected receptors are shown in Figure 4-1 and Table 4-1 (G = ground floor, 1 = 1st floor, etc).

Figure 4-1: Location of Receptors in Relation to Scheme
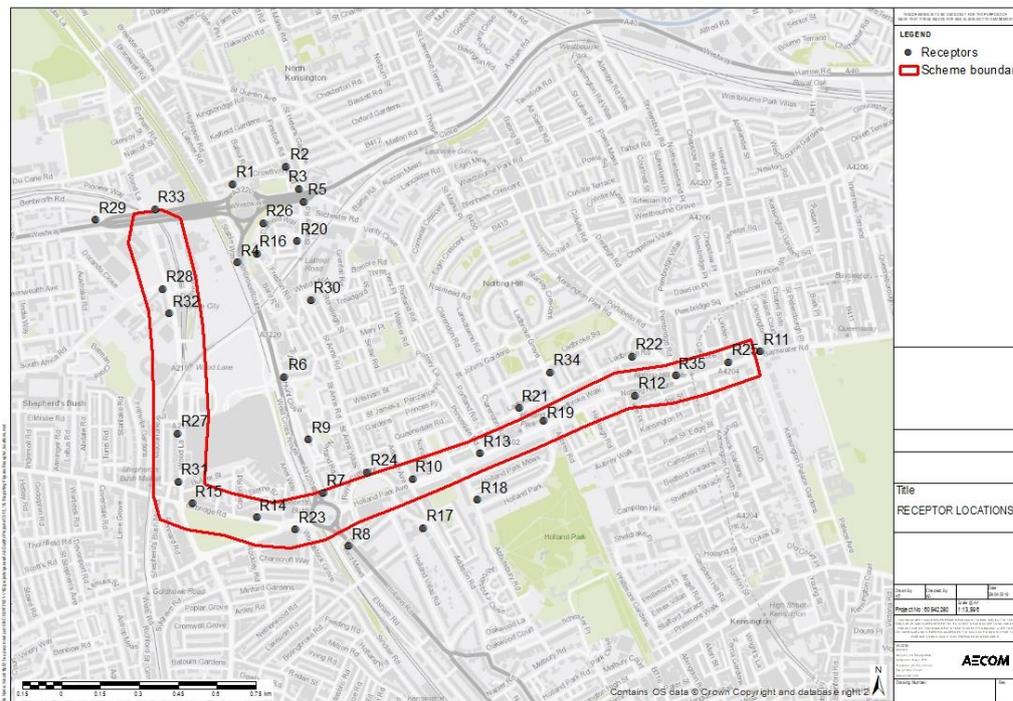
Table 4-1: Summary of Receptors

ID	Receptor Name	Use (by floor)	Borough	Floor
R1	Oxford Gardens	Residential	Kensington and Chelsea	G
R2	Oxford Gardens Primary School, Oxford Gardens	Educational	Kensington and Chelsea	G
R3	Crowthorne Road	Residential	Kensington and Chelsea	G
R4	Stable Way	Residential	Kensington and Chelsea	G
R5	Bramley Road	Residential	Kensington and Chelsea	G
R6	Hunt Close	Residential	Kensington and Chelsea	G

ID	Receptor Name	Use (by floor)	Borough	Floor
R7	Kingsdale Gardens	Residential	Kensington and Chelsea	G
R8	Holland Road	Residential	Kensington and Chelsea	G
R9	Queensdale Crescent	Residential	Kensington and Chelsea	G
R10	Norland Place School, Holland Park Avenue	Educational	Kensington and Chelsea	G
R11	Bayswater Road (above the Champion pub)	Residential	Kensington and Chelsea	1
R12	Notting Hill Gate (above Pizza Express)	Residential	Kensington and Chelsea	1
R13	Holland Park Avenue (above Giraffe)	Residential	Kensington and Chelsea	1
R14	Uxbridge Road (above TAI Buffet)	Residential	Hammersmith and Fulham	1
R15	Uxbridge Road (above Sainsbury's Local)	Residential	Hammersmith and Fulham	1
R16	St Anne's Nursery School	Educational	Kensington and Chelsea	G
R17	The Cardinal Vaughan Memorial School, Addison Road	Educational	Kensington and Chelsea	G
R18	Holland Park	Residential	Kensington and Chelsea	G
R19	Holland Park Avenue	Residential	Kensington and Chelsea	G
R20	Bramley Road	Residential	Kensington and Chelsea	G
R21	Lansdowne Road	Residential	Kensington and Chelsea	G
R22	Ladbroke Road	Residential	Kensington and Chelsea	G
R23	Shepherd's Bush Green (above Vue cinema)	Residential	Hammersmith and Fulham	4
R24	Royal Crescent	Residential	Kensington and Chelsea	G
R25	Notting Hill Gate (above Britain Change)	Residential	Kensington and Chelsea	G
R26	Darfield Way	Residential	Kensington and Chelsea	G
R27	Wood Lane	Residential	Hammersmith and Fulham	G
R28	S Africa Road	Residential	Hammersmith and Fulham	G
R29	WestWay	Residential	Hammersmith and Fulham	G
R30	St Francis of Assisi Catholic Primary School, Stoneleigh School	Educational	Kensington and Chelsea	G
R31	Wood Lane	Residential	Hammersmith and Fulham	G

ID	Receptor Name	Use (by floor)	Borough	Floor
R32	Wood Lane	Residential	Hammersmith and Fulham	G
R33	Wood Lane (Student accommodation not yet completed)	Residential	Hammersmith and Fulham	1
R34	Bright Horizon Holland Park Day Nursery	Educational	Kensington and Chelsea	G
R35	Pembridge Road (above Bureau de Change)	Residential	Kensington and Chelsea	1

4.4 Air Quality Prediction Methodology

There is currently no statutory guidance on the method by which an air quality impact assessment should be undertaken. Several non-statutory bodies have published their own guidance relating to air quality and development control (Environmental Protection UK, EPUK and Institute of Air Quality Management, IAQM, 2017) or to the assessment of the significance of air quality effects (IAQM, 2009).

This section will explain the methods used to assess the significance of the impact of road traffic exhaust emissions associated with the proposed scheme.

Potentially affected air quality sensitive receptors have been identified as detailed above and the magnitude of the change in air quality statistics at each receptor has been considered. The methods used to determine the significance of effect associated with air quality impacts are described later.

4.4.1 Road Traffic Emissions

The incomplete combustion of fuel in vehicle engines results in the presence of hydrocarbons (HC) such as benzene and 1,3-butadiene, and sulphur dioxide (SO_2), carbon monoxide (CO), PM_{10} and $PM_{2.5}$ in exhaust emissions. In addition, at the high temperatures and pressures found within vehicle engines, some of the nitrogen in the air and the fuel is oxidised to form NO_X, mainly in the form of nitric oxide (NO), which is then converted to NO_2 in the atmosphere. NO_2 is associated with adverse effects on human health. Better emission control technology and fuel specifications are expected to reduce emissions per vehicle in the long term.

Although SO_2, CO, benzene and 1,3-butadiene are also present in motor vehicle exhaust emissions, detailed consideration of the associated impacts on local air quality is not considered relevant in the context of this proposal as none of these pollutants are at risk of exceeding the relevant objective values within the study area.

Exhaust emissions from road vehicles affect the concentrations of the principal pollutants of concern, NO_2, PM_{10} and $PM_{2.5}$, at sensitive receptors in the vicinity of the scheme. Therefore, these pollutants are the focus of the assessment of the significance of road traffic impacts.

This assessment follows current guidance for the determination of pollutant concentrations, and uses emissions factors for road traffic calculated with the latest information as provided in the latest version of Defra's Emission Factor Toolkit (EFT) (Version 8.0.1).

The same version of the EFT is also used to consider changes in annual road transport emissions of carbon in the form of carbon dioxide (CO_2) that may be brought about by the proposed scheme across the study area in the 2021 opening year.

4.4.2 Other Emission Sources

The assessment has only explicitly modelled emissions from road traffic sources in the area. Emissions from other sources such as rail and industry directly within the study area, other roads and other sources from further afield are taken into account as part of the background contribution.

4.4.3   Prediction of Air Quality Impacts

This assessment has used the dispersion model software 'ADMS-Roads' (4.1.1.0) to quantify pollution levels at selected receptors due to road traffic emissions. ADMS-Roads is a modern dispersion model that has an extensive published track record of use in the UK for the assessment of local air quality impacts, including model validation and verification studies (CERC, 2013).

The model outputs have been presented at individual receptor locations rather than across a regular grid to provide a contour plot. This chosen approach provides a better representation of the impact of the scheme as it avoids the need to interpolate results between gridded points.

4.4.4   Air Quality Dispersion Model Input Data and Model Conditions

Details of general model conditions set up in ADMS-Roads are provided in Table 4-2. Some of these conditions are summarised in detail below.

Table 4-2: General ADMS-Roads Model Conditions

Variables	ADMS-Roads Model Input: Road Traffic Model
Surface roughness at source	1.5m
Minimum Monin-Obukhov length for stable conditions	100m
Terrain types	Flat
Receptor location	x, y coordinates determined by GIS, z = various.
Emissions	NO_x, PM_{10}, $PM_{2.5}$
Emission factors	EFT Version 8.0.1 emission factor dataset.
Meteorological data	1 year (2016) hourly sequential data from Heathrow Airport meteorological station.
Emission profiles	Weekday, Saturday and Sunday emission profiles were included for air quality modelling.
Receptors	Facades of selected receptors only.
Model output	Long-term (annual) mean NO_x concentrations. Long-term (annual) mean PM_{10} concentrations. Long-term (annual) mean $PM_{2.5}$ concentrations.

4.4.5   Air Quality Meteorological Data

One year (2016) of hourly sequential observation data from Heathrow Airport meteorological station has been used in this assessment to correspond with the baseline year. The station is located approximately 20 km west of the proposed scheme and experiences meteorological conditions that are representative of those experienced in London and within the air quality study area. A wind rose for this site for the year 2016, used to allow verification of the model with the latest local monitoring data, is shown in Figure 4-2.

It is recommended in the GLA's technical guidance (LLAQM.TG(16) (Greater London Authority, 2016b) that the meteorological data log file be checked, to confirm the number of missing and calm hours that cannot therefore be modelled. The meteorological data should only be used if the percentage of usable hours is greater than 75%, and preferably 90%. 2016 meteorological data from Heathrow Airport includes 8,742 lines of usable hourly data out of the total 8,784 for the year, i.e. 99.5% usable data. These data are, therefore, suitable for application to the assessment.

Figure 4-2: Heathrow Airport 2016 Meteorological Data
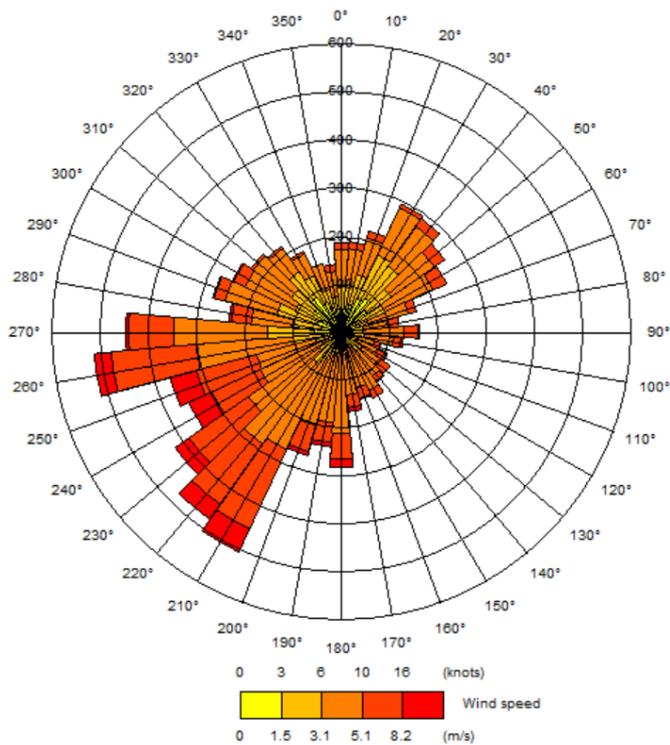
4.4.6   Air Quality Background Data

Background data for NO_2, PM_{10} and $PM_{2.5}$ concentrations for the baseline year of 2016 are given in Table 4-3 and for the opening year of 2021 are given in Table 4-4. These data have been sourced from Defra's 2015-based background maps (Defra, 2019b) for receptors within the nearest 1km by 1km grid squares. Trunk roads and Primary A roads are included in the model so these have been taken out of the background to avoid double counting of emissions.

The background levels of concentrations are below all relevant objectives at all receptors. It is noted that the background NO_2 concentrations are lower than those measured at the urban background monitoring site (KC53) which is near to the scheme. In 2016, the measured concentration at this site was 47 µg/m^3.

Table 4-3: Defra 2016 Background Concentrations

Receptor ID	X	Y	NO$_2$	PM$_{10}$	PM$_{2.5}$
R28, R29, R32, R33	522500	180500	27.2	19.4	12.0
R1, R2, R3, R4, R5, R16, R20, R26, R30,	523500	180500	29.9	19.5	12.1
R15, R27, R31	522500	179500	27.9	18.3	11.5
R6, R7, R8, R9, R10, R13, R14, R17, R18, R23, R24	523500	179500	29.5	19.9	12.3
R22, R25	524500	180500	31.8	19.0	11.9
R11	525500	180500	33.1	20.1	12.5
R12, R19, R21, R34, R35	524500	179500	30.6	19.5	12.2

Source: Defra (2019b)

Table 4-4: Defra 2021 Background Concentrations

Receptor ID	X	Y	NO$_2$	PM$_{10}$	PM$_{2.5}$
R28, R29, R32, R33	522500	180500	21.5	18.8	11.4
R1, R2, R3, R4, R5, R16, R20, R26, R30,	523500	180500	23.5	18.8	11.4
R15, R27, R31	522500	179500	22.0	17.7	10.8
R6, R7, R8, R9, R10, R13, R14, R17, R18, R23, R24	523500	179500	23.3	19.2	11.6
R22, R25	524500	180500	24.9	18.3	11.2
R11	525500	180500	25.9	19.3	11.8
R12, R19, R21, R34, R35	524500	179500	23.9	18.8	11.4

Source: Defra (2019b)

4.4.7 Air Quality Model Verification

Model verification is the process by which the performance of the model is assessed to identify any discrepancies between modelled and measured concentrations at air quality monitoring sites within the study area.

Model verification has been undertaken following the methodology described in LLAQM.TG(16) (Greater London Authority, 2016b). This verification process is supported by Defra's NO$_X$ - NO$_2$ conversion tool to convert modelled NO$_X$ from the road to NO$_2$ by taking into account the background concentrations.

Initially, modelled predictions were made for annual mean NO$_2$ concentrations at the monitoring sites given in Table 5-1 to compare monitored and modelled NO$_2$ concentrations. This comparison found that the results for KC69 and KC5 were within 25% of the monitored concentrations at both sites. The result for HF61 was 29% below the monitored concentration at the site. This monitor is close to a side road (Devonport Road) which is not included in the TfL's ONE model which may contribute to the under-prediction found. A monitoring site on Shepherd's Bush Green was discounted from the process as it was not well placed for verification as it was influenced by local congested conditions. Based on these monitoring sites, an adjustment factor of 2.5 was calculated and then applied to the modelled road NO$_X$, PM$_{10}$ and PM$_{2.5}$ concentrations at receptor locations.

Where a number of monitoring sites were used to provide an adjustment factor, the accuracy of the adjusted model can be determined using the Route Mean Square Error (RMSE) calculation. An RMSE value within ±25% of the national air quality objective of 40 µg/m^3 is considered acceptable i.e. 10 µg/m^3. The RMSE value for the adjusted model using the 2.5 adjustment factor was 5.7 µg/m^3.

4.4.8 Air Quality Predicting Short Term PM$_{10}$ Objective

The guidance document LAQM.TG(03) (Defra, 2003) sets out the method by which the number of days in which the PM$_{10}$ 24-hour objective is exceeded can be obtained based on a relationship with the predicted PM$_{10}$ annual mean concentration. The most recent guidance LAQM.TG(16) (Defra, 2018) and LLAQM.TG(16) (Greater London Authority, 2016b) suggests no change to this method. As such, the formula used within this assessment is:

$$\text{No. of } Exceedances = 0.0014 * C^3 + \frac{206}{C} - 18.5$$

where C is the annual mean concentration of PM$_{10}$.

4.4.9   Air Quality Predicting Short Term NO$_2$ Objective

Research projects completed on behalf of Defra and the Devolved Administrations (Laxen and Marner, 2003, and AEAT, 2008) have concluded that the hourly mean NO$_2$ objective is unlikely to be exceeded if annual mean concentrations are predicted to be less the 60 µg/m^3.

In 2003, Laxen and Marner concluded:

"…local authorities could reliably base decisions on likely exceedances of the 1-hour objective for nitrogen dioxide alongside busy streets using an annual mean of 60 µg/m^3 and above."

The findings presented by Laxen and Marner (2003) are further supported by AEAT (2008) who revisited the investigation to complete an updated analysis including new monitoring results and additional monitoring sites. The recommendations of this report are:

"Local authorities should continue to use the threshold of 60 µg/m^3 NO$_2$ as the trigger for considering a likely exceedance of the hourly mean nitrogen dioxide objective."

This means that where predicted concentrations are below 60 µg/m^3, it can be concluded that the hourly mean NO$_2$ objective (200 µg/m^3 NO$_2$ not more than 18 times per year) will be achieved. In addition to this, the assessment has evaluated the likelihood of exceeding the hourly mean NO$_2$ objective by predicting the 99.79[th] percentile of NO$_2$ concentrations as this is equivalent to the hourly objective value.

4.5   Traffic Noise Prediction Methodology

Noise from a flow of road traffic is generated by both vehicles' engines and the interaction of tyres with the road surface. The traffic noise level at a receptor, such as an observer at the roadside or occupants of a building, is influenced by a number of factors including traffic flow, speed, composition (percentage heavy duty vehicles), gradient, type of road surface, distance from the road and the presence of any obstructions between the road and the receptor.

Noise from a stream of traffic is not constant; therefore, to assess the noise impact a single figure estimate of the overall noise level is necessary. The index adopted by the Government in 'The Calculation of Road Traffic Noise' (CRTN) (DoT and the Welsh Office, 1988) to assess traffic noise is $L_{A10,18h}$. This value is determined by taking the highest 10% of noise readings in each of the eighteen 1-hour periods between 06:00 and 24:00, and then calculating the arithmetic mean. A reasonably good correlation has been shown to exist between this index and residents' perception of traffic noise over a wide range of exposures. When CRTN was first validated it was found to have a mean error of 0.3 dB(A) with a standard deviation of 2.4 dB(A) (Delaney et al, 1976).

CRTN provides the standard methodology for predicting the $L_{A10,18h}$ road traffic noise level in the UK. Noise levels are predicted at a point 1 m measured horizontally externally from the façade of the building and therefore are 'façade' rather than 'free-field' levels. Façade levels include the reflection of noise from the building façade. CRTN applies a standard 'façade correction' of +2.5 dB to convert free-field levels (unaffected by façade reflections) to 'façade' levels (including façade reflections).

Details of the road layout with and without the proposed scheme have been provided by TfL, along with corresponding 2021 traffic data, see Section 4.2. Based on the provided information noise models of the 'with' and 'without' scheme situations have been developed using the SoundPLAN (v8.0) noise mapping software. SoundPLAN implements the standard UK CRTN road traffic noise prediction methodology. Further details of the traffic noise modelling approach are provided in Appendix A.

4.6   Method for Assessment of Significance

4.6.1   Air Quality Assessment of Significance

4.6.1.1   Air Quality Effects Descriptors
With regard to road traffic emissions, the change in pollutant concentrations with respect to future baseline concentrations has been described at receptors that are representative of exposure to impacts on local air quality within the study area. The absolute magnitude of pollutant concentrations

in the "with" and "without" scheme scenario is also described and this is used to consider the risk of the air quality limit values being exceeded in each scenario.

For consideration of a change in annual mean concentration of a given magnitude, the EPUK and IAQM have published recommendations for describing the effects of such impacts at individual receptors as set out in Table 4-5 and Table 4-6 (EPUK and IAQM, 2017).

Table 4-5: Effects Descriptors at Individual Receptors – Annual Mean NO$_2$ and PM$_{10}$

Long Term Average Concentration at Receptor in Assessment Year (µg/m^3)	Change in Concentration Relative to Air Quality Assessment Level (AQAL) – NO$_2$ and PM$_{10}$ (µg/m^3)				
	<0.2	0.2 - <0.6	0.6 - <2.2	2.2 -<=4.0	>4.0
	(Imperceptible)	(Very Small)	(Small)	(Medium)	(Large)
<30.2	Negligible	Negligible	Negligible	Slight	Moderate
30.2 - <37.8	Negligible	Negligible	Slight	Moderate	Moderate
37.8 - <41.0	Negligible	Slight	Moderate	Moderate	Substantial
41.0 - <43.8	Negligible	Moderate	Moderate	Substantial	Substantial
≥43.8	Negligible	Moderate	Substantial	Substantial	Substantial

Table 4-6: Effects Descriptors at Individual Receptors – Annual Mean PM$_{2.5}$

Long Term Average Concentration at Receptor in Assessment Year (µg/m^3)	Change in Concentration Relative to Air Quality Assessment Level (AQAL) – PM$_{2.5}$ (µg/m^3)				
	<0.1	0.1 - <0.4	0.4 - <1.4	1.4 -<=2.5	>2.5
	(Imperceptible)	(Very Small)	(Small)	(Medium)	(Large)
<18.9	Negligible	Negligible	Negligible	Slight	Moderate
18.9 - <23.6	Negligible	Negligible	Slight	Moderate	Moderate
23.6 - <25.6	Negligible	Slight	Moderate	Moderate	Substantial
25.6 - <27.4	Negligible	Moderate	Moderate	Substantial	Substantial
≥27.4	Negligible	Moderate	Substantial	Substantial	Substantial

An increase in concentrations is conserved an adverse effect and a decrease in concentrations is considered a beneficial effect. A change in predicted annual mean concentrations of NO$_2$ or PM$_{10}$ of less than 0.2 µg/m^3 is considered to be so small as to be imperceptible. For short-term objectives, the guidance states that where the concentrations range from 11% - 20% of the relevant objective, the magnitude of impacts is small. Concentrations that are 21% - 50% and greater than 50% of the objectives have moderate or large impact respectively. A change (impact) that is imperceptible, given normal bounds of variation, would not be capable of having a direct effect on local air quality that could be considered to be significant.

All relevant receptors that have been selected to represent locations where people are likely to be present are based on impacts on human health. The air quality objective values have been set at concentrations that provide protection to all members of society, including more vulnerable groups

such as the very young, elderly or unwell. As such the sensitivity of receptors was considered in the definition of the air quality objective values, and therefore, no additional subdivision of human health receptors on the basis of building or location type is necessary.

4.6.1.2   Significance of Effects

The significance of the reported effects is then considered for the proposed scheme in overall terms. The potential for the scheme to contribute to or interfere with the successful implementation of policies and strategies for the management of local air quality are considered if relevant, but the principal focus is any change to the likelihood of future achievement of the air quality objective values set out in Table 2-1 for the following pollutants:

- Annual mean nitrogen dioxide (NO_2) concentration of 40 $\mu g/m^3$;

- Annual mean particulate matter (PM_{10}) concentration of 40 $\mu g/m^3$;

- Annual mean fine particulate matter ($PM_{2.5}$) concentrations of 25 $\mu g/m^3$;

- 24-hour mean PM_{10} concentration of 50 $\mu g/m^3$ not to be exceeded on more than 35 days per year; and

- 1-hour mean NO_2 concentration of 200 $\mu g/m^3$ not to be exceeded on more than 18 times per year.

The achievement of local authority goals for local air quality management are directly linked to the achievement of the air quality objective values described above, and as such, this assessment focuses on the likelihood of achievement of the air quality objective values as a result of the proposed scheme.

In terms of the significance of any adverse impacts, an effect is reported as being either 'not significant' or as being 'significant'. If the overall effect of the scheme on local air quality or on amenity is found to be 'moderate' or 'substantial' this is deemed to be 'significant'. Effects found to be 'slight' are considered to be 'not significant', although they may be a matter of local concern. 'Negligible' effects are considered to be 'not significant'.

4.6.2   Traffic Noise Assessment of Significance

The assessment of the significance of the effect of the proposed scheme on traffic noise levels is based on the guidance in the Design Manual for Roads and Bridges (DMRB) (Highways Agency, 2011) on the magnitude of traffic noise changes, combined with consideration of the sensitivity of the receptor. Table 4-7 is adapted from the DMRB classification of the magnitude of impact in the short term i.e. the year of opening.

Table 4-7: Road Traffic Noise Magnitude of Impact Criteria

Change in Traffic Noise Level $L_{A10,18h}$ dB	Magnitude of Impact
0	No change
0.1-0.9	Imperceptible
1.0-2.9	Small
3.0-4.9	Medium
5.0+	Large

The significance of the effect is determined based on the matrix in Table 4-8. The effect is beneficial if the traffic noise level is reduced and adverse if the traffic noise level is increased.

Table 4-8: Road Traffic Noise Significance of Effect Matrix

Sensitivity of Receptor	Magnitude of Impact			
	Large	**Medium**	**Small**	**Imperceptible**
High	Substantial	Moderate	Minor	Negligible
Medium	Moderate	Minor	Negligible	Negligible
Low	Minor	Negligible	Negligible	Negligible
Very Low	Negligible	Negligible	Negligible	Negligible

Residential properties or buildings containing some residential use including houses and nursing homes are considered to be of high sensitivity to changes in road traffic noise. Receptors such as schools and hostels with permanent residences are also ranked as 'high' sensitivity. Commercial receptors are considered to be of low sensitivity to traffic noise changes.

Generally, effects classed as negligible or slight are considered to be insignificant, whereas effects classed as moderate or substantial adverse are considered to be significant. However, final determination of whether effects are likely to be significant in specific situations is made following the classification of effects and using professional judgement. This is based on information such as the overall magnitude of the noise level.

5.   Predicted Impacts

5.1   Summary

The following sections present the results of the air quality and noise assessments at selected receptors, providing the predicted levels with and without the scheme in place and the differences. For both air quality and noise, a consideration of whether these changes are considered to be significant is provided.

5.2   Air Quality Concentrations

5.2.1   Baseline

There are three monitoring locations close to the route of the proposed scheme. Two are within London Borough of Kensington and Chelsea and one is within the London Borough of Hammersmith and Fulham. The measured annual mean NO_2 concentrations for 2016 at these three sites are provided in Table 5-1. Concentrations were above the annual mean objective of 40 $\mu g/m^3$ at all three sites except in 2015 at KC69.

Table 5-1: Measured Baseline Annual Mean NO_2 Concentrations within the Study Area

ID	Name	Site Type	Annual mean NO_2 concentration ($\mu g/m^3$) 2014	Annual mean NO_2 concentration ($\mu g/m^3$) 2015	Annual mean NO_2 concentration ($\mu g/m^3$) 2016	Annual mean NO_2 concentration ($\mu g/m^3$) 2017
1	KC69	Background	**48.7**	39.3	**46.1**	**48.4**
2	KC53	Urban Background	**48.4**	**42.6**	**47**	**50.3**
3	HF61	Roadside	**45.8**	**45.9**	**45.2**	not available

Concentrations in bold are above the annual mean objective value and concentrations in bold

Following model verification, the results of the baseline air quality modelling are presented in Table 5-2 for all three pollutants at the selected receptor locations.

Table 5-2: Modelled Baseline Annual Mean Concentrations at Selected Locations, 2016

ID	Receptor Name	X co-ordinate (m)	Y co-ordinate (m)	Height (m)	NO_2 ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	Borough
R1	Oxford Gardens	523511	181203	1.5	39.8	21.2	13.2	Kensington and Chelsea
R2	Oxford Gardens Primary School, Oxford Gardens	523718	181270	1.5	37.0	20.8	12.9	Kensington and Chelsea
R3	Crowthorne Road	523768	181185	1.5	**47.0**	22.8	14.2	Kensington and Chelsea
R4	Stable Way	523529	180899	1.5	**56.9**	25.2	15.6	Hammersmith and Fulham
R5	Bramley Road	523786	181134	1.5	**53.5**	24.4	15.1	Kensington and Chelsea
R6	Hunt Close	523711	180454	1.5	**49.7**	24.2	15.0	Hammersmith and Fulham
R7	Kingsdale Gardens	523859	180004	1.5	**57.8**	24.9	15.4	Kensington and Chelsea
R8	Holland Road	523957	179796	1.5	**53.2**	23.9	14.8	Kensington and Chelsea

ID	Receptor Name	X co-ordinate (m)	Y co-ordinate (m)	Height (m)	NO$_2$ (µg/m^3)	PM$_{10}$ (µg/m^3)	PM$_{2.5}$ (µg/m^3)	Borough
R9	Queensdale Crescent	523803	180211	1.5	**43.0**	22.3	13.8	Hammersmith and Fulham
R10	Norland Place School, Holland Park Avenue	524205	180058	1.5	**44.9**	22.0	13.7	Kensington and Chelsea
R11	Bayswater Road (above the Champion pub)	525545	180553	4.5	**41.7**	21.6	13.5	Kensington and Chelsea
R12	Notting Hill Gate (above Pizza Express)	525064	180382	4.5	**44.0**	21.5	13.4	Kensington and Chelsea
R13	Holland Park Avenue (above Giraffe)	524416	180136	4.5	**41.9**	21.6	13.4	Kensington and Chelsea
R14	Uxbridge Road (above TAI Buffet)	523630	179904	4.5	**48.5**	22.9	14.2	Hammersmith and Fulham
R15	Uxbridge Road (above Sainsbury's Local)	523356	179963	4.5	**47.9**	21.4	13.4	Hammersmith and Fulham
R16	St Anne's Nursery School	523603	180932	1.5	**43.3**	22.1	13.7	Kensington and Chelsea
R17	The Cardinal Vaughan Memorial School, Addison Road	524246	179868	1.5	36.2	20.9	13.0	Kensington and Chelsea
R18	Holland Park	524456	179976	1.5	38.0	21.3	13.2	Kensington and Chelsea
R19	Holland Park Avenue	524709	180288	1.5	39.7	20.9	13.1	Kensington and Chelsea
R20	Bramley Road	523760	180980	1.5	**43.1**	21.9	13.6	Kensington and Chelsea
R21	Lansdowne Road	524615	180339	1.5	35.4	20.3	12.7	Kensington and Chelsea
R22	Ladbroke Road	525053	180532	1.5	38.1	20.0	12.6	Kensington and Chelsea
R23	Shepherd's Bush Green (above vue cinema)	523754	179861	12	**42.7**	21.7	13.5	Hammersmith and Fulham
R24	Royal Crescent	524031	180083	1.5	**49.4**	22.8	14.1	Kensington and Chelsea
R25	Notting Hill Gate (above Britain Change)	525423	180511	1.5	**48.0**	21.4	13.4	Kensington and Chelsea
R26	Darfield Way	523628	181051	1.5	**44.9**	22.4	13.9	Hammersmith and Fulham
R27	Wood Lane	523299	180182	1.5	39.2	20.0	12.5	Hammersmith and

ID	Receptor Name	X co-ordinate (m)	Y co-ordinate (m)	Height (m)	NO$_2$ (µg/m^3)	PM$_{10}$ (µg/m^3)	PM$_{2.5}$ (µg/m^3)	Borough
								Fulham
R28	S Africa Road	523241	180796	1.5	**43.3**	21.7	13.4	Hammersmith and Fulham
R29	WestWay	522982	181065	1.5	**48.3**	23.7	14.6	Hammersmith and Fulham
R30	St Francis of Assisi Catholic Primary School, Stoneleigh School	523813	180753	1.5	39.2	21.1	13.1	Kensington and Chelsea
R31	Wood Lane	523301	180047	1.5	**42.2**	20.2	12.7	Hammersmith and Fulham
R32	Wood Lane	523266	180700	1.5	36.7	20.8	12.9	Hammersmith and Fulham
R33	Wood Lane (Student accommodation not yet completed)	523212	181105	4.5	**46.4**	22.9	14.1	Hammersmith and Fulham
R34	Bright Horizon Holland Park Day Nursery	524736	180471	1.5	**40.6**	21.1	13.2	Kensington and Chelsea
R35	Pembridge Road (above Bureau de Change)	525220	180459	4.5	**48.4**	22.1	13.8	Kensington and Chelsea

Concentrations in bold are predicted to be above the annual mean NO$_2$ objective value of 40 µg/m^3

The results show that the objective value for NO$_2$ of 40 µg/m^3 was exceeded at many of the selected roadside locations in the baseline year of 2016. The highest concentrations were predicted at locations close to the A3220 West Cross Route (R4 and R7 at 56.9 µg/m^3 and 57.8 µg/m^3, respectively) and the A40 Westway (R5 at 53.5 µg/m^3). As none of the predicted concentrations are above 60 µg/m^3, the hourly mean objective of 200 µg/m^3 is unlikely to be exceeded more than 18 times a year.

Predicted concentrations of particulates (PM$_{10}$ and PM$_{2.5}$) were well below the relevant air quality objectives at all selected locations.

5.2.2 Opening Year

The results of the detailed modelling of annual mean NO$_2$, PM$_{10}$, and PM$_{2.5}$ concentrations with and without the scheme are given in Table 5-3 for the scheme opening year. The last column in Table 5-3 provides a description of the significance of the predicted change in annual mean concentration. This is based on the approach presented in EPUK and IAQM guidance (EPUK and IAQM, 2017). These descriptors take into account the absolute concentration in the opening year and the change in concentration in relation to the annual mean objective and are used as part of an overall evaluation of the significance of effects for schemes.

The impact (change in NO$_2$ concentrations) is also illustrated in Table 5-3 and Figure 5-1 at receptors. Changes in PM$_{10}$ and PM$_{2.5}$ are illustrated in Table 5-4 and Table 5-5.

Table 5-3: Predicted Annual Mean NO$_2$ Impacts due to the Scheme, Opening Year

ID	Receptor Name	Annual Mean NO$_2$ Concentration (µg/m^3)	Impact (µg/m^3)	Significance Descriptor

		2021 Without Scheme	2021 With Scheme		
R1	Oxford Gardens	30.1	30.2	0.1	Negligible
R2	Oxford Gardens Primary School, Oxford Gardens	28.1	28.5	0.4	Negligible
R3	Crowthorne Road	33.8	35.8	2.1	Slight Adverse
R4	Stable Way	**46.2**	**43.7**	-2.5	Substantial Beneficial
R5	Bramley Road	37.5	**40.9**	3.4	Moderate Adverse
R6	Hunt Close	37.6	37.1	-0.5	Negligible
R7	Kingsdale Gardens	**42.9**	**43.1**	0.2	Moderate Adverse
R8	Holland Road	38.8	39.5	0.8	Moderate Adverse
R9	Queensdale Crescent	32.2	32.0	-0.2	Negligible
R10	Norland Place School, Holland Park Avenue	31.6	32.1	0.5	Negligible
R11	Bayswater Road (above the Champion pub)	31.0	31.2	0.1	Negligible
R12	Notting Hill Gate (above Pizza Express)	32.8	30.8	-2.0	Slight Beneficial
R13	Holland Park Avenue (above Giraffe)	28.8	29.5	0.7	Negligible
R14	Uxbridge Road (above TAI Buffet)	35.2	34.6	-0.6	Negligible
R15	Uxbridge Road (above Sainsbury's Local)	34.9	33.9	-1.0	Slight Beneficial
R16	St Anne's Nursery School	33.0	32.6	-0.3	Negligible
R17	The Cardinal Vaughan Memorial School, Addison Road	27.4	28.1	0.7	Negligible
R18	Holland Park	27.6	29.5	1.8	Negligible
R19	Holland Park Avenue	30.1	30.0	-0.1	Negligible
R20	Bramley Road	32.7	33.1	0.4	Negligible
R21	Lansdowne Road	26.8	27.5	0.8	Negligible
R22	Ladbroke Road	29.2	30.0	0.8	Negligible
R23	Shepherd's Bush Green (above vue cinema)	31.7	31.1	-0.5	Negligible
R24	Royal Crescent	38.0	39.2	1.2	Moderate Adverse
R25	Notting Hill Gate (above Britain Change)	33.4	34.9	1.5	Slight Adverse
R26	Darfield Way	33.8	33.8	<0.1	Negligible
R27	Wood Lane	29.1	30.5	1.4	Slight Adverse
R28	S Africa Road	30.3	31.9	1.7	Slight Adverse
R29	Westway	34.8	35.4	0.6	Negligible
R30	St Francis of Assisi Catholic Primary School, Stoneleigh School	30.0	30.2	0.2	Negligible
R31	Wood Lane	31.1	32.5	1.4	Slight Adverse
R32	Wood Lane	26.9	28.8	1.9	Negligible
R33	Wood Lane (Student accommodation not yet completed)	34.1	34.9	0.8	Slight Adverse
R34	Bright Horizon Holland Park Day Nursery	27.8	30.2	2.4	Moderate Adverse
R35	Pembridge Road (above Bureau de Change)	36.0	33.4	-2.6	Moderate Beneficial

Concentrations in bold are predicted to be above the annual mean objective value of 40 µg/m³.

Figure 5-1: Predicted Annual Mean NO₂ Impacts due to the Scheme, Opening Year
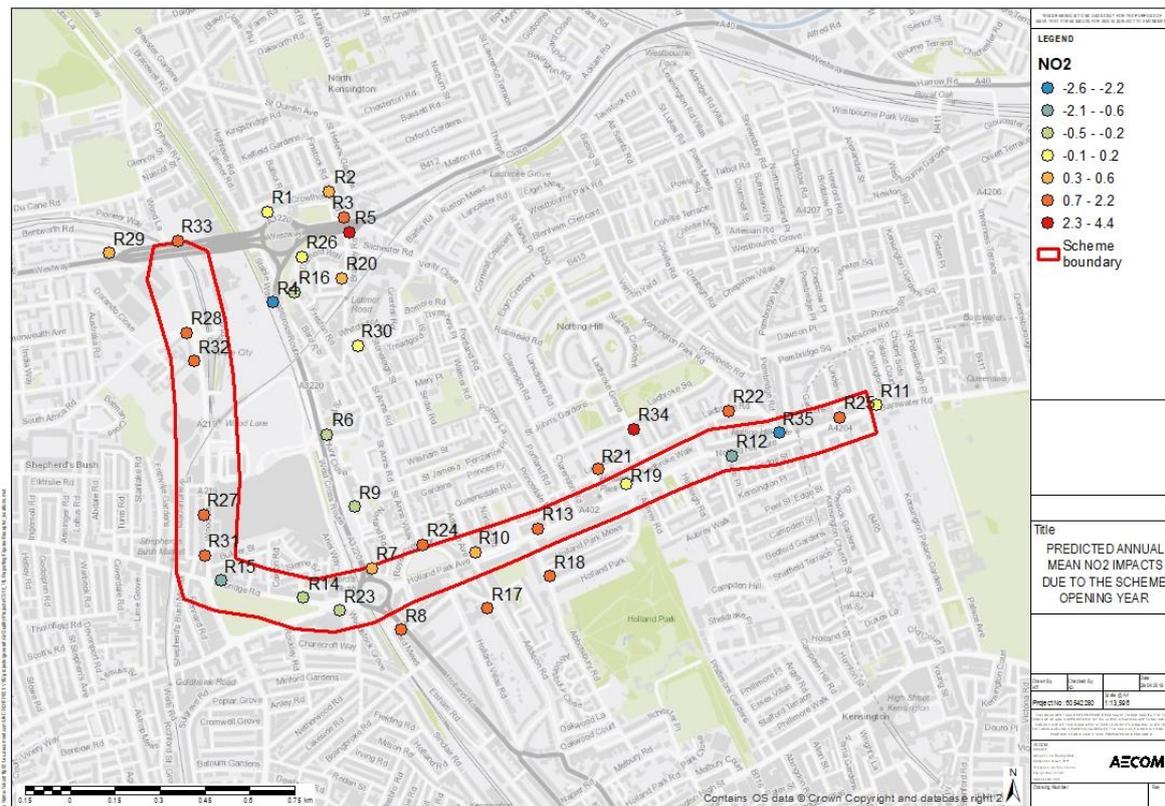
Annual mean NO₂ concentrations in 2021 are predicted to decline compared to the 2016 baseline and are below the annual mean objective with and without the scheme at the majority of receptor locations. There are exceedances of the objective at 3 receptors within the study area (R4 Stable Way, R5 Bramley Road and R7 Kingsdale Gardens). These receptor locations are in close vicinity to main roads, ie. the A40 Westway and A3220 West Cross Route dual carriageways. R5 Bramley Road is the only new exceedances of the objective.

There was no change, or an imperceptible change, in concentrations at 4 receptors. There are predicted increases in concentrations at 22 receptors. The increase was very small at 5 receptors, small at 15 receptors and medium at 2 receptors. There were predicted decreases in concentrations at 9 receptors. The decrease was very small at 4 receptors, small at 3 receptors and medium at 2 receptors. There were no large changes at any receptors.

These changes are translated to significance descriptors as per the Table 4-5. Using these descriptors, the impact of the proposed scheme on NO₂ concentrations is considered to be negligible at 19 of the 35 receptor locations, with slight adverse impacts at 6 receptors and slight beneficial effects at 2. These effects are considered to be not significant according to the EPUK/IAQM guidance.

R7 (Kingsdale Gardens) and R8 (Holland Road) show a moderate adverse impact due to the scheme. This is due to their close proximity to the A3220 roundabout at Holland Park Avenue. Vehicle speeds have decreased on the roundabout and adjoining roads resulting in an increase in emissions. The concentrations at R7 are above the annual mean objective with and without the scheme. At location R5 (Bramley Road), there is a moderate adverse effect due to the scheme as the annual mean concentrations increase by the largest absolute amount (3.4 µg/m³) and this causes the concentration to be above the annual mean objective. The reason for this is the increased traffic flow along the A40 Westway east of the A3220 roundabout with the A40. R24 (Royal Crescent) shows a moderate adverse impact due to increased traffic flow on the road adjacent to the proposed scheme making the concentration close to the annual mean objective.

R4 (Stable Way) shows a substantial beneficial impact due to a decrease in traffic flow along the A40 west of the A3220 roundabout. The impact of the proposed scheme is moderately beneficial at R35 (Pembridge Road) which is located on the route of the proposed scheme, at the corner of Clanricarde Gardens and the A402. The reduction in concentrations will be due to the large reduction in traffic flow predicted along the A402 in the vicinity of the receptor.

Table 5-4: Predicted Annual Mean PM$_{10}$ Impacts due to the Scheme, Opening Year

ID	Receptor Name	Annual Mean PM$_{10}$ Concentration (µg/m^3)		Impact (µg/m^3)	Significance Descriptor
		2021 Without Scheme	2021 With Scheme		
R1	Oxford Gardens	20.4	20.4	0.03	Negligible
R2	Oxford Gardens Primary School, Oxford Gardens	19.9	20.0	0.09	Negligible
R3	Crowthorne Road	21.5	22.0	0.54	Negligible
R4	Stable Way	24.4	24.1	-0.34	Negligible
R5	Bramley Road	22.5	23.5	0.94	Negligible
R6	Hunt Close	23.2	22.9	-0.21	Negligible
R7	Kingsdale Gardens	23.7	23.4	-0.33	Negligible
R8	Holland Road	22.6	22.7	0.03	Negligible
R9	Queensdale Crescent	21.5	21.3	-0.12	Negligible
R10	Norland Place School, Holland Park Avenue	20.8	20.9	0.05	Negligible
R11	Bayswater Road (above the Champion pub)	20.6	20.6	-0.01	Negligible
R12	Notting Hill Gate (above Pizza Express)	20.7	19.9	-0.74	Negligible
R13	Holland Park Avenue (above Giraffe)	20.5	20.6	0.13	Negligible
R14	Uxbridge Road (above TAI Buffet)	21.9	21.4	-0.47	Negligible
R15	Uxbridge Road (above Sainsbury's Local)	20.6	20.1	-0.52	Negligible
R16	St Anne's Nursery School	21.2	21.2	-0.05	Negligible
R17	The Cardinal Vaughan Memorial School, Addison Road	20.0	20.1	0.09	Negligible
R18	Holland Park	20.2	20.6	0.41	Negligible
R19	Holland Park Avenue	20.2	20.0	-0.20	Negligible
R20	Bramley Road	21.1	21.1	0.07	Negligible
R21	Lansdowne Road	19.4	19.5	0.13	Negligible
R22	Ladbroke Road	19.2	19.3	0.13	Negligible
R23	Shepherd's Bush Green (above vue cinema)	20.8	20.6	-0.21	Negligible
R24	Royal Crescent	22.0	22.1	0.10	Negligible
R25	Notting Hill Gate (above Britain Change)	20.1	20.3	0.17	Negligible
R26	Darfield Way	21.4	21.4	0.01	Negligible
R27	Wood Lane	19.3	19.4	0.06	Negligible
R28	S Africa Road	20.6	21.0	0.38	Negligible
R29	WestWay	22.4	22.5	0.15	Negligible

ID	Receptor Name	Annual Mean PM$_{10}$ Concentration (μg/m^3)		Impact (μg/m^3)	Significance Descriptor
		2021 Without Scheme	2021 With Scheme		
R30	St Francis of Assisi Catholic Primary School, Stoneleigh School	20.4	20.4	0.03	Negligible
R31	Wood Lane	19.6	19.4	-0.12	Negligible
R32	Wood Lane	20.0	20.4	0.40	Negligible
R33	Wood Lane (Student accommodation not yet completed)	21.7	21.8	0.06	Negligible
R34	Bright Horizon Holland Park Day Nursery	19.6	20.1	0.51	Negligible
R35	Pembridge Road (above Bureau de Change)	21.5	20.8	-0.63	Negligible

Table 5-5: Predicted Annual Mean PM$_{2.5}$ Impacts due to the Scheme, Opening Year

ID	Receptor name	Annual Mean PM$_{2.5}$ Concentration (μg/m^3)		Impact (μg/m^3)	Significance Descriptor
		2021 Without Scheme	2021 With Scheme		
R1	Oxford Gardens	12.3	12.3	0.02	Negligible
R2	Oxford Gardens Primary School, Oxford Gardens	12.1	12.1	0.05	Negligible
R3	Crowthorne Road	12.9	13.2	0.30	Negligible
R4	Stable Way	14.6	14.4	-0.21	Negligible
R5	Bramley Road	13.5	14.0	0.53	Negligible
R6	Hunt Close	13.8	13.7	-0.12	Negligible
R7	Kingsdale Gardens	14.2	14.0	-0.17	Negligible
R8	Holland Road	13.6	13.6	0.02	Negligible
R9	Queensdale Crescent	12.9	12.8	-0.07	Negligible
R10	Norland Place School, Holland Park Avenue	12.5	12.6	0.03	Negligible
R11	Bayswater Road (above the Champion pub)	12.5	12.5	0.00	Negligible
R12	Notting Hill Gate (above Pizza Express)	12.5	12.1	-0.41	Negligible
R13	Holland Park Avenue (above Giraffe)	12.3	12.4	0.08	Negligible
R14	Uxbridge Road (above TAI Buffet)	13.1	12.9	-0.24	Negligible
R15	Uxbridge Road (above Sainsbury's Local)	12.5	12.2	-0.28	Negligible
R16	St Anne's Nursery School	12.8	12.7	-0.03	Negligible
R17	The Cardinal Vaughan Memorial School, Addison Road	12.1	12.2	0.05	Negligible
R18	Holland Park	12.2	12.4	0.24	Negligible
R19	Holland Park Avenue	12.2	12.1	-0.11	Negligible

ID	Receptor name	Annual Mean $PM_{2.5}$ Concentration (µg/m³)		Impact (µg/m³)	Significance Descriptor
		2021 Without Scheme	2021 With Scheme		
R20	Bramley Road	12.7	12.7	0.04	Negligible
R21	Lansdowne Road	11.8	11.9	0.08	Negligible
R22	Ladbroke Road	11.7	11.8	0.08	Negligible
R23	Shepherd's Bush Green (above vue cinema)	12.6	12.4	-0.11	Negligible
R24	Royal Crescent	13.3	13.3	0.06	Negligible
R25	Notting Hill Gate (above Britain Change)	12.2	12.3	0.10	Negligible
R26	Darfield Way	12.9	12.9	0.00	Negligible
R27	Wood Lane	11.8	11.8	0.04	Negligible
R28	S Africa Road	12.4	12.6	0.21	Negligible
R29	WestWay	13.4	13.5	0.08	Negligible
R30	St Francis of Assisi Catholic Primary School, Stoneleigh School	12.3	12.3	0.02	Negligible
R31	Wood Lane	11.9	11.9	-0.05	Negligible
R32	Wood Lane	12.1	12.3	0.23	Negligible
R33	Wood Lane (Student accommodation not yet completed)	13.0	13.1	0.04	Negligible
R34	Bright Horizon Holland Park Day Nursery	11.9	12.2	0.29	Negligible
R35	Pembridge Road (above Bureau de Change)	13.0	12.6	-0.36	Negligible

Particulate concentrations (PM_{10} and $PM_{2.5}$) are below the relevant objectives with and without the scheme at all selected receptor locations. The impact of the scheme is negligible at all locations.

5.3 Carbon Dioxide Emissions

Changes in annual carbon dioxide (CO_2) emissions due to the scheme were calculated across the modelled road networks for the opening year. These results are given in Table 5-6 and show that there is a predicted increase in CO_2 emissions of less than 3% due to the scheme which is considered to be small and mostly likely due to additional vehicle kilometres travelled.

Table 5-6: Predicted Change in CO_2 Emissions due to the Scheme, Opening Year

Tonnes CO_2/year		
Without Scheme	With Scheme	Difference (%)
41040	42163	+1123 (3%)

5.4 Noise Scheme Impacts

The results of the modelling of road traffic noise levels, in terms of $L_{A10, 18h}$ (dB), with and without the scheme are given in Table 5-7 for the scheme opening year.

The impact (change in noise level) at receptors is illustrated in Figure 5-2 and presented in Table 5-7.

The criteria for the significance descriptor are given in Table 4-8. Generally speaking only moderate and major impacts at noise sensitive receptors are considered significant.

Table 5-7: Predicited L$_{A10, 18h}$ Noise Levels in the Opening Year

ID	Receptor Name	Road Traffic Noise		Change	Significance Descriptor
		2021 Without Scheme	2021 With Scheme		
R1	Oxford Gardens	64.8	64.7	-0.1	Negligible
R2	Oxford Gardens Primary School, Oxford Gardens	55.5	55.5	<0.1	No Change
R3	Crowthorne Road	73.8	73.9	0.1	No Change
R4	Stable Way	64.9	64.6	-0.3	Negligible
R5	Bramley Road	74.8	74.9	0.1	Negligible
R6	Hunt Close	70.2	70.4	0.2	Negligible
R7	Kingsdale Gardens	74.9	74.9	<0.1	No Change
R8	Holland Road	76.4	76.3	-0.1	Negligible
R9	Queensdale Crescent	71.7	71.6	-0.1	Negligible
R10	Norland Place School, Holland Park Avenue	71.7	71.6	-0.1	Negligible
R11	Bayswater Road (above the Champion pub)	76.3	75.6	-0.7	Negligible
R12	Notting Hill Gate (above Pizza Express)	74.7	73.6	-1.1	Minor Beneficial
R13	Holland Park Avenue (above Giraffe)	75.5	74.7	-0.8	Negligible
R14	Uxbridge Road (above TAI Buffet)	75.6	71.8	-3.8	Moderate Beneficial
R15	Uxbridge Road (above Sainsbury's Local)	76.1	73.6	-2.5	Minor Beneficial
R16	St Anne's Nursery School	69.0	68.9	-0.1	No Change
R17	The Cardinal Vaughan Memorial School, Addison Road	64.3	64.1	-0.2	Negligible
R18	Holland Park	66.6	68.3	1.7	Minor Adverse
R19	Holland Park Avenue	73.0	72.8	-0.2	Negligible
R20	Bramley Road	72.2	72.3	0.1	Negligible
R21	Lansdowne Road	56.8	61.0	4.2	Moderate Adverse
R22	Ladbroke Road	65.9	67.3	1.4	Minor Adverse
R23	Shepherd's Bush Green (above vue cinema)	72.5	70.7	-1.8	Minor Beneficial
R24	Royal Crescent	75.2	75.4	0.2	Negligible
R25	Notting Hill Gate (above Britain Change)	77.2	77.4	0.2	Negligible
R26	Darfield Way	63.1	63.1	<0.1	No Change
R27	Wood Lane	74.2	74.9	0.7	Negligible
R28	S Africa Road	75.2	74.1	-1.1	Minor Beneficial
R29	WestWay	68.7	68.7	<0.1	No Change
R30	St Francis of Assisi Catholic Primary School, Stoneleigh School	65.2	65.3	0.1	Negligible
R31	Wood Lane	74.6	75.0	0.4	Negligible
R32	Wood Lane	73.5	73.7	0.2	Negligible
R33	Wood Lane (Student accommodation not yet completed)	70.5	70.6	0.1	Negligible

R34	Bright Horizon Holland Park Day Nursery	70.4	70.4	0.0	No Change
R35	Pembridge Road (above Bureau de Change)	77.5	77.4	-0.1	No Change

Figure 5-2: Predicted Change in $L_{A10,\,18h}$ Noise Levels due to the Scheme, Opening Year
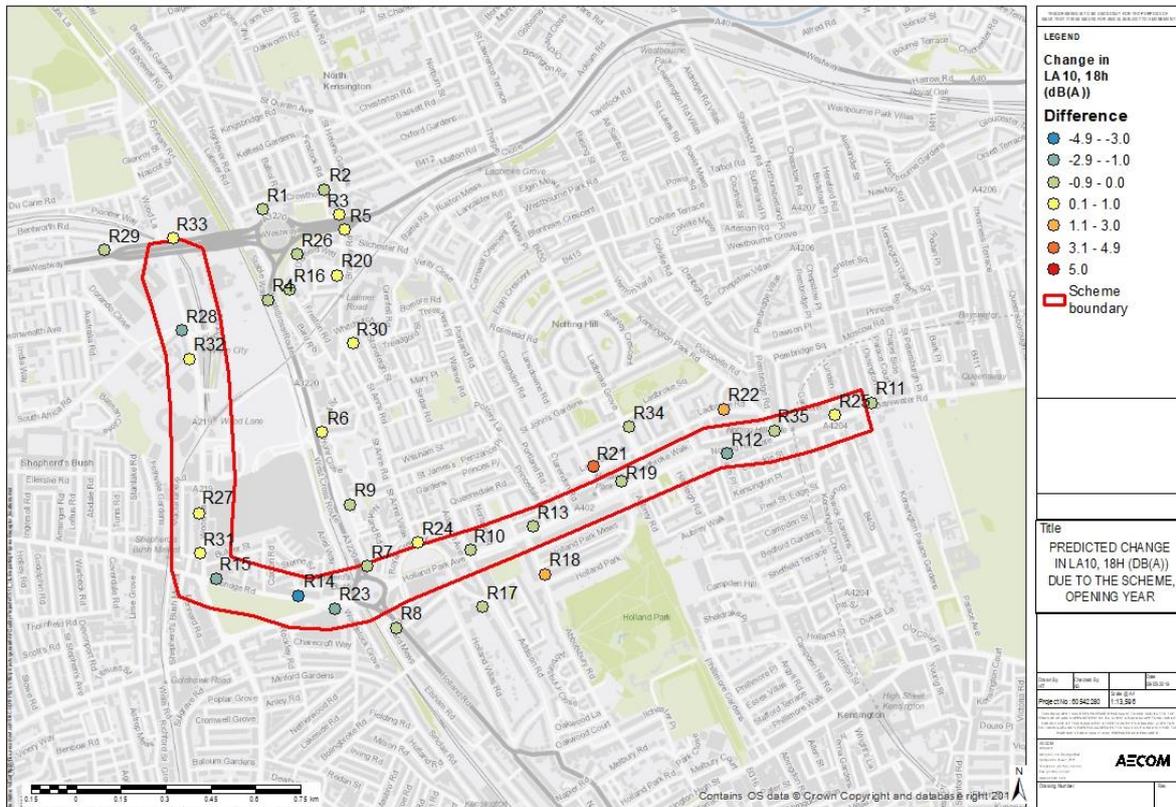
Predicted traffic noise levels in the vicinity of the scheme area, both with and without the scheme, are typical for central London. Properties close to and facing the main routes, A402, Wood Lane, A3220 and A40 West Way are expected to experience the highest opening year noise levels of over 70 dB, both with and without the scheme.

Overall there is expected to be little significant change in noise exposure in the opening year as a result of the scheme, with 27 of the 35 selected properties predicted to experience either no change or an imperceptible change in road traffic noise. However, there are expected to be a few minor effects, both beneficial and adverse.

A moderate adverse effect is expected at R21 as a result of an expected increase in traffic on Lansdowne Walk, running parallel to the scheme on A402 Holland Park Avenue. It should be noted however that the traffic flow in this area is relatively low and therefore both sensitive to changes in the $L_{A10,\,18h}$ metric as well as relatively quiet overall, even with the scheme, in terms of the absolute noise levels of the modelled receptors in the vicinity of the scheme. Minor adverse effects are expected at properties along Holland Park (R18), which runs perpendicular to the section of the scheme on the A402, and Ladbroke Road, (R22) which runs parallel to the section of the scheme on A402. These minor adverse effects are due to an increase in traffic flow.

The main beneficial effects on noise level are expected along A4020 Uxbridge Road (R14 and R15) and along Shepherd's Bush Green (R23), resulting from a reduction in traffic flow, in particular heavy duty vehicles. Beneficial effects are also expected at some properties facing the roads where cycle lanes will be placed. Minor beneficial effects are expected along Notting Hill Gate (R12), due to a reduction of traffic flow, and along Wood Lane (R28, junction with S Africa Road), caused by the increase in distance between the property and road edge due to the introduction of the segregated carriageway cycle lane.

6.   Conclusions

6.1   Summary

This report presents the results from an assessment to predict traffic impacts on air quality and noise due to implementation of the Proposed Improvements between Wood Lane and Notting Hill gate.

The vast majority of the changes in air quality and noise are considered to be negligible and therefore not significant at these selected representative locations.

There are small to medium improvements in air quality due to traffic reductions predicted on the A40 west of the A3220 and on the A402. Conversely there are slight to moderate increases to the east of this roundabout close to the A40 as well as moderate increases around Holland Park due to traffic increases on the Holland Park A3220 roundabout.

There are small to medium improvements (i.e. minor to moderate beneficial effects) in noise due to traffic reductions predicted on A4020 (Uxbridge Road and Shepherd's Bush Green) and A402 (Notting Hill Gate). There is also a small improvement (minor beneficial effect) on Wood Lane due to the segregated cycle lane moving some of the traffic further from adjacent building façades. Conversely, increases due to traffic increases on some local roads lead to a medium increase (i.e. a moderate adverse effect) in noise levels along Lansdowne Road and small increases (i.e. a minor adverse effect) along Holland Park and Ladbroke Road.

The results of the air quality and noise assessment suggest that the overall impact of the Scheme is considered to be not significant on air quality and noise across the majority of the study area, with a few areas predicted to experience benefits and worsening. The Scheme can therefore proceed and there are no recommendations for further assessment or mitigation measures required to be implemented.

7.   References

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Appendix A Data and Assumptions

Data Provided:

- Ground heights from publically available LIDAR Digital Terrain Map data, downloaded at http://environment.data.gov.uk/ds/survey/index.jsp#/survey on 20th March 2019.

- Building heights from OS TOPO layer provided by TfL on 15th March 2019.

- OS mapping files from MasterMap® including ITN road centreline and TOPO layer from TfL on 15th March 2019.

- AddressBase® layer with building points and addresses provided by TfL on 15th March 2019

- Road scheme layout provided by TfL in CAD format on 14th March 2019.

- AM (8am - 9am) and PM (5pm - 6pm) peak traffic data from ONE model provided by TfL for base (2016), future-base and proposed case (2021) on 20th February 2019.

- Flow and speed data from traffic counts for selected locations provided by TfL in April 2019.

Air Modelling Assumptions

- Traffic data converted to 24-hour AADT format based on existing traffic count data in the study area provided by TfL.

- NO_X, PM_{10} and $PM_{2.5}$ and CO_2 vehicle emission factors assumed for 2016 and 2021 as per information in Defra's Emission Factor Toolkit v8.0.1 which was the latest version at the time of assessment.

- Background NO_X, NO_2, PM_{10} and $PM_{2.5}$ concentrations assumed as per information in Defra's background maps for 2016 and 2021.

- Residential accommodation is assumed for ground floor (1.5m height) except where alternative information is known (for example where ground floor is commercial).

Noise Modelling Assumptions:

- Traffic data converted to 18-hour AAWT format based on existing traffic count data in the study area provided by TfL.

- Presumed that any average speeds less than 20 km/h are 20 km/h in CRTN

- Predominantly hard ground assumed across the study area (ground absorption 0.0) except for park areas where soft ground assumed (ground absorption 1.0).

- Road surface correction: road surface correction of -1 dB(A) applied to all roads in accordance with guidance in DMRB and CRTN for Hot Rolled Asphalt.

- Existing building heights and number of floors based on a combination of Building heights from OS TOPO layer provided by TfL on 15th March 2019 and aerial photography.

- Buildings being constructed have been digitised based on public information available and determined by AECOM.

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