Air Quality
CONSULTANTS

Air Quality Assessment: Fox Lane Quieter Neighbourhood, Enfield

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Experts in air quality
management & assessment

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1 Introduction

1.1 This report describes the potential air quality impacts associated with the Quieter Neighbourhood Scheme at Fox Lane (the 'scheme') in Enfield. The assessment has been carried out by Air Quality Consultants Ltd (AQC) on behalf of London Borough of Enfield (LB Enfield). This air quality assessment has been undertaken in conjunction with a noise assessment undertaken by AQC's sister company Noise Consultants Ltd (NCL), which is presented in a separate report.

1.2 A Quieter Neighbourhood Scheme is an area in which *"through motor vehicle traffic is discouraged or removed"* in alignment with the Mayor's Transport Strategy 2018 (GLA, 2018a) to transform London's streets. The Fox Lane scheme was introduced in 2020.

1.3 This report describes existing local air quality conditions (base year 2019), and the predicted changes in pollutant concentrations at sensitive receptors with the scheme in place (assessment year 2021). The assessment focuses on nitrogen dioxide (NO_2) and fine particulate matter (PM_{10} and $PM_{2.5}$) as these are the main pollutants of concern associated with road traffic emissions.

1.4 The predicted annual mean pollutant concentrations at selected receptors, with and without the scheme in place in 2021, and associated impacts, are also described in full in Appendix A1.

1.5 This report has been prepared taking into account all relevant local and national guidance and regulations.

Proposed Scheme

1.6 A series of measures were implemented on residential roads within the streets bounded by the A105 Green Lanes, the A1004 Aldermans Hill / Cannon Hill / The Green / High Street, and the A111 The Bourne / Bourne Hill to reallocate through traffic from these minor roads onto the surrounding 'key distributor roads'.

1.7 The scheme was implemented as a trial under an Experimental Traffic Order in September 2020, with a number of restrictions to motorised vehicles implemented through camera enforcement and the placement of bollards. In addition, Devonshire Road was converted from a one-way road to allow two-way traffic flows. A summary of the proposed amendments is provided in Figure 1.

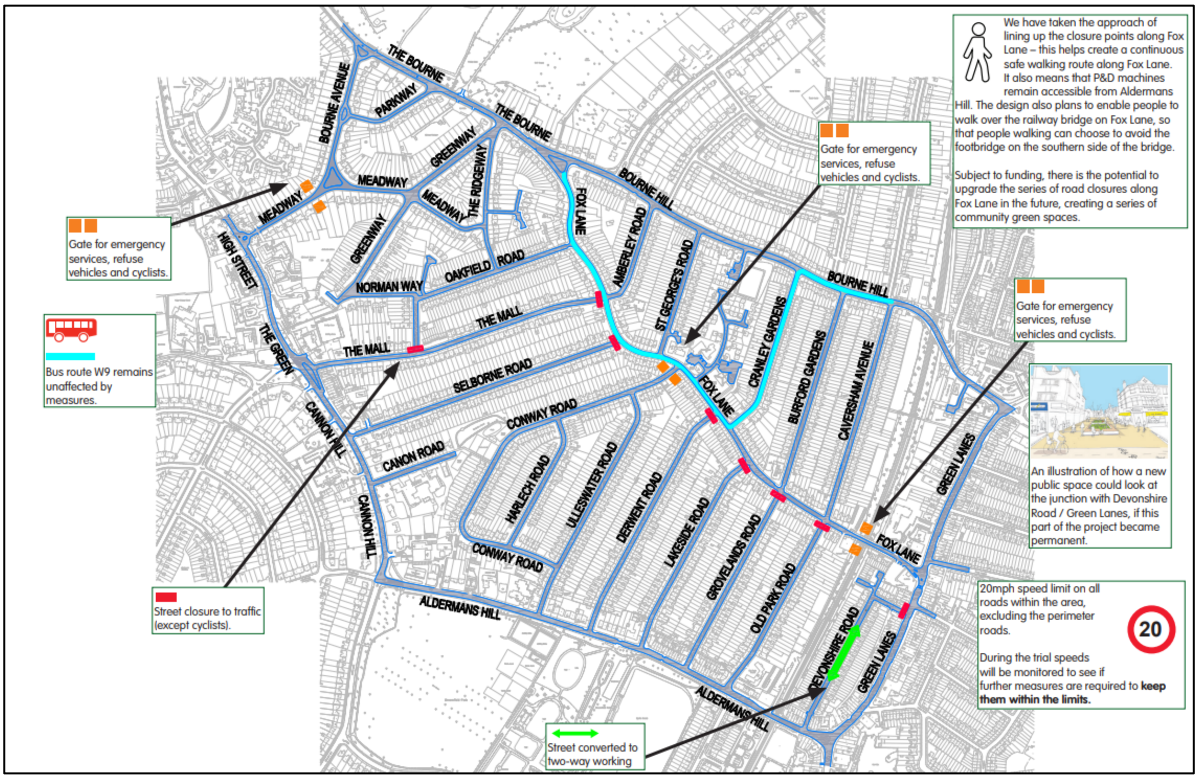

Figure 1: Fox Lane Quieter Neighbourhood Trial

Downloaded from LB Enfield's website.

1.8 Automatic Traffic Counts (ATCs) in March 2019 (prior to scheme implementation) and September 2021 (post-scheme implementation) were commissioned by LB Enfield at the locations shown in Figure 2; each data collection period lasted seven days. The raw traffic data were processed into the appropriate format for air quality modelling through adjustments to represent an Annual Average Daily Traffic (AADT) flow by NRP Ltd[1]. The changes in annual traffic flows have been considered directly attributable to the scheme and used to predict impacts on local air quality conditions associated with the scheme. Uncertainties associated with this process, as well as with other parameters that would have influenced measured traffic data (i.e. the Covid-19 pandemic), have, to some extent, been taken into account within the assessment and conclusions, as further discussed in this report. Further details regarding the locations of traffic counts, derivation of traffic data and transformations are provided in the standalone Post Scheme Monitoring Data Analysis Report completed by NRP Ltd.

1 NRP Ltd were appointed as traffic consultants for the scheme.

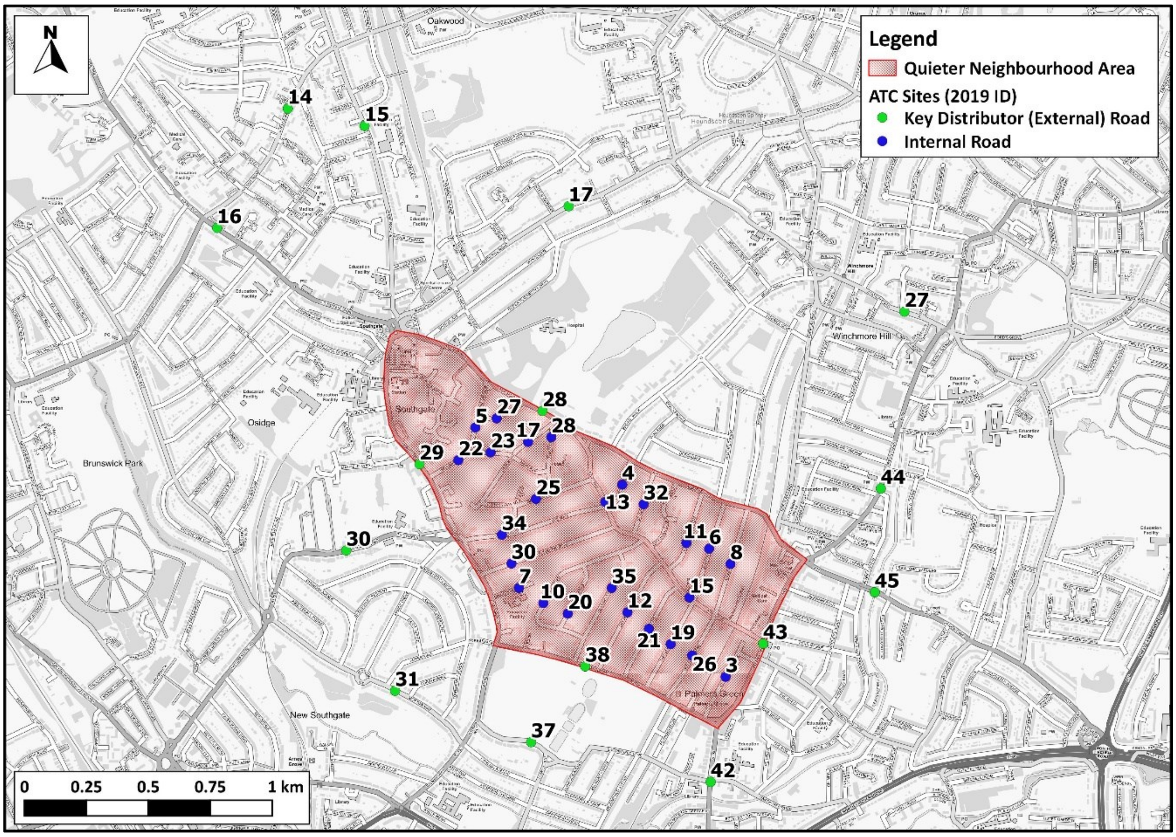

Figure 2: ATC Sites

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2 Policy Context and Assessment Criteria

2.1 All European legislation referred to in this report is written into UK law and remains in place, although there is uncertainty at this point in time as to who will enforce the requirements of some of this legislation.

Air Quality Strategy

2.2 The Air Quality Strategy (Defra, 2007) published by the Department for Environment, Food, and Rural Affairs (Defra) and Devolved Administrations, provides the policy framework for air quality management and assessment in the UK. It provides air quality standards and objectives for key air pollutants, which are designed to protect human health and the environment. It also sets out how the different sectors: industry, transport and local government, can contribute to achieving the air quality objectives. Local authorities are seen to play a particularly important role. The strategy describes the Local Air Quality Management (LAQM) regime that has been established, whereby every authority has to carry out regular reviews and assessments of air quality in its area to identify whether the objectives have been, or will be, achieved at relevant locations, by the applicable date. If this is not the case, the authority must declare an Air Quality Management Area (AQMA), and prepare an action plan which identifies appropriate measures that will be introduced in pursuit of the objectives.

Clean Air Strategy 2019

2.3 The Clean Air Strategy (Defra, 2019) sets out a wide range of actions by which the UK Government will seek to reduce pollutant emissions and improve air quality. Actions are targeted at four main sources of emissions: Transport, Domestic, Farming and Industry. At this stage, there is no straightforward way to take account of the expected future benefits to air quality within this assessment.

Reducing Emissions from Road Transport: Road to Zero Strategy

2.4 The Office for Low Emission Vehicles (OLEV) and Department for Transport (DfT) published a Policy Paper (DfT, 2018) in July 2018 outlining how the government will support the transition to zero tailpipe emission road transport and reduce tailpipe emissions from conventional vehicles during the transition. This paper affirms the Government’s pledge to end the sale of new conventional petrol and diesel cars and vans by 2040, and states that the Government expects the majority of new cars and vans sold to be 100% zero tailpipe emission and all new cars and vans to have significant zero tailpipe emission capability by this year, and that by 2050 almost every car and van should have zero tailpipe emissions. It states that the Government wants to see at least 50%, and as many as 70%, of new car sales, and up to 40% of new van sales, being ultra-low emission by 2030.

2.5 The paper sets out a number of measures by which Government will support this transition, but is clear that Government expects this transition to be industry and consumer led. The Government has since announced that the phase-out date for the sale of new petrol and diesel cars and vans will be brought forward to 2030 and that all new cars and vans must be fully zero emission at the tailpipe from 2035. If these ambitions are realised then road traffic-related NOx emissions can be expected to reduce significantly over the coming decades, likely beyond the scale of reductions forecast in the tools utilised in carrying out this air quality assessment.

Planning Policy

National Policies

2.6 The National Planning Policy Framework (NPPF) (2021) sets out planning policy for England. It states that the purpose of the planning system is to contribute to the achievement of sustainable development, and that the planning system has three overarching objectives, one of which (Paragraph 8c) is an environmental objective:

"to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy".

2.7 To prevent unacceptable risks from air pollution, Paragraph 174 of the NPPF states that:

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

2.8 Paragraph 185 states:

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

2.9 More specifically on air quality, Paragraph 186 makes clear 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".

2.10 The NPPF is supported by Planning Practice Guidance (PPG) (Ministry of Housing, Communities & Local Government, 2019), which includes guiding principles on how planning can take account of the impacts of new development on air quality. The PPG states that:

"Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with Limit Values. It is important that the potential impact of new development on air quality is taken into account where the national assessment indicates that relevant limits have been exceeded or are near the limit, or where the need for emissions reductions has been identified".

2.11 Regarding plan-making, the PPG states:

"It is important to take into account air quality management areas, Clean Air Zones and other areas including sensitive habitats or designated sites of importance for biodiversity where there could be specific requirements or limitations on new development because of air quality".

2.12 The role of the local authorities through the LAQM regime is covered, with the PPG stating that a local authority Air Quality Action Plan "*identifies measures that will be introduced in pursuit of the objectives and can have implications for planning*".

London-Specific Policies

2.13 The key London-specific policies are summarised below, with more detail provided, where required, in Appendix A2.

The London Plan

2.14 The London Plan (GLA, 2021) sets out an integrated economic, environmental, transport and social framework for the development of London over the next 20-25 years. The key policy relating to air quality is Policy SI1 on *Improving air quality*, which includes the following supporting text:

*"An air quality positive approach is linked to other policies in the London Plan, such as **Healthy Streets**, energy masterplanning and green infrastructure."*

2.15 Policy D8 Public Realm recognises that:

"The specific balance between the different functions of any one space, such as its place-based activities, its function to facilitate movement and its ability to accommodate different uses of the kerbside, should be at the heart of how the space is designed and managed. The Mayor's Healthy Streets Approach explains how the design and management of streets can support a wide range of activities in the public realm as well as encourage and facilitate a shift to active travel."

2.16 Healthy Streets also has its own policy, T2, which states that:

"A Development proposals and Development Plans should deliver patterns of land use that facilitate residents making shorter, regular trips by walking or cycling.

B Development Plans should: 1) promote and demonstrate the application of the Mayor's Healthy Streets Approach to: improve health and reduce health inequalities; reduce car dominance, ownership and use, road danger, severance, vehicle emissions and noise; increase walking, cycling and public transport use; improve street safety, comfort, convenience and amenity; and support these outcomes through sensitively designed freight facilities. 2) identify opportunities to improve the balance of space given to people to dwell, walk, cycle, and travel on public transport and in essential vehicles, so space is used more efficiently and streets are greener and more pleasant."

London Environment Strategy

2.17 The London Environment Strategy was published in May 2018 (GLA, 2018b). The strategy considers air quality in Chapter 4; the Mayor's main objective is to create a *"zero emission London by 2050".* Policy 4.2.1 aims to *"reduce emissions from London's road transport network by phasing out fossil fuelled vehicles, prioritising action on diesel, and enabling Londoners to switch to more sustainable forms of transport".* An implementation plan for the strategy has also been published which sets out what the Mayor will do between 2018 and 2023 to help achieve the ambitions in the strategy.

Mayor's Transport Strategy

2.18 The Mayor's Transport Strategy (GLA, 2018a) sets out the Mayor's policies and proposals to reshape transport in London over the next two decades. The Strategy focuses on reducing car dependency and increasing active sustainable travel, with the aim of improving air quality and creating healthier streets.

2.19 The Strategy also outlines the "Healthy Streets Approach" providing ten evidence-based indicators to determine whether an individual street is an "*appealing location to walk, cycle and spend time*".

Air Quality Focus Areas

2.20 The Greater London Authority (GLA) has identified 183 air quality Focus Areas in London as part of the 2016 update to the London Atmospheric Emissions Inventory (LAEI). These are locations that not only exceed the European Union (EU) annual mean limit value for NO_2, but also have high levels of human exposure. They do not represent an exhaustive list of London's air quality hotspot locations, but locations where the GLA believes the problem to be most acute. They are also areas where the GLA considers there to be the most potential for air quality improvements and are, therefore, where the GLA and Transport for London (TfL) will focus actions to improve air quality. Three air quality Focus Areas are situated within the study area: 'Southgate Circus A111/A1004', 'Palmers Green junction Green Lane A105/Edge Lane A111' and 'A406 North Circular between Bowes Road and Great Cambridge', as shown on Figure 4.

Local Transport Plan

2.21 LB Enfield published its Transport Plan in 2019 (LB Enfield, 2019). It sets out how the Council will improve travel to, from and within the Borough, and forms the basis of the Council's third Local Implementation Plan. Objective O3 of the Plan is to *"monitor air quality and develop and deliver interventions which address local issues"*, whilst Objective O7 is to *"maintain and improve the transport network in Enfield including developing potential interventions"* with a view to *"provide an enhanced transport network and significantly enhanced streetscape environments with associated environmental (air quality and emission) benefits as well as health benefits"*. A series of actions have been defined under each of these objectives, including:

- *"Work with TfL to develop plans for appropriate emergency measures to be undertaken to reduce or restrict vehicle use when forecast or actual periods of very high air pollution occur, for example, to tackle non-essential vehicle use or engine idling;*
- *Reliable and resilient charging infrastructure to support uptake of electric vehicles with a focus on rapid and fast charging points in strategic locations;*
- *Reducing traffic volumes by encouraging mode shift from travelling by car to walking, cycling and public transport;*
- *Continue to make the pedestrian environment more accessible to people with buggies, pushchairs and those using wheelchairs; and*
- *Provide a low speed environment."*

Local Policies

2.22 The Core Strategy (LB Enfield, 2010) was adopted in November 2010, and within this there is one policy (Core Policy 32) that refers to pollution, stating that LB Enfield will:

"…work with its partners to minimise air, water, noise and light […]. In particular, new development will be required to improve air quality by reducing pollutant emissions and public exposure to pollution, particularly in areas identified as having poor air quality in the Air Quality Action Plan. Criteria for assessing applications will be set out in the Development Management Document. The area action plans, particularly the North Circular Area Action Plan, will consider how pollution can be reduced or successfully mitigated against at a local level…"

2.23 LB Enfield is currently working on their new Local Plan. A consultation document (LB Enfield, 2021) was published in June 2021. One of the strategic objectives is to *"ensure the delivery of a joined-up, liveable and inclusive public realm network by requiring development to improve its connectivity,* *legibility, permeability, accessibility and visual appearance. To make walking and cycling the natural choice by embedding the healthy streets approach into new developments."*

2.24 Strategic Policy SC1 states that:

"Proposals will be expected to contribute to healthy and active lifestyles and include measures to reduce health inequalities through the provision of:

a. access to sustainable modes of travel, including safe cycling routes, attractive walking route and easy access to public transport to reduce car dependency; […]

e. an inclusive development layout and public realm that considers the needs of all, including the older population and disabled people; and

f. active design principles which supports [sic] *wellbeing and greater physical movement as part of everyday routines."*

2.25 Strategic Policy ENV1 on Local Environmental Protection states that:

"New developments should contribute to the health and wellbeing of existing and future occupiers by mitigating the adverse negative impacts of noise and other pollution generating nuisances on the environment and on the quality of life of residents […]"

Air Quality Action Plans

National Air Quality Plan

2.26 Defra has produced an Air Quality Plan to tackle roadside NO_2 concentrations in the UK (Defra, 2017); a supplement to the 2017 Plan (Defra, 2018) was published in October 2018 and sets out the steps Government is taking in relation to a further 33 local authorities where shorter-term exceedances of the limit value were identified. Alongside a package of national measures, the 2017 Plan and the 2018 Supplement require those identified English Local Authorities (or the GLA in the case of London Authorities) to produce local action plans and/or feasibility studies. These plans and feasibility studies must have regard to measures to achieve the statutory limit values within the shortest possible time, which may include the implementation of a Clean Air Zone (CAZ). This assessment has principally been carried out in relation to the air quality objectives, rather than the EU limit values that are the focus of the Air Quality Plan.

Local Air Quality Action Plan

2.27 The LB Enfield Air Quality Action Plan (LB Enfield, 2012) sets out a series of measures by which they will seek to achieve the air quality objectives in their borough-wide AQMA. A series of measures concern transport, including Action 15 which targets the development of *"a high-quality network of*

'Greenway' cycle and walking routes using parks, open spaces, quiet traffic routes, and 20mph zones". The Air Quality Action Plan is currently being reviewed and updated.

Assessment Criteria

2.28 The Government has established a set of air quality standards and objectives to protect human health. The 'standards' are set as concentrations below which effects are unlikely even in sensitive population groups, or below which risks to public health would be exceedingly small. They are based purely upon the scientific and medical evidence of the effects of an individual pollutant. The 'objectives' set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of economic efficiency, practicability, technical feasibility and timescale. The objectives for use by local authorities are prescribed within the Air Quality (England) Regulations (2000) and the Air Quality (England) (Amendment) Regulations (2002).

2.29 The UK-wide objectives for NO_2 and PM_{10} were to have been achieved by 2005 and 2004 respectively, and continue to apply in all future years thereafter. The $PM_{2.5}$ objective was to be achieved by 2020. Measurements across the UK have shown that the 1-hour mean NO_2 objective is unlikely to be exceeded at roadside locations where the annual mean concentration is below 60 µg/m^3 (Defra, 2021). Measurements have also shown that the 24-hour mean PM_{10} objective could be exceeded at roadside locations where the annual mean concentration is above 32 µg/m^3.

2.30 The objectives apply at locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective. Defra explains where these objectives will apply in its LAQM Technical Guidance (Defra, 2021). The annual mean objectives for NO_2 and PM_{10} are considered to apply at the façades of residential properties, schools, hospitals etc.; they do not apply at hotels. The 24-hour mean objective for PM_{10} is considered to apply at the same locations as the annual mean objective, as well as in gardens of residential properties and at hotels. The 1-hour mean objective for NO_2 applies wherever members of the public might regularly spend 1-hour or more, including outdoor eating locations and pavements of busy shopping streets.

2.31 EU Directive 2008/50/EC (The European Parliament and the Council of the European Union, 2008) sets limit values for NO_2, PM_{10} and $PM_{2.5}$, and is implemented in UK law through the Air Quality Standards Regulations (2010). The limit values for NO_2 are the same numerical concentrations as the UK objectives, but achievement of these values is a national obligation rather than a local one. In the UK, only monitoring and modelling carried out by UK Central Government meets the specification required to assess compliance with the limit values. Central Government does not normally recognise local authority monitoring or local modelling studies when determining the likelihood of the limit values being exceeded, unless such studies have been audited and approved by Defra and DfT's Joint Air Quality Unit (JAQU).

2.32 The relevant air quality criteria for this assessment are provided in Table 1.

Table 1: Air Quality Criteria for NO_2, PM_{10} and $PM_{2.5}$

Pollutant	Time Period	Objective
NO_2	1-hour Mean	200 µg/m³ not to be exceeded more than 18 times a year
	Annual Mean	40 µg/m³
Fine Particles (PM_{10})	24-hour Mean	50 µg/m³ not to be exceeded more than 35 times a year
	Annual Mean	40 µg/m³ [a]
Fine Particles ($PM_{2.5}$) [b]	Annual Mean	25 µg/m³

[a] A proxy value of 32 µg/m³ as an annual mean is used in this assessment to assess the likelihood of the 24-hour mean PM_{10} objective being exceeded. Measurements have shown that, above this concentration, exceedances of the 24-hour mean PM_{10} objective are possible (Defra, 2021).

[b] The $PM_{2.5}$ objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

Descriptors for Air Quality Impacts and Assessment of Significance

2.33 There is no official guidance in the UK in relation to development control on how to describe air quality impacts, nor how to assess their significance. The approach developed jointly by Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM)[2] (Moorcroft and Barrowcliffe et al, 2017) has therefore been used. This includes defining descriptors of the impacts at individual receptors, which take account of the percentage change in concentrations relative to the relevant air quality objective, rounded to the nearest whole number, and the absolute concentration relative to the objective. The overall significance of the air quality impacts is determined using professional judgement, taking account of the impact descriptors. Full details of the EPUK/IAQM approach are provided in Appendix A3. The approach includes elements of professional judgement, and the experience of the consultants preparing the report is set out in Appendix A4.

[2] The IAQM is the professional body for air quality practitioners in the UK.

3 Assessment Approach

Proposed Scheme

3.1 The re-distribution of traffic on local roads associated with the scheme may affect air pollutant concentrations that local residents and users are exposed to. The impacts of the proposed scheme on air quality have thus been assessed using detailed dispersion modelling and traffic data obtained by the commissioned surveys prior to, and after, the implementation of the scheme.

Study Area

3.2 The study area covers all internal roads affected by the implementation of the scheme. The study area also incorporates peripheral roads where traffic volumes may change as a result of the scheme. Only roads where traffic counts were undertaken have been included so as not to mix sources of data.

Assessment Scenarios

3.3 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been predicted for the following scenarios:

- a base year (2019) for model verification purposes;
- without the scheme operating in 2021; and
- with the scheme operating in 2021.

Modelling Methodology

3.4 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been predicted using the ADMS-Roads dispersion model. Details of the model inputs, assumptions and the verification are provided in Appendix A5. Where assumptions have been made, a realistic worst-case approach has been adopted.

Traffic Data and Emissions Calculation

3.5 Traffic data for the assessment have been informed by 40 traffic counts commissioned by LB Enfield, at the locations shown in Figure 2.

3.6 The dispersion model used to predict annual mean pollutant concentrations throughout the study area uses traffic and meteorological data that are defined for a given calendar year, in order for the outputs to be compared to the air quality objectives[3]. Traffic data for each of the 40 traffic counts have, therefore, been provided by NRP Ltd as AADT flows, the format required for input into the dispersion model, for the 2019 baseline and 2021 with scheme scenarios.

3 In the case of this study, the annual mean objectives have been considered.

3.7 For the 2019 baseline and 2021 without scheme scenarios, the data collected in March 2019 were used, whilst data collected in September 2021 were used for the 2021 with scheme scenario. Due to the Covid pandemic, there is no projected baseline traffic growth between 2019 and 2021, thus data from March 2019 were considered appropriate for use as the 2021 without scheme scenario.

3.8 The traffic data have been annualised, a process which addresses the seasonal variations in traffic, and how this could have impacted the recorded number of vehicles over the two seven-day traffic counts undertaken by the LB Enfield. In this instance, the traffic flows in September 2021 would also have been affected by residual impacts of the Covid-19 pandemic on travel activities.

3.9 To account for changes in traffic flows as a result of Covid-19, NRP Ltd uplifted the Automatic Traffic Count (ATC data) as follows:

- Data from January 2019 to October 2021 were provided for a TfL count site located away from the area which recorded continuous traffic data;
- The annualisation factors for the pre-implementation (11th – 17th March 2019 – internal roads) and (21st – 27th March 2019 – external roads) and post-implementation (21st – 24th September 2021) surveys were calculated using the specific days of the surveys and the average of these dates for 2019 were compared to the yearly average for 2019 to derive an annualisation factor; and
- A factor of 0.8% (internal roads) and -0.4% (external roads) for 2019 (pre-scheme) and 0.004% for 2021 (post-scheme) was applied to the data for the Fox Lane AADTs.

3.10 In effect, the 2021 post-scheme traffic data were adjusted to reflect traffic flows in 2019.

3.11 The ATCs provide data every 15-minutes on the number of each vehicle type (e.g. cars, motorcycles, heavy duty vehicles) for each day of the week, as well as vehicle speeds. The measured distribution of traffic throughout the day (‘diurnal profiles’) on each specific road were then used within the dispersion model.

3.12 Vehicle emissions have been derived using Defra’s Emission Factor Toolkit (EFT) (v10.1)[4] (Defra, 2022). Further details about model input, traffic data and how diurnal profiles have been derived are presented in Appendix A5.

Sensitive Locations

3.13 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been predicted at a number of high sensitivity receptors (e.g. residential properties) within and in close proximity to the study area. Receptors have been

4 In November 2021, Defra released EFT v11.0. For the years and pollutants considered in this assessment, emissions are the same in EFT v11.0 and EFT v10.1. This update to the EFT thus has no effect on the assessment.

identified to represent a range of exposure, including the worst-case locations (these being at the façades of the residential properties closest to affected road links). When selecting receptors, particular attention has been paid to assessing impacts close to junctions, where traffic may become congested and where there is a combined effect of several road links, and alongside those roads where changes in traffic volumes are most significant.

3.14 A number of existing residential properties have been identified as receptors for the assessment. These locations are shown in Figure 3. In addition, concentrations have been modelled at LB Enfield diffusion tube monitoring sites ‘Enfield 2’ and ‘Enfield 4’ in order to verify the model outputs (see Appendix A5 for verification method).

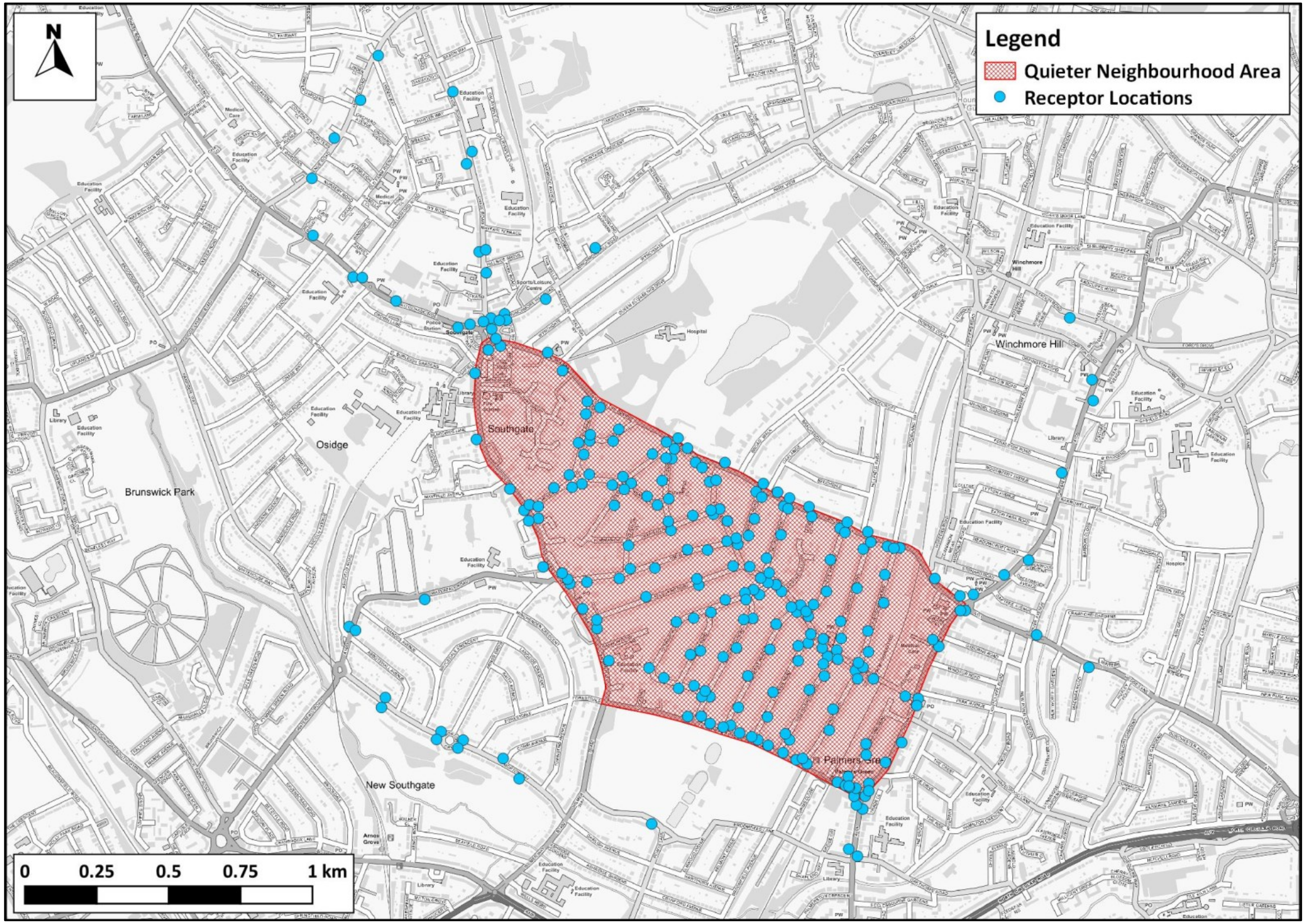

Figure 3: Quieter Neighbourhood Area and Receptor Locations

Uncertainty in Road Traffic Modelling Predictions

3.15 There are many components that contribute to the uncertainty of modelling predictions. The road traffic emissions dispersion model used in this assessment is dependent upon the traffic data that have been input, which will have inherent uncertainties associated with them, as discussed in Paragraphs 3.5 to 3.10. The annualisation process to 2019 is based on traffic flows recorded prior to the Covid-19 pandemic, and thus 2019 AADT flows can be expected to be representative of 'typical' flows on modelled roads. As described in Paragraph 3.9, the adjustment of 2021 flows to represent 2019-equivalent flows (pre- and post- implementation of the scheme) has, therefore, addressed, as far as possible, the uncertainties relating to the irregular traffic flows associated with the Covid-19 pandemic.

3.16 During September 2021, the UK experienced a fuel supply shortage which coincided with the deployment of the ATCs. Following analysis by NRP Ltd of the traffic count data for each site, on each day of the September week, it was identified that the fuel crisis had affected traffic flows after Friday 24th September. To generate flow profiles for Saturday, Sunday and Monday, NRP Ltd supplemented the September ATC data with data collected at the same sites in July 2021. As such, traffic data affected by the fuel crisis were discounted from the traffic data analysis.

3.17 There are then additional uncertainties, as models, by their nature simulate real-world conditions through a series of algorithms.

3.18 An important stage in the process is model verification, which involves comparing the model output with measured concentrations. Because the model has been verified and adjusted, there can be reasonable confidence in the prediction of base year (2019) concentrations.

3.19 Predicting pollutant concentrations in a future year[5] will always be subject to greater uncertainty. For obvious reasons, the model cannot be verified in the future, and it is necessary to rely on a series of projections provided by DfT and Defra as to what will happen to traffic volumes, background pollutant concentrations and vehicle emissions. Historic versions of Defra's EFT tended to over-state emissions reductions into the future. However, analyses of the most recent versions of Defra's EFT carried out by AQC (2020a; 2020b) suggest that, on balance, these versions are unlikely to over-state the rate at which NOx emissions decline in the future at an 'average' site in the UK. In practice, the balance of evidence suggests that NOx concentrations are most likely to decline more quickly in the future, on average, than predicted by the current EFT, especially against a base year of 2016 or later. Using EFT v10.1 for future-year forecasts in this report thus provides a robust assessment, given that the model has been verified against measurements made in 2019.

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5 For the purposes of this assessment, the phrase 'future year' is used to describe a scenario in which air quality monitoring data are not yet available. There were no published 2021 annual mean monitoring data at the time of this report, hence, 2021 is described as a 'future year'.

3.20 There are inherent uncertainties within the modelling, including the traffic data as primary input, and as such the results should not be considered exact, but represent the best possible estimates, using the best available data available at the time this report was undertaken.

4 Baseline Conditions

Existing Conditions

4.1 Information on existing air quality has been obtained by collating the results of air quality monitoring carried out by LB Enfield within the study area.

4.2 Background concentrations have been defined using the national pollution maps published by Defra (2022). These cover the whole country on a 1x1 km grid.

Air Quality Management Area and Focus Areas

4.3 LB Enfield declared a borough-wide AQMA in 2001 for exceedances of the annual mean NO_2 and 24-hour PM_{10} objectives; the Fox Lane Quieter Neighbourhood Scheme therefore lies within this AQMA.

4.4 There are also three air quality Focus Areas situated within the study area, shown in Figure 4:

- ‘Southgate Circus A111/A1004’;
- ‘Palmers Green junction Green Lane A105/Hedge Lane A111’; and
- ‘A406 North Circular between Bowes Road and Great Cambridge’.

4.5 As explained in Paragraph 2.20, these Focus Areas were last defined in 2016, and correspond to areas where the EU annual mean limit value for NO_2 is exceeded, and where there are high levels of human exposure.

4.6 All receptors selected for the assessment are located within the LB Enfield AQMA, whilst 15 receptors are located within the nearby air quality Focus Areas.

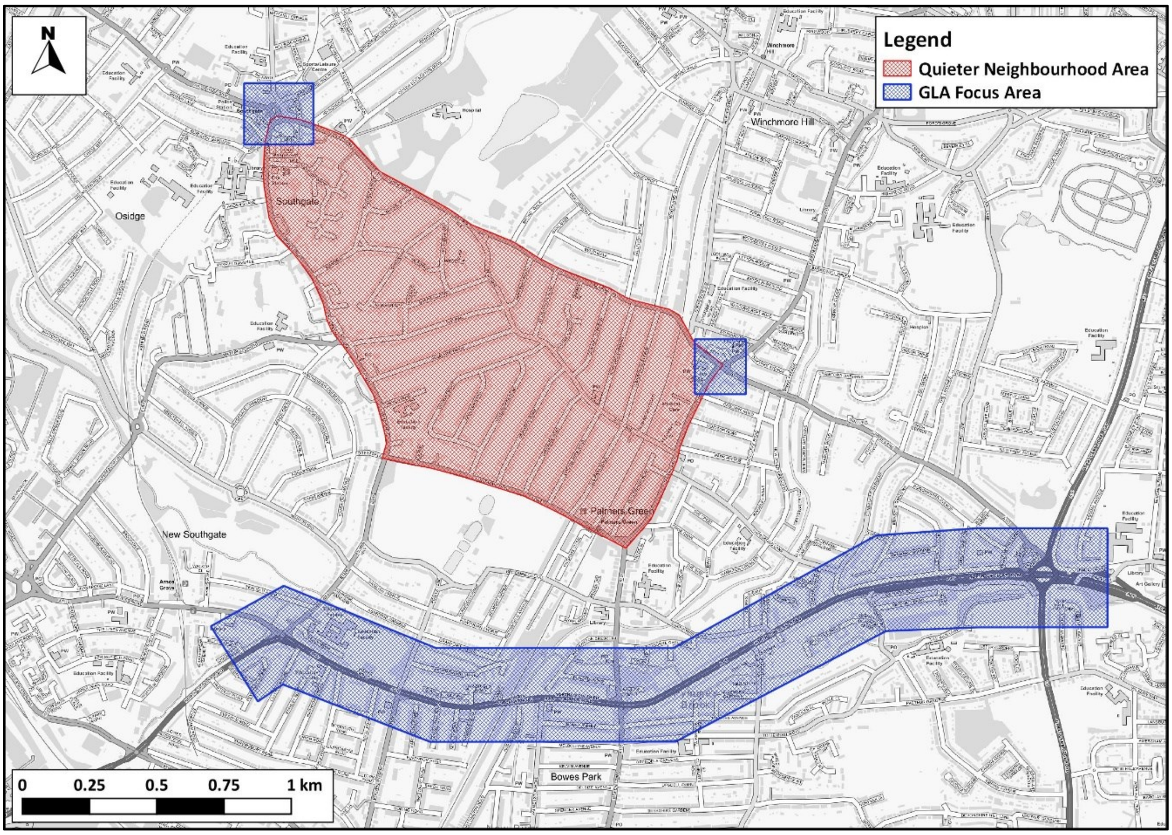

Figure 4: Quieter Neighbourhood Area and Air Quality Focus Areas

Local Air Quality Monitoring

4.7 LB Enfield measures NO_2 concentrations at two locations within the consultation area using diffusion tubes; one situated on Winchmore Hill Road (Enfield 2) and one situated at the junction of Aldermans Hill and Devonshire Road (Enfield 4). The diffusion tubes are prepared and analysed by Socotec (using the 50% TEA in acetone method).

4.8 In 2021, LB Enfield installed two further diffusion tubes within the study area, along Fox Lane and Conway Road, shown in Figure 5. There are currently no data for a full calendar year; therefore, it is not possible to present an annual mean concentration for either site.

4.9 Annual mean results for the years 2014 to 2019 are summarised in Table 2 for Enfield 2 and Enfield 4, whilst the monitoring locations of all four sites are shown in Figure 5. The monitoring data have been taken from 2019 LB Enfield Annual Status Report (ASR) (LB Enfield, 2020).

Table 2: Summary of Annual Mean NO_2 Monitoring ($\mu g/m^3$) [a, b]

Site ID	Site Type	Location	2014	2015	2016	2017	2018	2019
Enfield 2	Industrial	Centenary Road	29.9	25.9	32.1	30.0	-	-
	Kerbside	Winchmore Hill Road	-	-	-	-	36.9	37.1
Enfield 4	Urban Background	Conway Road	21.6	17.9	22.4	20.8	-	-
	Roadside	Devonshire Road	-	-	-	-	30.2	30.1
Objective			**40**					

[a] Data for 2020 have not been presented owing to the Covid-19 pandemic.

[b] Both sites were moved in January 2018.

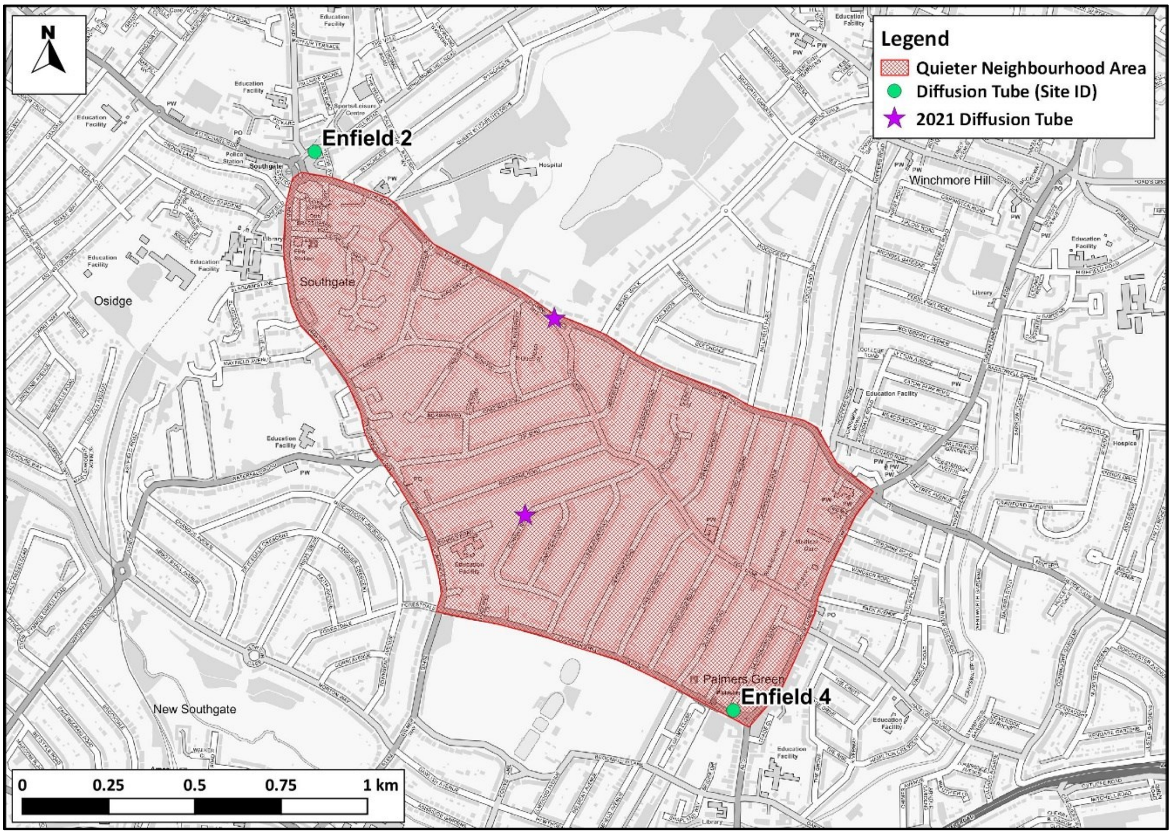

Figure 5: Quieter Neighbourhood Area and Current Monitoring Locations

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4.10 Monitoring indicates that measured annual mean NO_2 concentrations have remained below the objective at both monitoring sites over the past six years. As the locations of the monitoring sites changed in 2018, it is not possible to derive any trend in the monitoring data. Measured concentrations are also well below 60 $\mu g/m^3$, indicating that an exceedance of the 1-hour mean NO_2 objective is unlikely (Defra, 2021).

4.11 There are no monitoring sites within the study area which monitor PM_{10} concentrations; however, LB Enfield has concluded that there have been no recorded exceedances in its borough of the annual mean or 24-hour mean PM_{10} objectives over the past six years (LB Enfield, 2020). As such, it is reasonable to assume that concentrations will be below the objectives in the study area. Concentrations of $PM_{2.5}$ are not currently monitored in LB Enfield.

Background Concentrations

4.12 Estimated background concentrations in the study area have been determined for 2019 and 2021 using Defra's background maps (Defra, 2022). The NO_2 background maps for 2019 have been calibrated against local measurements made at the Enfield 6 urban background site, located at Hadley Wood Primary School and shown in Figure 6 below.

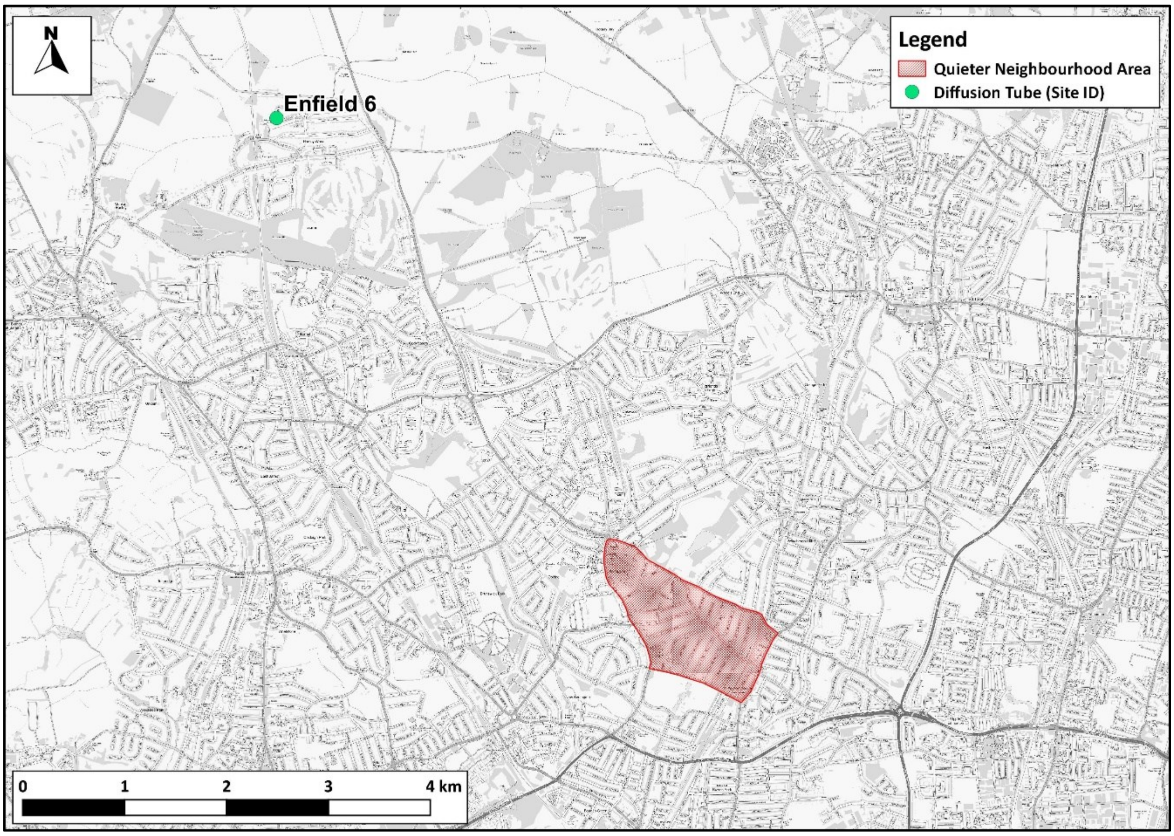

Figure 6: Location of Urban Background Monitoring Site Enfield 6

4.13 The measured NO_2 concentration at this site in 2019 was 14.0 μg/m^3, while the mapped background for the grid square within which it lies was 14.3 μg/m^3. All mapped background NO_2 concentrations have therefore been calibrated by applying a factor of 0.97. No adjustments have been made to the

PM_{10} and $PM_{2.5}$ maps. The background concentrations are set out in Table 3 and are all well below the objectives.

4.14 The "in-square" contribution of minor roads has been removed from the mapped background concentrations throughout the study area using Defra's sector removal tool. This is done to avoid double-counting of emissions, given that the emissions from minor roads have been explicitly modelled.

Table 3: Estimated Annual Mean Background Pollutant Concentrations in 2019 and 2021 (µg/m^3) [a]

Year	NO_2	PM_{10}	$PM_{2.5}$
2019	16.7 – 21.9	16.1 – 18.7	10.9 – 12.4
2021	15.3 – 19.8	15.6 – 18.1	10.5 – 12.0
Objectives	**40**	**40**	**25 [b]**

[a] The range of values is for the different 1x1 km grid squares covering the study area.

[b] The $PM_{2.5}$ objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

Baseline Dispersion Model Results

4.15 Baseline concentrations of NO_2 have been modelled at each of the selected receptor locations (see Figure 3 for receptor locations). The annual mean NO_2 results cover existing (2019) baseline conditions and are presented on Figure 7. The modelled road components of nitrogen oxides have remained unadjusted from those predicted by the model based on a comparison with local measurements (see Appendix A5 for the verification methodology).

4.16 The predicted annual mean concentrations of NO_2 are below the objective at all receptors in 2019. Furthermore, as the annual mean concentrations are below 60 µg/m^3, it is unlikely that the 1-hour mean NO_2 objective will have been exceeded (see Paragraph 2.29).

4.17 Results for annual mean PM_{10} and $PM_{2.5}$ concentrations in 2019 are presented in Appendix A1, and are predicted to be well below the respective objectives throughout the study area. Additionally, as the annual mean PM_{10} concentrations were below 32 µg/m^3, it is unlikely that the 24-hour mean PM_{10} objective will have been exceeded (see Paragraph 2.29).

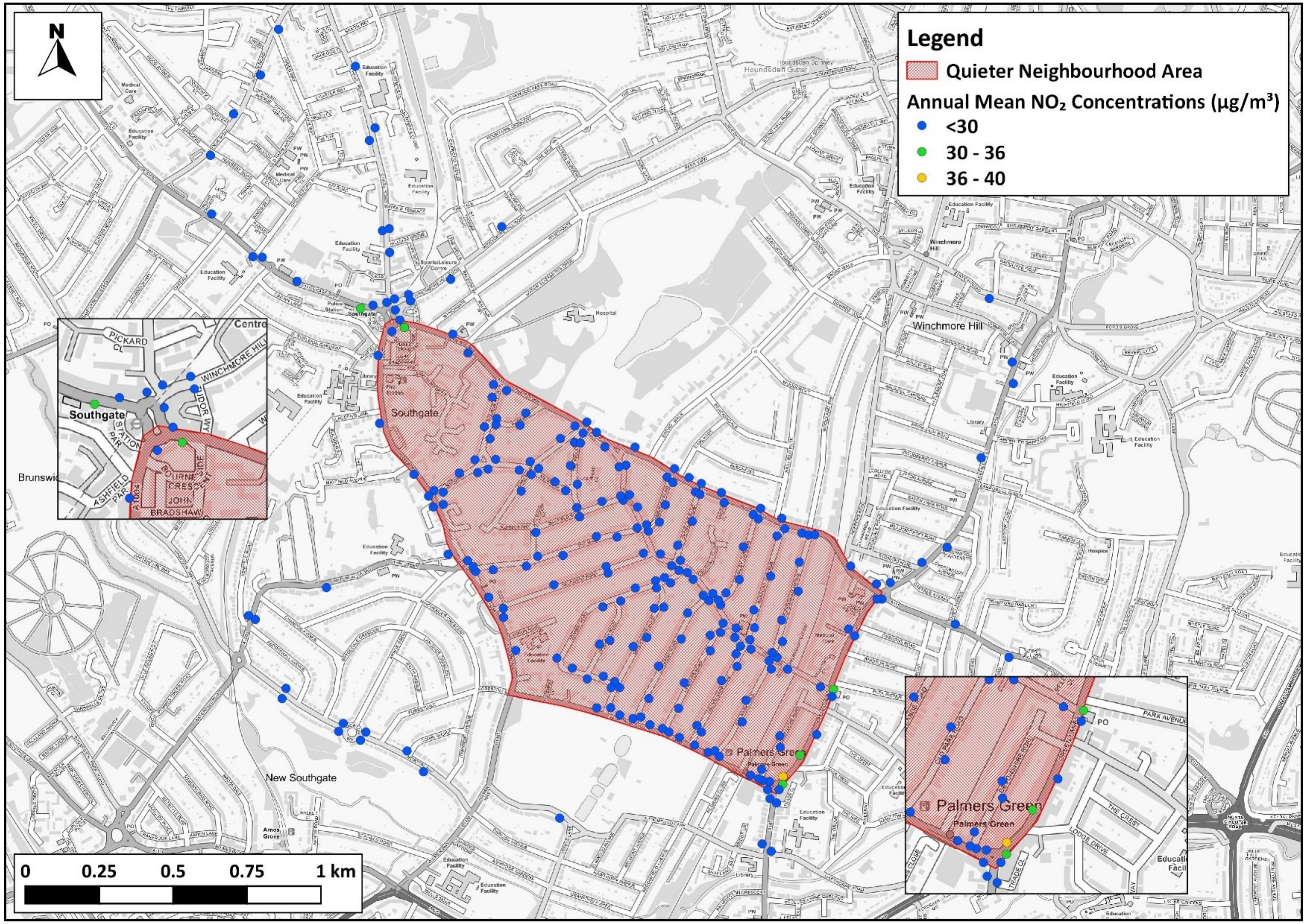

Figure 7: Predicted Annual Mean NO_2 Concentrations in the Study Area in the 2019 Baseline Scenario (µg/m^3)

5 Scheme Impact Assessment

5.1 This section presents the predicted changes in 2021 annual mean pollutant concentrations as a result of the scheme. The full suite of results, including total concentrations, percentage changes and associated impact descriptors, are presented in Appendix A1.

5.2 The predicted changes in annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations at receptors are presented in Figure 8, Figure 9 and Figure 10, respectively, with decreases in concentrations marked by blue/green shaded points, and increases displayed as orange/red shaded points.

5.3 The modelled data show that the implementation of the Quieter Neighbourhood Scheme led to both slight decreases and increases in annual mean NO_2 concentrations, ranging between -2.9 μg/m^3 and +1.7 μg/m^3, as shown on Figure 8. Such changes correspond to -7.3 % and +4.3 % of the annual mean objective value (40 μg/m^3), at most[6]. At many locations (65% of all assessed receptors), the absolute changes were small (±1% of the objective). Increases in concentrations occurred on the external distributor roads, whilst reductions in concentrations were predicted on the internal residential streets.

5.4 While NO_2 concentrations are heavily influenced by vehicle emissions, PM concentrations are influenced by a wider range of sources, and thus are less influenced by vehicular emissions. Therefore, changes in PM_{10} and $PM_{2.5}$ concentrations follow a similar pattern to that of NO_2, but the changes are smaller, with predicted changes in concentrations ranging between -0.5 and +0.3 μg/m^3 for PM_{10}, and between -0.3 and +0.2 μg/m^3 for $PM_{2.5}$. Such changes correspond to -1.6 % and +0.9% of the annual mean PM_{10} criterion (32 μg/m^3), and -1.2 % and +0.8 % of the $PM_{2.5}$ objective value (25 μg/m^3).

5.5 Using industry standard guidance (Moorcroft and Barrowcliffe et al, 2017), to determine the air quality impacts and effects at receptors, absolute changes in pollutant concentrations are considered in conjunction with the associated predicted long-term concentrations (see Paragraph 2.33). The full results are presented in Appendix A1, and show that in 2021, the predicted changes in annual mean PM_{10} and $PM_{2.5}$ pollutant concentrations result in *'negligible'* impacts at all receptors within the study area. With regards to annual mean NO_2 concentrations, impacts are described as '*negligible*' at most receptors, with the exception of two receptors (Receptors 18 and 19, located along Green Lanes, to the southeast of the scheme, close to the junction with Aldermans Hill) where '*slight adverse'* impacts are predicted and at two receptors (Receptors 61 and 138, located at the junctions of Meadway/High Street and Fox Lane/Amberley Road, respectively), '*slight beneficial*' impacts are predicted.

6 Calculated by dividing the change in NO_2 concentration by the annual mean objective value of 40 μg/m^3; e.g. (2.9 / 40) x 100 = 7.3% (when rounded).

5.6 Overall, whilst the scheme leads to changes in pollutant concentrations, the scale of these changes in relation to total predicted concentrations are sufficiently small to lead to no significant effect, neither beneficial nor adverse.

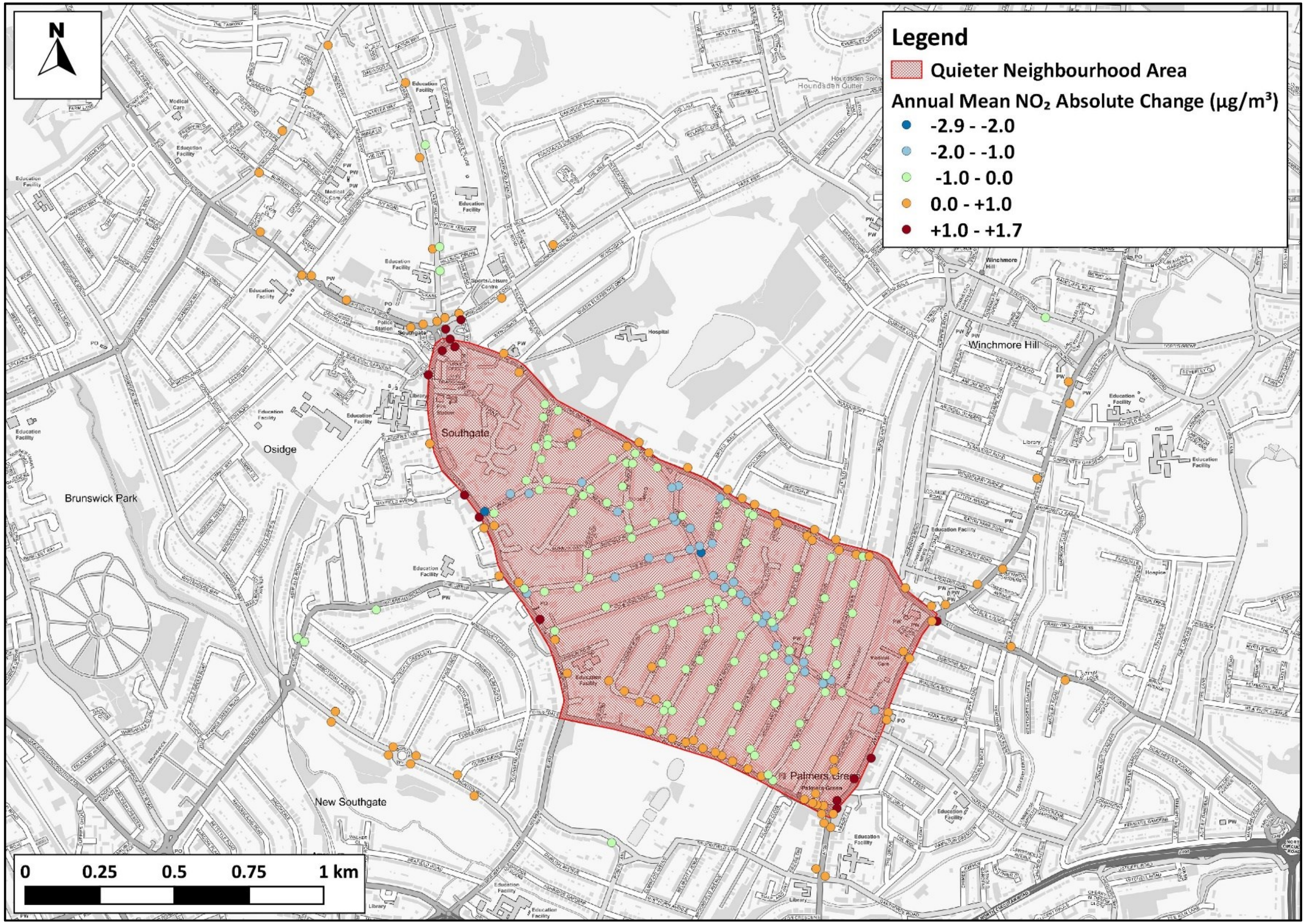

Figure 8: Predicted Absolute Changes in Annual Mean NO_2 Concentrations with Quieter Neighbourhood Scheme in 2021 (µg/m³)

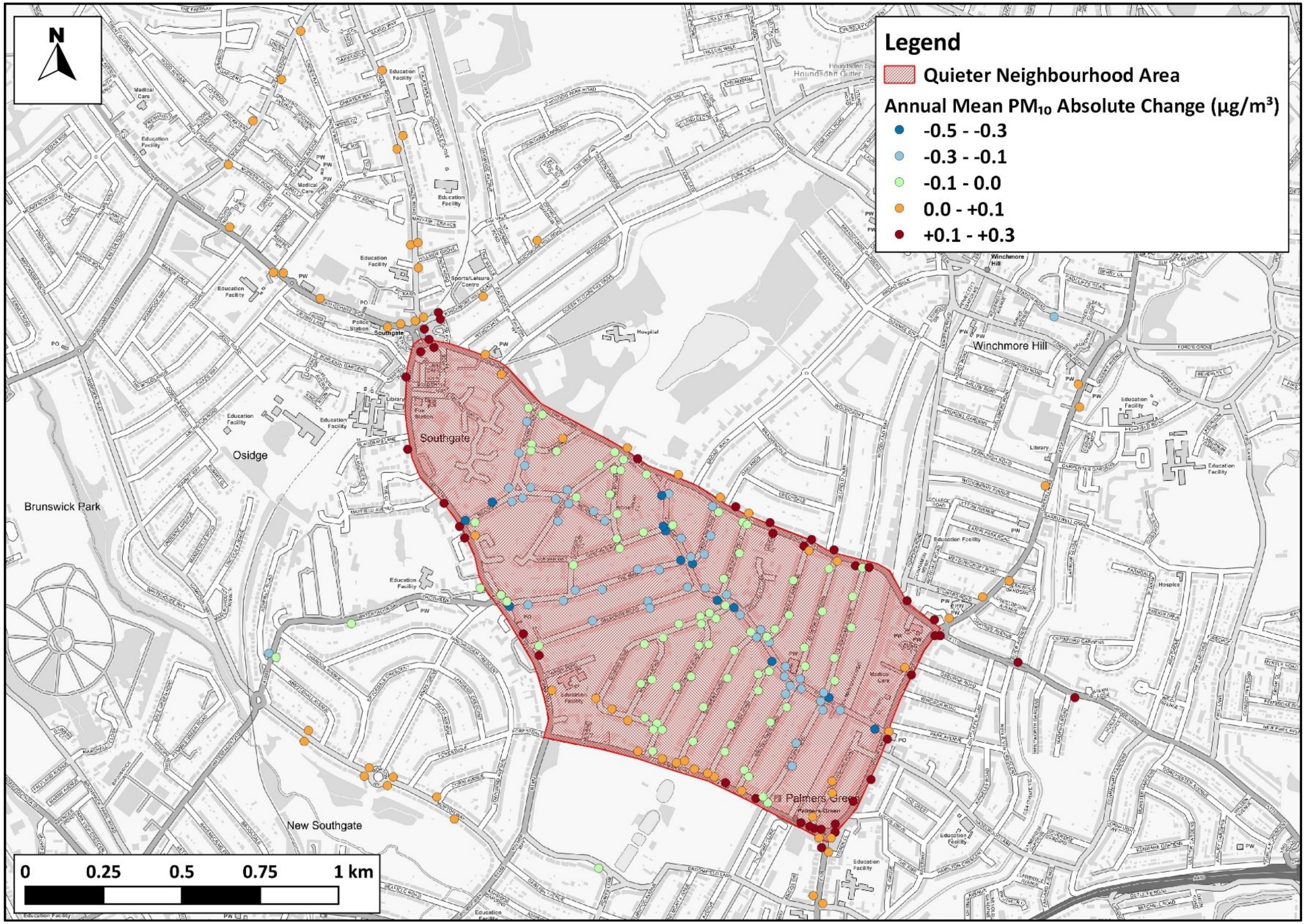

Figure 9: Predicted Absolute Changes in Annual Mean PM_{10} Concentrations with Quieter Neighbourhood Scheme in 2021 (µg/m^3)

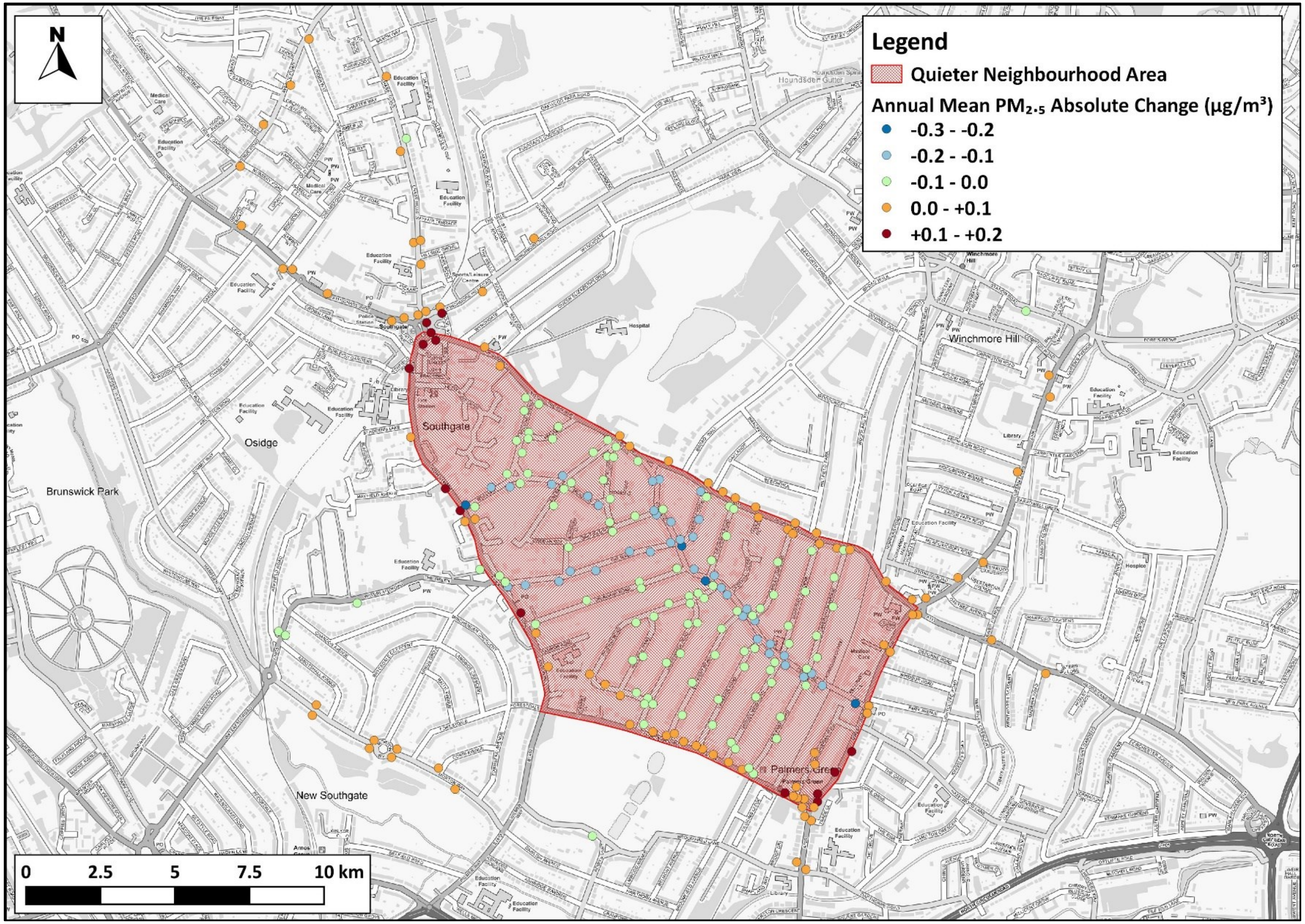

Figure 10: Predicted Changes in Annual Mean $PM_{2.5}$ Concentrations with Quieter Neighbourhood Scheme in 2021 (µg/m³)

6 Summary and Conclusions

6.1 The assessment has considered the local air quality impacts of the Fox Lane Area Quieter Neighbourhood Scheme. Traffic flows were measured over two separate periods in March 2019 (prior to scheme implementation) and September 2021 (post-scheme implementation); with each collection period lasting seven days. These have been used to estimate the changes in traffic attributable to the scheme. Dispersion modelling has then been used to predict the effect that these changes in traffic will have had on local air quality.

6.2 Annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ in 2019 (baseline scenario) at all receptors were below the objectives set by the UK Government.

6.3 Implementation of the Quieter Neighbourhood Scheme is predicted to have led to both slight decreases and increases in NO_2 concentrations, correlating with the observed changes in traffic flows with the scheme in operation. Changes to PM_{10} and $PM_{2.5}$ concentrations follow a similar pattern to those of NO_2, but the changes are smaller.

6.4 The scales of the changes to pollutant concentrations are described by industry standard guidance as *negligible* at all receptors for PM_{10} and $PM_{2.5}$ concentrations, and most receptors for NO_2 concentrations, with the exception of two locations along Green Lanes where *slight adverse* impacts are predicted, and two locations at the junctions of Meadway/High Street and Fox Lane/Amberley Road, where *slight beneficial* impacts are predicted.

6.5 Overall, taking into consideration the increases and decreases in concentrations, the results of this assessment are not considered to represent a significant effect on local air quality. There are inherent uncertainties within the modelling, including the traffic data as primary input, and as such, the results should not be considered exact, but represent the best possible estimates, using the best available data at the time this modelling study was undertaken.

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8 Glossary

AADT	Annual Average Daily Traffic
ADMS-Roads	Atmospheric Dispersion Modelling System model for Roads
AQC	Air Quality Consultants
AQAL	Air Quality Assessment Level
AQMA	Air Quality Management Area
ATC	Automatic Traffic Count
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
EFT	Emission Factor Toolkit
EPUK	Environmental Protection UK
Exceedance	A period of time when the concentration of a pollutant is greater than the appropriate air quality objective. This applies to specified locations with relevant exposure
HDV	Heavy Duty Vehicles (> 3.5 tonnes)
HMSO	Her Majesty's Stationery Office
IAQM	Institute of Air Quality Management
kph	Kilometres Per hour
LAQM	Local Air Quality Management
LB	London Borough
LDV	Light Duty Vehicles (<3.5 tonnes)
$\mu g/m^3$	Microgrammes per cubic metre
NO	Nitric oxide
NO_2	Nitrogen dioxide
NOx	Nitrogen oxides (taken to be NO_2 + NO)
Objectives	A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date. There are also vegetation-based objectives for sulphur dioxide and nitrogen oxides

PM_{10}	Small airborne particles, more specifically particulate matter less than 10 micrometres in aerodynamic diameter
$PM_{2.5}$	Small airborne particles less than 2.5 micrometres in aerodynamic diameter
PPG	Planning Practice Guidance
Receptors	Receptors correspond to OS grid coordinates in the dispersion model, to allow for pollutant concentrations to be predicted at a specific point within the study area. They are representative of 'physical' locations of relevant exposure to the air quality objectives, such as residential properties, school, hospitals etc. in the study area.
Standards	A nationally defined set of concentrations for nine pollutants below which health effects do not occur or are minimal
TEA	Triethanolamine – used to absorb nitrogen dioxide

9 Appendices

A1 Modelling Results

A1.1 This section sets out the full 2019 baseline and 2021 'Without Scheme' and 'With Scheme' results for NO_2, PM_{10} and $PM_{2.5}$. The predicted impacts at each receptor are also described using the impact descriptors set out in Table A3.1. Receptor locations and IDs are set out in Figure A1.1 to Figure A1.4.

Table A1.1: Predicted Impacts on Annual Mean NO_2 Concentrations

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
1	21.6	19.5	18.9	-0.6	-1	-	Negligible
2	22.0	19.8	20.0	0.1	0	N/A	Negligible
3	21.3	19.2	19.3	0.1	0	N/A	Negligible
4	23.5	21.1	21.3	0.2	0	N/A	Negligible
5	26.0	23.1	23.4	0.3	1	+	Negligible
6	25.2	22.4	22.7	0.3	1	+	Negligible
7	25.7	22.8	23.3	0.5	1	+	Negligible
8	29.0	25.6	26.9	1.2	3	+	Negligible
9	26.6	23.8	24.3	0.5	1	+	Negligible
10	27.2	24.3	24.8	0.5	1	+	Negligible
11	28.8	25.4	26.3	1.0	2	+	Negligible
12	24.3	21.7	22.3	0.6	1	+	Negligible
13	26.2	23.3	24.2	0.9	2	+	Negligible
14	30.6	26.8	27.6	0.7	2	+	Negligible
15	29.5	25.9	26.7	0.8	2	+	Negligible
16	28.9	25.5	26.8	1.3	3	+	Negligible
17	33.1	28.9	30.2	1.3	3	+	Negligible
18	37.3	32.3	34.1	1.7	4	+	Slight Adverse
19	34.7	30.2	31.7	1.5	4	+	Slight Adverse
20	23.5	21.1	21.2	0.2	0	N/A	Negligible
21	28.9	25.5	26.1	0.6	2	+	Negligible
22	25.8	22.9	23.3	0.3	1	+	Negligible
23	25.2	22.5	22.7	0.3	1	+	Negligible

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
24	29.4	25.9	26.6	0.7	2	+	Negligible
25	26.4	23.5	24.1	0.7	2	+	Negligible
26	26.8	23.8	24.5	0.7	2	+	Negligible
27	28.7	25.3	26.3	1.0	3	+	Negligible
28	28.0	24.8	25.7	0.9	2	+	Negligible
29	28.3	25.1	26.0	0.9	2	+	Negligible
30	23.6	21.1	20.7	-0.4	-1	-	Negligible
31	26.1	23.3	23.8	0.6	1	+	Negligible
32	25.4	22.7	23.2	0.6	1	+	Negligible
33	23.2	20.8	21.0	0.1	0	N/A	Negligible
34	23.1	20.7	20.8	0.1	0	N/A	Negligible
35	23.5	21.1	21.4	0.3	1	+	Negligible
36	23.1	20.7	20.9	0.2	1	+	Negligible
37	23.1	20.8	21.0	0.3	1	+	Negligible
38	23.3	20.9	21.2	0.3	1	+	Negligible
39	23.1	20.6	21.2	0.6	1	+	Negligible
40	23.4	20.9	21.6	0.7	2	+	Negligible
41	25.4	22.5	23.5	1.1	3	+	Negligible
42	25.9	22.8	21.1	-1.7	-4	-	Negligible
43	23.7	21.1	20.6	-0.5	-1	-	Negligible
44	24.2	21.5	21.5	0.1	0	N/A	Negligible
45	21.7	19.6	19.3	-0.2	-1	-	Negligible
46	22.8	20.4	20.1	-0.3	-1	-	Negligible
47	21.9	19.7	19.4	-0.2	-1	-	Negligible
48	20.5	18.5	18.6	0.1	0	N/A	Negligible
49	21.5	19.4	19.7	0.3	1	+	Negligible
50	22.8	20.5	21.0	0.5	1	+	Negligible
51	22.4	20.1	20.5	0.4	1	+	Negligible
52	22.4	20.1	20.5	0.4	1	+	Negligible
53	22.9	20.5	21.0	0.5	1	+	Negligible
54	22.0	19.8	20.0	0.3	1	+	Negligible

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
55	22.5	20.3	20.6	0.3	1	+	Negligible
56	25.2	22.5	22.4	-0.1	0	N/A	Negligible
57	21.1	19.0	19.0	0.1	0	N/A	Negligible
58	21.2	19.1	19.4	0.3	1	+	Negligible
59	23.2	20.7	21.4	0.7	2	+	Negligible
60	28.3	24.8	26.3	1.5	4	+	Negligible
61	25.7	22.5	19.7	-2.9	-7	-	Slight Beneficial
62	26.0	23.0	24.4	1.4	3	+	Negligible
63	22.1	19.8	20.5	0.7	2	+	Negligible
64	24.8	21.9	23.2	1.3	3	+	Negligible
65	25.9	22.7	23.8	1.0	3	+	Negligible
66	29.5	25.7	26.1	0.4	1	+	Negligible
67	33.8	29.2	29.7	0.5	1	+	Negligible
68	29.6	25.8	26.2	0.4	1	+	Negligible
69	26.1	23.0	23.3	0.3	1	+	Negligible
70	27.6	24.2	24.5	0.3	1	+	Negligible
71	22.4	20.0	20.2	0.2	0	N/A	Negligible
72	20.5	18.5	18.8	0.2	1	+	Negligible
73	19.8	17.9	18.1	0.2	0	N/A	Negligible
74	19.0	17.3	17.4	0.1	0	N/A	Negligible
75	19.1	17.3	17.5	0.2	0	N/A	Negligible
76	19.3	17.4	17.4	0.0	0	N/A	Negligible
77	19.4	17.6	17.5	0.0	0	N/A	Negligible
78	20.4	18.4	18.4	0.1	0	N/A	Negligible
79	21.8	19.5	19.6	0.1	0	N/A	Negligible
80	20.6	18.5	18.5	0.0	0	N/A	Negligible
81	21.2	19.1	19.1	0.0	0	N/A	Negligible
82	21.8	19.5	19.8	0.3	1	+	Negligible
83	22.9	20.4	20.9	0.5	1	+	Negligible
84	24.5	21.8	22.7	1.0	2	+	Negligible
85	19.5	17.7	18.0	0.3	1	+	Negligible

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
86	20.1	18.1	18.4	0.3	1	+	Negligible
87	26.1	23.1	24.4	1.3	3	+	Negligible
88	28.3	24.9	26.1	1.2	3	+	Negligible
89	27.5	24.2	25.4	1.3	3	+	Negligible
90	30.3	26.5	28.3	1.7	4	+	Negligible
91	21.3	19.2	19.7	0.5	1	+	Negligible
92	20.4	18.4	18.8	0.4	1	+	Negligible
93	20.5	18.4	18.4	0.0	0	N/A	Negligible
94	21.2	19.0	18.9	0.0	0	N/A	Negligible
95	21.0	18.9	18.9	0.0	0	N/A	Negligible
96	21.1	19.0	19.1	0.2	0	N/A	Negligible
97	20.7	18.6	18.4	-0.2	0	N/A	Negligible
98	24.1	21.5	22.3	0.8	2	+	Negligible
99	23.5	20.9	20.8	-0.1	0	N/A	Negligible
100	22.5	20.1	20.5	0.4	1	+	Negligible
101	22.0	19.8	18.8	-1.0	-3	-	Negligible
102	22.8	20.5	20.8	0.4	1	+	Negligible
103	23.5	21.0	21.6	0.6	1	+	Negligible
104	21.3	19.2	19.0	-0.2	0	N/A	Negligible
105	20.9	18.9	19.0	0.1	0	N/A	Negligible
106	21.3	19.2	19.0	-0.2	-1	-	Negligible
107	23.3	20.9	21.5	0.6	2	+	Negligible
108	24.9	22.2	23.1	0.9	2	+	Negligible
109	24.6	22.0	22.8	0.8	2	+	Negligible
110	23.6	21.1	21.7	0.7	2	+	Negligible
111	21.3	19.1	19.2	0.1	0	N/A	Negligible
112	23.6	21.1	21.8	0.7	2	+	Negligible
113	21.6	19.5	19.5	0.0	0	N/A	Negligible
114	25.4	22.7	23.6	0.9	2	+	Negligible
115	22.7	20.3	20.1	-0.2	-1	-	Negligible
116	24.2	21.6	22.2	0.6	2	+	Negligible

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
117	24.5	21.9	22.7	0.7	2	+	Negligible
118	25.2	22.5	23.2	0.7	2	+	Negligible
119	25.6	22.7	20.7	-2.0	-5	-	Negligible
120	22.5	20.2	19.4	-0.8	-2	-	Negligible
121	23.5	21.0	19.6	-1.4	-4	-	Negligible
122	22.8	20.4	19.3	-1.1	-3	-	Negligible
123	22.5	20.2	19.1	-1.1	-3	-	Negligible
124	22.6	20.2	19.1	-1.1	-3	-	Negligible
125	22.3	20.0	18.9	-1.1	-3	-	Negligible
126	22.0	19.8	18.9	-1.0	-2	-	Negligible
127	22.9	20.4	19.0	-1.4	-4	-	Negligible
128	22.7	20.2	19.0	-1.2	-3	-	Negligible
129	21.3	19.1	18.8	-0.3	-1	-	Negligible
130	22.6	20.2	18.9	-1.4	-3	-	Negligible
131	22.1	19.9	18.7	-1.1	-3	-	Negligible
132	20.9	18.9	18.6	-0.3	-1	-	Negligible
133	22.3	20.0	18.6	-1.4	-3	-	Negligible
134	22.6	20.2	18.7	-1.5	-4	-	Negligible
135	21.9	19.6	18.4	-1.2	-3	-	Negligible
136	22.5	20.2	18.5	-1.6	-4	-	Negligible
137	21.5	19.3	18.2	-1.1	-3	-	Negligible
138	23.0	20.5	18.3	-2.2	-6	-	Slight Beneficial
139	21.7	19.5	18.1	-1.4	-4	-	Negligible
140	21.7	19.4	18.1	-1.4	-3	-	Negligible
141	21.9	19.6	18.2	-1.5	-4	-	Negligible
142	20.0	18.1	17.7	-0.4	-1	-	Negligible
143	22.1	19.8	18.2	-1.6	-4	-	Negligible
144	21.5	19.3	18.2	-1.1	-3	-	Negligible
145	22.1	19.7	18.2	-1.5	-4	-	Negligible
146	20.1	18.1	17.7	-0.4	-1	-	Negligible
147	19.4	17.6	17.5	-0.1	0	N/A	Negligible

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
148	19.6	17.8	17.8	0.0	0	N/A	Negligible
149	19.4	17.6	17.5	-0.1	0	N/A	Negligible
150	19.5	17.7	17.5	-0.2	0	N/A	Negligible
151	20.1	18.1	17.5	-0.5	-1	-	Negligible
152	20.0	18.0	17.5	-0.5	-1	-	Negligible
153	20.4	18.3	17.7	-0.7	-2	-	Negligible
154	21.3	19.1	17.8	-1.3	-3	-	Negligible
155	20.9	18.8	18.6	-0.2	0	N/A	Negligible
156	21.0	18.8	17.7	-1.2	-3	-	Negligible
157	20.1	18.1	17.6	-0.5	-1	-	Negligible
158	20.1	18.1	17.6	-0.5	-1	-	Negligible
159	20.6	18.5	17.7	-0.9	-2	-	Negligible
160	20.9	18.7	17.7	-1.0	-3	-	Negligible
161	19.6	17.8	17.6	-0.1	0	N/A	Negligible
162	19.9	18.0	17.5	-0.5	-1	-	Negligible
163	20.2	18.2	17.6	-0.6	-2	-	Negligible
164	20.1	18.2	17.7	-0.5	-1	-	Negligible
165	20.4	18.4	17.6	-0.8	-2	-	Negligible
166	21.1	18.9	17.7	-1.2	-3	-	Negligible
167	19.5	17.7	17.6	-0.1	0	N/A	Negligible
168	19.7	17.9	17.8	-0.1	0	N/A	Negligible
169	20.1	18.2	17.9	-0.3	-1	-	Negligible
170	19.7	17.8	17.6	-0.2	-1	-	Negligible
171	19.7	17.8	17.7	-0.1	0	N/A	Negligible
172	19.7	17.9	17.7	-0.2	0	N/A	Negligible
173	19.8	18.0	17.8	-0.1	0	N/A	Negligible
174	22.1	19.8	18.9	-0.9	-2	-	Negligible
175	21.4	19.3	18.3	-0.9	-2	-	Negligible
176	21.2	19.1	18.2	-0.9	-2	-	Negligible
177	21.4	19.2	18.1	-1.1	-3	-	Negligible
178	21.1	19.0	18.0	-1.1	-3	-	Negligible

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
179	21.4	19.2	18.0	-1.2	-3	-	Negligible
180	22.2	19.9	18.2	-1.7	-4	-	Negligible
181	19.7	17.9	17.7	-0.2	0	N/A	Negligible
182	21.3	19.2	18.0	-1.2	-3	-	Negligible
183	21.0	19.0	18.0	-1.0	-2	-	Negligible
184	20.7	18.7	18.5	-0.2	-1	-	Negligible
185	20.3	18.4	18.1	-0.3	-1	-	Negligible
186	20.6	18.6	18.1	-0.5	-1	-	Negligible
187	20.8	18.8	18.1	-0.7	-2	-	Negligible
188	20.6	18.6	18.1	-0.6	-1	-	Negligible
189	20.8	18.8	18.3	-0.6	-1	-	Negligible
190	22.1	19.9	19.6	-0.2	-1	-	Negligible
191	20.7	18.7	18.1	-0.6	-1	-	Negligible
192	20.5	18.5	18.2	-0.3	-1	-	Negligible
193	20.4	18.5	18.3	-0.2	0	N/A	Negligible
194	20.3	18.4	18.2	-0.2	0	N/A	Negligible
195	20.2	18.3	18.2	-0.2	0	N/A	Negligible
196	20.3	18.3	18.2	-0.2	0	N/A	Negligible
197	20.1	18.3	18.2	-0.1	0	N/A	Negligible
198	20.2	18.3	18.3	0.0	0	N/A	Negligible
199	20.2	18.3	18.3	0.0	0	N/A	Negligible
200	20.8	18.8	18.8	0.1	0	N/A	Negligible
201	20.9	18.9	18.9	0.0	0	N/A	Negligible
202	20.4	18.5	18.5	0.0	0	N/A	Negligible
203	20.4	18.5	18.5	0.0	0	N/A	Negligible
204	21.0	19.0	19.0	0.0	0	N/A	Negligible
205	20.9	18.9	18.9	0.0	0	N/A	Negligible
206	21.4	19.2	19.1	-0.2	0	N/A	Negligible
207	21.8	19.5	19.2	-0.3	-1	-	Negligible
208	22.7	20.3	20.1	-0.1	0	N/A	Negligible
209	21.4	19.3	19.1	-0.1	0	N/A	Negligible

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
210	20.9	18.8	18.6	-0.2	0	N/A	Negligible
211	20.9	18.8	18.6	-0.2	0	N/A	Negligible
212	20.7	18.6	18.4	-0.2	-1	-	Negligible
213	20.7	18.6	18.4	-0.3	-1	-	Negligible
214	20.8	18.8	18.6	-0.1	0	N/A	Negligible
215	21.1	19.0	19.0	-0.1	0	N/A	Negligible
216	22.2	20.0	20.1	0.1	0	N/A	Negligible
217	21.5	19.4	19.4	0.0	0	N/A	Negligible
218	20.9	18.9	18.8	-0.1	0	N/A	Negligible
219	21.1	19.0	18.8	-0.2	-1	-	Negligible
220	20.6	18.6	18.5	-0.1	0	N/A	Negligible
221	20.8	18.7	18.6	-0.1	0	N/A	Negligible
222	21.3	19.2	18.9	-0.3	-1	-	Negligible
223	21.0	19.0	18.8	-0.2	0	N/A	Negligible
224	21.0	19.0	19.0	0.0	0	N/A	Negligible
225	21.6	19.5	19.4	-0.1	0	N/A	Negligible
226	21.1	19.0	18.9	-0.2	0	N/A	Negligible
227	21.6	19.5	18.9	-0.6	-1	-	Negligible
228	21.5	19.4	18.9	-0.5	-1	-	Negligible
229	21.6	19.5	19.1	-0.4	-1	-	Negligible
230	22.1	19.9	19.6	-0.3	-1	-	Negligible
231	26.1	23.2	23.6	0.4	1	+	Negligible
232	21.8	19.7	19.7	0.0	0	N/A	Negligible
233	21.5	19.4	19.0	-0.4	-1	-	Negligible
234	21.3	19.2	18.9	-0.3	-1	-	Negligible
235	21.1	19.0	18.8	-0.3	-1	-	Negligible
236	20.7	18.8	18.6	-0.2	0	N/A	Negligible
237	20.9	18.9	18.8	-0.1	0	N/A	Negligible
238	21.1	19.1	18.9	-0.2	-1	-	Negligible
239	21.2	19.2	18.9	-0.2	-1	-	Negligible
240	21.5	19.4	19.1	-0.3	-1	-	Negligible

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
241	21.8	19.6	19.2	-0.4	-1	-	Negligible
242	22.0	19.8	19.3	-0.5	-1	-	Negligible
243	22.5	20.1	19.3	-0.8	-2	-	Negligible
244	22.4	20.2	19.5	-0.7	-2	-	Negligible
245	22.5	20.2	19.7	-0.6	-1	-	Negligible
246	23.3	20.8	20.4	-0.4	-1	-	Negligible
247	22.9	20.6	20.8	0.3	1	+	Negligible
248	22.6	20.3	20.5	0.2	0	N/A	Negligible
249	22.4	20.2	20.3	0.1	0	N/A	Negligible
Objective	**40**			**-**	**-**	**-**	**-**

[a] % changes are relative to the objective and have been rounded to the nearest whole number.

[b] A notion (plus / minus) has not been assigned where the percentage change in concentration, when rounded, is zero.

Table A1.2: Predicted Impacts on Annual Mean PM_{10} Concentrations

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
1	17.6	17.0	16.9	-0.1	0	N/A	Negligible
2	17.9	17.2	17.3	0.0	0	N/A	Negligible
3	17.8	17.1	17.2	0.0	0	N/A	Negligible
4	18.3	17.7	17.7	0.1	0	N/A	Negligible
5	19.0	18.3	18.4	0.1	0	N/A	Negligible
6	18.8	18.2	18.3	0.1	0	N/A	Negligible
7	18.8	18.1	18.2	0.1	0	N/A	Negligible
8	19.3	18.7	18.8	0.2	1	+	Negligible

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
9	19.3	18.6	18.8	0.2	0	N/A	Negligible
10	19.5	18.8	19.0	0.2	0	N/A	Negligible
11	19.3	18.6	18.7	0.2	0	N/A	Negligible
12	18.7	18.0	18.1	0.1	0	N/A	Negligible
13	19.1	18.4	18.5	0.1	0	N/A	Negligible
14	19.7	19.0	19.1	0.1	0	N/A	Negligible
15	19.6	18.9	19.0	0.1	0	N/A	Negligible
16	19.8	19.1	19.3	0.2	1	+	Negligible
17	20.3	19.6	19.8	0.2	1	+	Negligible
18	21.0	20.3	20.6	0.3	1	+	Negligible
19	20.6	19.9	20.1	0.2	1	+	Negligible
20	18.8	18.2	18.2	0.0	0	N/A	Negligible
21	19.7	19.1	19.2	0.1	0	N/A	Negligible
22	19.3	18.7	18.7	0.0	0	N/A	Negligible
23	19.3	18.6	18.6	0.0	0	N/A	Negligible
24	19.8	19.1	19.2	0.1	0	N/A	Negligible
25	19.3	18.6	18.7	0.1	0	N/A	Negligible
26	19.3	18.6	18.8	0.1	0	N/A	Negligible
27	19.6	18.9	19.1	0.2	0	N/A	Negligible
28	19.7	19.0	19.2	0.2	1	+	Negligible
29	19.7	19.1	19.2	0.2	1	+	Negligible
30	18.7	18.0	18.0	-0.1	0	N/A	Negligible
31	19.2	18.5	18.7	0.1	0	N/A	Negligible
32	19.0	18.3	18.4	0.1	0	N/A	Negligible
33	18.5	17.9	17.9	0.0	0	N/A	Negligible
34	18.5	17.8	17.8	0.0	0	N/A	Negligible
35	18.5	17.9	18.0	0.1	0	N/A	Negligible
36	18.4	17.8	17.8	0.0	0	N/A	Negligible
37	18.4	17.7	17.8	0.1	0	N/A	Negligible
38	18.4	17.7	17.8	0.1	0	N/A	Negligible
39	18.1	17.5	17.6	0.1	0	N/A	Negligible

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
40	18.1	17.4	17.5	0.1	0	N/A	Negligible
41	18.4	17.7	17.9	0.2	1	+	Negligible
42	18.1	17.4	17.1	-0.3	-1	-	Negligible
43	17.8	17.1	17.0	-0.1	0	N/A	Negligible
44	17.8	17.2	17.2	0.0	0	N/A	Negligible
45	17.6	16.9	16.9	-0.1	0	N/A	Negligible
46	17.8	17.2	17.0	-0.1	0	N/A	Negligible
47	17.6	17.0	16.9	-0.1	0	N/A	Negligible
48	17.6	16.9	17.0	0.0	0	N/A	Negligible
49	17.8	17.2	17.2	0.1	0	N/A	Negligible
50	18.1	17.5	17.5	0.1	0	N/A	Negligible
51	18.0	17.4	17.4	0.1	0	N/A	Negligible
52	18.0	17.4	17.5	0.1	0	N/A	Negligible
53	18.1	17.5	17.6	0.1	0	N/A	Negligible
54	18.1	17.5	17.6	0.1	0	N/A	Negligible
55	18.3	17.7	17.8	0.1	0	N/A	Negligible
56	19.1	18.4	18.4	0.0	0	N/A	Negligible
57	17.3	16.7	16.7	0.0	0	N/A	Negligible
58	17.3	16.7	16.8	0.0	0	N/A	Negligible
59	17.7	17.1	17.2	0.1	0	N/A	Negligible
60	18.7	18.1	18.3	0.3	1	+	Negligible
61	18.0	17.3	16.8	-0.5	-2	-	Negligible
62	18.3	17.6	17.9	0.2	1	+	Negligible
63	17.4	16.8	16.9	0.1	0	N/A	Negligible
64	17.9	17.3	17.5	0.2	1	+	Negligible
65	17.8	17.1	17.3	0.2	1	+	Negligible
66	18.3	17.7	17.7	0.1	0	N/A	Negligible
67	19.1	18.3	18.4	0.1	0	N/A	Negligible
68	18.4	17.7	17.7	0.0	0	N/A	Negligible
69	17.8	17.1	17.2	0.0	0	N/A	Negligible
70	18.0	17.4	17.4	0.0	0	N/A	Negligible

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
71	17.3	16.7	16.7	0.0	0	N/A	Negligible
72	17.0	16.4	16.5	0.1	0	N/A	Negligible
73	16.8	16.2	16.3	0.1	0	N/A	Negligible
74	16.6	16.0	16.1	0.1	0	N/A	Negligible
75	16.6	16.0	16.1	0.1	0	N/A	Negligible
76	16.6	16.0	16.0	0.0	0	N/A	Negligible
77	16.7	16.1	16.1	0.0	0	N/A	Negligible
78	16.9	16.3	16.3	0.0	0	N/A	Negligible
79	17.2	16.6	16.6	0.0	0	N/A	Negligible
80	17.0	16.4	16.4	0.0	0	N/A	Negligible
81	17.1	16.5	16.5	0.0	0	N/A	Negligible
82	17.2	16.5	16.6	0.0	0	N/A	Negligible
83	17.3	16.7	16.8	0.1	0	N/A	Negligible
84	17.6	16.9	17.1	0.2	0	N/A	Negligible
85	16.7	16.1	16.2	0.1	0	N/A	Negligible
86	16.9	16.3	16.4	0.1	0	N/A	Negligible
87	17.8	17.2	17.4	0.2	1	+	Negligible
88	18.2	17.5	17.7	0.2	1	+	Negligible
89	18.0	17.4	17.6	0.2	1	+	Negligible
90	18.5	17.8	18.1	0.3	1	+	Negligible
91	17.2	16.6	16.7	0.1	0	N/A	Negligible
92	17.0	16.4	16.5	0.1	0	N/A	Negligible
93	17.0	16.4	16.4	0.0	0	N/A	Negligible
94	17.2	16.6	16.6	0.0	0	N/A	Negligible
95	17.2	16.6	16.6	0.0	0	N/A	Negligible
96	17.2	16.6	16.6	0.0	0	N/A	Negligible
97	17.1	16.5	16.5	0.0	0	N/A	Negligible
98	17.9	17.2	17.4	0.2	0	N/A	Negligible
99	17.7	17.1	17.0	0.0	0	N/A	Negligible
100	17.6	16.9	17.0	0.1	0	N/A	Negligible
101	17.5	16.9	16.7	-0.2	-1	-	Negligible

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
102	17.7	17.1	17.2	0.1	0	N/A	Negligible
103	17.9	17.3	17.4	0.1	0	N/A	Negligible
104	17.5	16.9	16.8	0.0	0	N/A	Negligible
105	17.4	16.8	16.8	0.0	0	N/A	Negligible
106	17.5	16.9	16.8	0.0	0	N/A	Negligible
107	18.0	17.3	17.5	0.1	0	N/A	Negligible
108	18.3	17.7	17.9	0.2	1	+	Negligible
109	18.4	17.7	17.9	0.2	0	N/A	Negligible
110	18.1	17.5	17.6	0.1	0	N/A	Negligible
111	17.6	17.0	17.0	0.0	0	N/A	Negligible
112	18.2	17.6	17.7	0.1	0	N/A	Negligible
113	17.8	17.2	17.2	0.0	0	N/A	Negligible
114	18.7	18.0	18.2	0.2	1	+	Negligible
115	18.0	17.4	17.4	0.0	0	N/A	Negligible
116	18.4	17.8	17.9	0.1	0	N/A	Negligible
117	18.6	18.0	18.1	0.1	0	N/A	Negligible
118	18.8	18.1	18.2	0.1	0	N/A	Negligible
119	18.9	18.2	17.9	-0.4	-1	-	Negligible
120	18.4	17.7	17.5	-0.2	-1	-	Negligible
121	18.5	17.8	17.5	-0.3	-1	-	Negligible
122	18.3	17.7	17.5	-0.2	-1	-	Negligible
123	18.3	17.6	17.4	-0.3	-1	-	Negligible
124	18.2	17.6	17.3	-0.2	-1	-	Negligible
125	18.2	17.5	17.3	-0.3	-1	-	Negligible
126	18.1	17.4	17.2	-0.2	-1	-	Negligible
127	18.1	17.5	17.2	-0.3	-1	-	Negligible
128	18.0	17.4	17.1	-0.2	-1	-	Negligible
129	17.8	17.1	17.1	-0.1	0	N/A	Negligible
130	18.0	17.4	17.1	-0.3	-1	-	Negligible
131	17.9	17.3	17.0	-0.2	-1	-	Negligible
132	17.7	17.1	17.0	-0.1	0	N/A	Negligible

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
133	17.8	17.2	16.9	-0.3	-1	-	Negligible
134	17.9	17.2	16.9	-0.3	-1	-	Negligible
135	17.7	17.1	16.8	-0.2	-1	-	Negligible
136	17.8	17.2	16.8	-0.3	-1	-	Negligible
137	17.6	16.9	16.7	-0.2	-1	-	Negligible
138	17.7	17.1	16.7	-0.4	-1	-	Negligible
139	17.5	16.9	16.6	-0.3	-1	-	Negligible
140	17.4	16.8	16.5	-0.3	-1	-	Negligible
141	17.4	16.8	16.5	-0.3	-1	-	Negligible
142	17.1	16.5	16.4	-0.1	0	N/A	Negligible
143	17.5	16.8	16.5	-0.3	-1	-	Negligible
144	17.3	16.7	16.5	-0.2	-1	-	Negligible
145	17.4	16.8	16.5	-0.3	-1	-	Negligible
146	17.0	16.4	16.3	-0.1	0	N/A	Negligible
147	16.9	16.3	16.3	0.0	0	N/A	Negligible
148	16.9	16.3	16.3	0.0	0	N/A	Negligible
149	16.9	16.3	16.3	0.0	0	N/A	Negligible
150	16.9	16.3	16.3	0.0	0	N/A	Negligible
151	17.0	16.4	16.3	-0.1	0	N/A	Negligible
152	17.0	16.4	16.3	-0.1	0	N/A	Negligible
153	17.1	16.5	16.3	-0.1	0	N/A	Negligible
154	17.3	16.7	16.4	-0.3	-1	-	Negligible
155	17.2	16.6	16.6	0.0	0	N/A	Negligible
156	17.2	16.6	16.4	-0.3	-1	-	Negligible
157	17.1	16.5	16.4	-0.1	0	N/A	Negligible
158	17.0	16.4	16.3	-0.1	0	N/A	Negligible
159	17.2	16.6	16.4	-0.2	-1	-	Negligible
160	17.2	16.5	16.4	-0.2	-1	-	Negligible
161	17.0	16.4	16.3	0.0	0	N/A	Negligible
162	17.0	16.4	16.3	-0.1	0	N/A	Negligible
163	17.1	16.5	16.4	-0.1	0	N/A	Negligible

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
164	17.1	16.5	16.4	-0.1	0	N/A	Negligible
165	17.2	16.6	16.4	-0.2	-1	-	Negligible
166	17.2	16.6	16.4	-0.2	-1	-	Negligible
167	17.0	16.4	16.3	0.0	0	N/A	Negligible
168	17.0	16.4	16.4	0.0	0	N/A	Negligible
169	17.0	16.4	16.4	0.0	0	N/A	Negligible
170	17.0	16.4	16.4	0.0	0	N/A	Negligible
171	17.1	16.5	16.4	0.0	0	N/A	Negligible
172	17.1	16.5	16.5	0.0	0	N/A	Negligible
173	17.1	16.5	16.5	0.0	0	N/A	Negligible
174	17.6	16.9	16.8	-0.2	-1	-	Negligible
175	17.5	16.9	16.7	-0.2	-1	-	Negligible
176	17.4	16.8	16.6	-0.2	-1	-	Negligible
177	17.4	16.8	16.6	-0.2	-1	-	Negligible
178	17.4	16.8	16.6	-0.2	-1	-	Negligible
179	17.4	16.8	16.6	-0.2	-1	-	Negligible
180	17.5	16.9	16.6	-0.3	-1	-	Negligible
181	17.1	16.5	16.4	0.0	0	N/A	Negligible
182	17.5	16.9	16.6	-0.2	-1	-	Negligible
183	17.4	16.8	16.6	-0.2	-1	-	Negligible
184	17.3	16.7	16.7	0.0	0	N/A	Negligible
185	17.4	16.8	16.7	-0.1	0	N/A	Negligible
186	17.4	16.8	16.7	-0.1	0	N/A	Negligible
187	17.4	16.8	16.7	-0.1	0	N/A	Negligible
188	17.4	16.8	16.7	-0.1	0	N/A	Negligible
189	17.5	16.8	16.7	-0.1	0	N/A	Negligible
190	17.7	17.1	17.1	0.0	0	N/A	Negligible
191	17.4	16.8	16.7	-0.1	0	N/A	Negligible
192	17.5	16.9	16.8	-0.1	0	N/A	Negligible
193	17.5	16.9	16.8	0.0	0	N/A	Negligible
194	17.5	16.8	16.8	0.0	0	N/A	Negligible

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
195	17.4	16.8	16.8	0.0	0	N/A	Negligible
196	17.5	16.8	16.8	0.0	0	N/A	Negligible
197	17.4	16.8	16.8	0.0	0	N/A	Negligible
198	17.4	16.8	16.8	0.0	0	N/A	Negligible
199	17.5	16.9	16.8	0.0	0	N/A	Negligible
200	17.7	17.1	17.1	0.0	0	N/A	Negligible
201	17.8	17.1	17.1	0.0	0	N/A	Negligible
202	17.6	17.0	17.0	0.0	0	N/A	Negligible
203	17.6	17.0	17.0	0.0	0	N/A	Negligible
204	17.8	17.2	17.2	0.0	0	N/A	Negligible
205	17.8	17.2	17.2	0.0	0	N/A	Negligible
206	17.9	17.3	17.3	0.0	0	N/A	Negligible
207	18.0	17.4	17.3	0.0	0	N/A	Negligible
208	18.2	17.6	17.6	0.0	0	N/A	Negligible
209	18.0	17.3	17.3	0.0	0	N/A	Negligible
210	17.8	17.1	17.1	-0.1	0	N/A	Negligible
211	17.7	17.1	17.1	-0.1	0	N/A	Negligible
212	17.6	17.0	16.9	-0.1	0	N/A	Negligible
213	17.6	17.0	16.9	-0.1	0	N/A	Negligible
214	17.7	17.1	17.0	0.0	0	N/A	Negligible
215	17.9	17.3	17.2	0.0	0	N/A	Negligible
216	18.2	17.6	17.6	0.0	0	N/A	Negligible
217	18.1	17.4	17.4	0.0	0	N/A	Negligible
218	17.8	17.2	17.2	0.0	0	N/A	Negligible
219	17.8	17.1	17.1	-0.1	0	N/A	Negligible
220	17.6	17.0	16.9	0.0	0	N/A	Negligible
221	17.7	17.1	17.0	0.0	0	N/A	Negligible
222	17.9	17.3	17.2	-0.1	0	N/A	Negligible
223	17.9	17.2	17.2	0.0	0	N/A	Negligible
224	18.0	17.4	17.3	0.0	0	N/A	Negligible
225	18.2	17.5	17.5	0.0	0	N/A	Negligible

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
226	17.9	17.3	17.3	0.0	0	N/A	Negligible
227	18.0	17.4	17.3	-0.1	0	N/A	Negligible
228	18.1	17.4	17.3	-0.1	0	N/A	Negligible
229	18.1	17.5	17.4	-0.1	0	N/A	Negligible
230	18.3	17.7	17.6	-0.1	0	N/A	Negligible
231	19.1	18.5	18.6	0.1	0	N/A	Negligible
232	18.3	17.7	17.7	0.0	0	N/A	Negligible
233	18.1	17.5	17.4	-0.1	0	N/A	Negligible
234	18.0	17.3	17.3	-0.1	0	N/A	Negligible
235	17.9	17.2	17.2	-0.1	0	N/A	Negligible
236	17.7	17.1	17.1	0.0	0	N/A	Negligible
237	17.7	17.0	17.0	0.0	0	N/A	Negligible
238	17.8	17.2	17.1	-0.1	0	N/A	Negligible
239	17.9	17.3	17.2	-0.1	0	N/A	Negligible
240	18.0	17.4	17.3	-0.1	0	N/A	Negligible
241	18.1	17.5	17.4	-0.1	0	N/A	Negligible
242	18.2	17.5	17.4	-0.1	0	N/A	Negligible
243	18.3	17.6	17.5	-0.2	0	N/A	Negligible
244	18.4	17.8	17.6	-0.2	-1	-	Negligible
245	18.5	17.8	17.7	-0.1	0	N/A	Negligible
246	18.6	18.0	17.9	-0.1	0	N/A	Negligible
247	18.7	18.0	18.1	0.0	0	N/A	Negligible
248	18.6	17.9	18.0	0.0	0	N/A	Negligible
249	18.5	17.9	17.9	0.0	0	N/A	Negligible
Objective	**32 [c]**			**-**	**-**	**-**	**-**

[a] % changes are relative to the objective and have been rounded to the nearest whole number.

[b] A notion (plus / minus) has not been assigned where the percentage change in concentration, when rounded, is zero.

[c] While the annual mean PM_{10} objective is 40 µg/m³, 32 µg/m³ is the annual mean concentration above which an exceedance of the 24-hour mean PM_{10} objective is possible, as outlined in LAQM.TG16 (Defra, 2021). A value of 32 µg/m³ is thus used as a proxy to determine the likelihood of exceedance of the 24-

hour mean PM_{10} objective, as recommended in EPUK & IAQM guidance (Moorcroft and Barrowcliffe et al, 2017).

Table A1.3: Predicted Impacts on Annual Mean $PM_{2.5}$ Concentrations

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
1	11.8	11.4	11.3	-0.1	0	N/A	Negligible
2	12.0	11.6	11.6	0.0	0	N/A	Negligible
3	11.9	11.5	11.5	0.0	0	N/A	Negligible
4	12.2	11.8	11.8	0.0	0	N/A	Negligible
5	12.6	12.2	12.2	0.0	0	N/A	Negligible
6	12.5	12.1	12.1	0.0	0	N/A	Negligible
7	12.5	12.1	12.1	0.0	0	N/A	Negligible
8	12.8	12.4	12.5	0.1	0	N/A	Negligible
9	12.8	12.4	12.4	0.1	0	N/A	Negligible
10	12.9	12.5	12.6	0.1	0	N/A	Negligible
11	12.8	12.3	12.4	0.1	0	N/A	Negligible
12	12.4	12.0	12.0	0.0	0	N/A	Negligible
13	12.6	12.2	12.3	0.1	0	N/A	Negligible
14	13.0	12.6	12.6	0.1	0	N/A	Negligible
15	12.9	12.5	12.5	0.1	0	N/A	Negligible
16	13.1	12.6	12.7	0.1	0	N/A	Negligible
17	13.4	12.9	13.0	0.1	0	N/A	Negligible
18	13.8	13.3	13.4	0.2	1	+	Negligible
19	13.5	13.0	13.2	0.1	1	+	Negligible
20	12.4	12.0	12.0	0.0	0	N/A	Negligible
21	13.0	12.5	12.6	0.1	0	N/A	Negligible
22	12.7	12.3	12.3	0.0	0	N/A	Negligible
23	12.7	12.2	12.3	0.0	0	N/A	Negligible
24	13.0	12.6	12.6	0.1	0	N/A	Negligible
25	12.7	12.3	12.3	0.1	0	N/A	Negligible
26	12.7	12.3	12.4	0.1	0	N/A	Negligible
27	12.9	12.5	12.6	0.1	0	N/A	Negligible

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
28	13.0	12.5	12.6	0.1	0	N/A	Negligible
29	13.0	12.5	12.6	0.1	0	N/A	Negligible
30	12.4	11.9	11.9	0.0	0	N/A	Negligible
31	12.7	12.2	12.3	0.1	0	N/A	Negligible
32	12.5	12.1	12.2	0.1	0	N/A	Negligible
33	12.2	11.8	11.8	0.0	0	N/A	Negligible
34	12.2	11.8	11.8	0.0	0	N/A	Negligible
35	12.3	11.8	11.9	0.0	0	N/A	Negligible
36	12.2	11.8	11.8	0.0	0	N/A	Negligible
37	12.2	11.8	11.8	0.0	0	N/A	Negligible
38	12.2	11.7	11.8	0.0	0	N/A	Negligible
39	12.0	11.6	11.7	0.1	0	N/A	Negligible
40	12.0	11.6	11.7	0.1	0	N/A	Negligible
41	12.2	11.8	11.9	0.1	0	N/A	Negligible
42	12.1	11.6	11.4	-0.2	-1	-	Negligible
43	11.9	11.4	11.4	-0.1	0	N/A	Negligible
44	11.9	11.5	11.5	0.0	0	N/A	Negligible
45	11.7	11.3	11.3	-0.1	0	N/A	Negligible
46	11.9	11.4	11.4	-0.1	0	N/A	Negligible
47	11.8	11.3	11.3	-0.1	0	N/A	Negligible
48	11.7	11.3	11.3	0.0	0	N/A	Negligible
49	11.8	11.4	11.5	0.0	0	N/A	Negligible
50	12.0	11.6	11.7	0.0	0	N/A	Negligible
51	12.0	11.6	11.6	0.0	0	N/A	Negligible
52	12.0	11.6	11.6	0.0	0	N/A	Negligible
53	12.1	11.6	11.7	0.0	0	N/A	Negligible
54	12.0	11.6	11.7	0.0	0	N/A	Negligible
55	12.2	11.7	11.8	0.0	0	N/A	Negligible
56	12.6	12.1	12.1	0.0	0	N/A	Negligible
57	11.6	11.2	11.2	0.0	0	N/A	Negligible
58	11.6	11.2	11.2	0.0	0	N/A	Negligible

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
59	11.8	11.4	11.5	0.1	0	N/A	Negligible
60	12.5	12.0	12.1	0.1	1	+	Negligible
61	12.0	11.6	11.2	-0.3	-1	-	Negligible
62	12.2	11.7	11.9	0.1	1	+	Negligible
63	11.7	11.3	11.3	0.1	0	N/A	Negligible
64	12.0	11.5	11.7	0.1	0	N/A	Negligible
65	11.9	11.5	11.6	0.1	0	N/A	Negligible
66	12.3	11.8	11.8	0.0	0	N/A	Negligible
67	12.7	12.2	12.2	0.0	0	N/A	Negligible
68	12.3	11.8	11.8	0.0	0	N/A	Negligible
69	11.9	11.5	11.5	0.0	0	N/A	Negligible
70	12.1	11.6	11.6	0.0	0	N/A	Negligible
71	11.6	11.2	11.2	0.0	0	N/A	Negligible
72	11.4	11.0	11.0	0.0	0	N/A	Negligible
73	11.3	10.9	10.9	0.0	0	N/A	Negligible
74	11.2	10.8	10.8	0.0	0	N/A	Negligible
75	11.2	10.8	10.8	0.0	0	N/A	Negligible
76	11.2	10.8	10.8	0.0	0	N/A	Negligible
77	11.2	10.8	10.8	0.0	0	N/A	Negligible
78	11.4	11.0	11.0	0.0	0	N/A	Negligible
79	11.6	11.1	11.2	0.0	0	N/A	Negligible
80	11.4	11.0	11.0	0.0	0	N/A	Negligible
81	11.5	11.1	11.1	0.0	0	N/A	Negligible
82	11.5	11.1	11.1	0.0	0	N/A	Negligible
83	11.6	11.2	11.2	0.0	0	N/A	Negligible
84	11.8	11.3	11.4	0.1	0	N/A	Negligible
85	11.3	10.9	10.9	0.0	0	N/A	Negligible
86	11.4	10.9	11.0	0.0	0	N/A	Negligible
87	11.9	11.5	11.6	0.1	0	N/A	Negligible
88	12.1	11.7	11.8	0.1	0	N/A	Negligible
89	12.1	11.6	11.7	0.1	0	N/A	Negligible

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
90	12.4	11.9	12.0	0.2	1	+	Negligible
91	11.5	11.1	11.2	0.1	0	N/A	Negligible
92	11.4	11.0	11.1	0.0	0	N/A	Negligible
93	11.4	11.0	11.0	0.0	0	N/A	Negligible
94	11.5	11.1	11.1	0.0	0	N/A	Negligible
95	11.5	11.1	11.1	0.0	0	N/A	Negligible
96	11.5	11.1	11.2	0.0	0	N/A	Negligible
97	11.5	11.1	11.1	0.0	0	N/A	Negligible
98	11.9	11.5	11.6	0.1	0	N/A	Negligible
99	11.8	11.4	11.4	0.0	0	N/A	Negligible
100	11.8	11.3	11.4	0.0	0	N/A	Negligible
101	11.7	11.3	11.2	-0.1	0	N/A	Negligible
102	11.9	11.5	11.5	0.0	0	N/A	Negligible
103	12.0	11.6	11.6	0.1	0	N/A	Negligible
104	11.7	11.3	11.3	0.0	0	N/A	Negligible
105	11.7	11.3	11.3	0.0	0	N/A	Negligible
106	11.7	11.3	11.3	0.0	0	N/A	Negligible
107	12.0	11.6	11.7	0.1	0	N/A	Negligible
108	12.2	11.8	11.9	0.1	0	N/A	Negligible
109	12.2	11.8	11.9	0.1	0	N/A	Negligible
110	12.1	11.7	11.8	0.1	0	N/A	Negligible
111	11.8	11.4	11.4	0.0	0	N/A	Negligible
112	12.2	11.7	11.8	0.1	0	N/A	Negligible
113	11.9	11.5	11.5	0.0	0	N/A	Negligible
114	12.4	12.0	12.1	0.1	0	N/A	Negligible
115	12.1	11.6	11.6	0.0	0	N/A	Negligible
116	12.3	11.8	11.9	0.1	0	N/A	Negligible
117	12.4	12.0	12.1	0.1	0	N/A	Negligible
118	12.5	12.1	12.1	0.1	0	N/A	Negligible
119	12.5	12.1	11.9	-0.2	-1	-	Negligible
120	12.2	11.8	11.7	-0.1	0	N/A	Negligible

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
121	12.3	11.9	11.7	-0.2	-1	-	Negligible
122	12.2	11.8	11.6	-0.1	0	N/A	Negligible
123	12.1	11.7	11.6	-0.2	-1	-	Negligible
124	12.1	11.7	11.6	-0.1	-1	-	Negligible
125	12.1	11.7	11.5	-0.1	-1	-	Negligible
126	12.0	11.6	11.5	-0.1	-1	-	Negligible
127	12.1	11.7	11.5	-0.2	-1	-	Negligible
128	12.0	11.6	11.5	-0.1	-1	-	Negligible
129	11.9	11.5	11.4	0.0	0	N/A	Negligible
130	12.0	11.6	11.4	-0.2	-1	-	Negligible
131	12.0	11.5	11.4	-0.1	-1	-	Negligible
132	11.8	11.4	11.4	0.0	0	N/A	Negligible
133	11.9	11.5	11.3	-0.2	-1	-	Negligible
134	11.9	11.5	11.3	-0.2	-1	-	Negligible
135	11.8	11.4	11.3	-0.1	-1	-	Negligible
136	11.9	11.5	11.3	-0.2	-1	-	Negligible
137	11.8	11.4	11.2	-0.1	-1	-	Negligible
138	11.9	11.4	11.2	-0.3	-1	-	Negligible
139	11.7	11.3	11.1	-0.2	-1	-	Negligible
140	11.7	11.3	11.1	-0.2	-1	-	Negligible
141	11.7	11.3	11.1	-0.2	-1	-	Negligible
142	11.5	11.1	11.1	0.0	0	N/A	Negligible
143	11.7	11.3	11.1	-0.2	-1	-	Negligible
144	11.6	11.2	11.1	-0.1	-1	-	Negligible
145	11.7	11.3	11.1	-0.2	-1	-	Negligible
146	11.4	11.0	11.0	-0.1	0	N/A	Negligible
147	11.4	11.0	10.9	0.0	0	N/A	Negligible
148	11.4	11.0	11.0	0.0	0	N/A	Negligible
149	11.4	11.0	10.9	0.0	0	N/A	Negligible
150	11.4	11.0	10.9	0.0	0	N/A	Negligible
151	11.4	11.0	11.0	-0.1	0	N/A	Negligible

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
152	11.4	11.0	11.0	-0.1	0	N/A	Negligible
153	11.5	11.1	11.0	-0.1	0	N/A	Negligible
154	11.6	11.2	11.0	-0.2	-1	-	Negligible
155	11.6	11.2	11.1	0.0	0	N/A	Negligible
156	11.6	11.2	11.0	-0.2	-1	-	Negligible
157	11.5	11.1	11.0	-0.1	0	N/A	Negligible
158	11.4	11.0	11.0	-0.1	0	N/A	Negligible
159	11.5	11.1	11.0	-0.1	0	N/A	Negligible
160	11.5	11.1	11.0	-0.1	0	N/A	Negligible
161	11.4	11.0	11.0	0.0	0	N/A	Negligible
162	11.4	11.0	11.0	-0.1	0	N/A	Negligible
163	11.5	11.1	11.0	-0.1	0	N/A	Negligible
164	11.5	11.1	11.0	-0.1	0	N/A	Negligible
165	11.5	11.1	11.0	-0.1	0	N/A	Negligible
166	11.6	11.2	11.0	-0.1	-1	-	Negligible
167	11.4	11.0	11.0	0.0	0	N/A	Negligible
168	11.4	11.0	11.0	0.0	0	N/A	Negligible
169	11.4	11.0	11.0	0.0	0	N/A	Negligible
170	11.4	11.0	11.0	0.0	0	N/A	Negligible
171	11.5	11.1	11.1	0.0	0	N/A	Negligible
172	11.5	11.1	11.1	0.0	0	N/A	Negligible
173	11.5	11.1	11.1	0.0	0	N/A	Negligible
174	11.7	11.3	11.2	-0.1	0	N/A	Negligible
175	11.7	11.3	11.2	-0.1	0	N/A	Negligible
176	11.7	11.3	11.1	-0.1	0	N/A	Negligible
177	11.7	11.3	11.1	-0.1	-1	-	Negligible
178	11.6	11.2	11.1	-0.1	-1	-	Negligible
179	11.7	11.3	11.1	-0.1	-1	-	Negligible
180	11.7	11.3	11.1	-0.2	-1	-	Negligible
181	11.5	11.1	11.0	0.0	0	N/A	Negligible
182	11.7	11.3	11.2	-0.1	-1	-	Negligible

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
183	11.7	11.3	11.1	-0.1	0	N/A	Negligible
184	11.6	11.2	11.2	0.0	0	N/A	Negligible
185	11.6	11.2	11.2	0.0	0	N/A	Negligible
186	11.7	11.3	11.2	-0.1	0	N/A	Negligible
187	11.7	11.3	11.2	-0.1	0	N/A	Negligible
188	11.6	11.2	11.2	-0.1	0	N/A	Negligible
189	11.7	11.3	11.2	-0.1	0	N/A	Negligible
190	11.8	11.4	11.4	0.0	0	N/A	Negligible
191	11.7	11.3	11.2	-0.1	0	N/A	Negligible
192	11.7	11.3	11.3	0.0	0	N/A	Negligible
193	11.7	11.3	11.3	0.0	0	N/A	Negligible
194	11.7	11.3	11.3	0.0	0	N/A	Negligible
195	11.7	11.3	11.3	0.0	0	N/A	Negligible
196	11.7	11.3	11.3	0.0	0	N/A	Negligible
197	11.6	11.3	11.2	0.0	0	N/A	Negligible
198	11.7	11.3	11.3	0.0	0	N/A	Negligible
199	11.7	11.3	11.3	0.0	0	N/A	Negligible
200	11.8	11.4	11.4	0.0	0	N/A	Negligible
201	11.8	11.4	11.4	0.0	0	N/A	Negligible
202	11.7	11.3	11.3	0.0	0	N/A	Negligible
203	11.7	11.3	11.3	0.0	0	N/A	Negligible
204	11.9	11.5	11.5	0.0	0	N/A	Negligible
205	11.9	11.5	11.5	0.0	0	N/A	Negligible
206	11.9	11.5	11.5	0.0	0	N/A	Negligible
207	11.9	11.5	11.5	0.0	0	N/A	Negligible
208	12.1	11.7	11.7	0.0	0	N/A	Negligible
209	11.9	11.5	11.5	0.0	0	N/A	Negligible
210	11.8	11.4	11.4	0.0	0	N/A	Negligible
211	11.8	11.4	11.4	0.0	0	N/A	Negligible
212	11.8	11.4	11.3	0.0	0	N/A	Negligible
213	11.8	11.4	11.3	0.0	0	N/A	Negligible

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
214	11.8	11.4	11.4	0.0	0	N/A	Negligible
215	11.9	11.5	11.5	0.0	0	N/A	Negligible
216	12.1	11.7	11.7	0.0	0	N/A	Negligible
217	12.0	11.6	11.6	0.0	0	N/A	Negligible
218	11.9	11.5	11.4	0.0	0	N/A	Negligible
219	11.9	11.5	11.4	0.0	0	N/A	Negligible
220	11.8	11.4	11.4	0.0	0	N/A	Negligible
221	11.8	11.4	11.4	0.0	0	N/A	Negligible
222	11.9	11.5	11.5	0.0	0	N/A	Negligible
223	11.9	11.5	11.5	0.0	0	N/A	Negligible
224	11.9	11.5	11.5	0.0	0	N/A	Negligible
225	12.0	11.6	11.6	0.0	0	N/A	Negligible
226	11.9	11.5	11.5	0.0	0	N/A	Negligible
227	12.0	11.6	11.5	-0.1	0	N/A	Negligible
228	12.0	11.6	11.5	-0.1	0	N/A	Negligible
229	12.0	11.6	11.6	-0.1	0	N/A	Negligible
230	12.1	11.7	11.7	0.0	0	N/A	Negligible
231	12.6	12.2	12.2	0.0	0	N/A	Negligible
232	12.1	11.7	11.7	0.0	0	N/A	Negligible
233	12.0	11.6	11.6	-0.1	0	N/A	Negligible
234	12.0	11.6	11.5	0.0	0	N/A	Negligible
235	11.9	11.5	11.5	0.0	0	N/A	Negligible
236	11.9	11.5	11.4	0.0	0	N/A	Negligible
237	11.8	11.4	11.4	0.0	0	N/A	Negligible
238	11.9	11.5	11.5	0.0	0	N/A	Negligible
239	12.0	11.6	11.5	0.0	0	N/A	Negligible
240	12.0	11.6	11.6	0.0	0	N/A	Negligible
241	12.1	11.7	11.6	-0.1	0	N/A	Negligible
242	12.1	11.7	11.6	-0.1	0	N/A	Negligible
243	12.2	11.7	11.6	-0.1	0	N/A	Negligible
244	12.2	11.8	11.7	-0.1	0	N/A	Negligible

Receptor ID	2019	2021		Impact			
	2019 Baseline Concentration (µg/m³)	Without Scheme Concentration (µg/m³)	With Scheme Concentration (µg/m³)	Absolute Change in Concentration (µg/m³)	Change (% of AQAL) [a]	Increase/ Decrease [b]	Impact Descriptor
245	12.2	11.8	11.7	-0.1	0	N/A	Negligible
246	12.3	11.9	11.8	0.0	0	N/A	Negligible
247	12.3	11.9	12.0	0.0	0	N/A	Negligible
248	12.3	11.9	11.9	0.0	0	N/A	Negligible
249	12.3	11.9	11.9	0.0	0	N/A	Negligible
Objective	**25 [c]**			-	-	-	-

[a] % changes are relative to the objective and have been rounded to the nearest whole number.

[b] A notion (plus / minus) has not been assigned where the percentage change in concentration, when rounded, is zero.

[c] The $PM_{2.5}$ objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

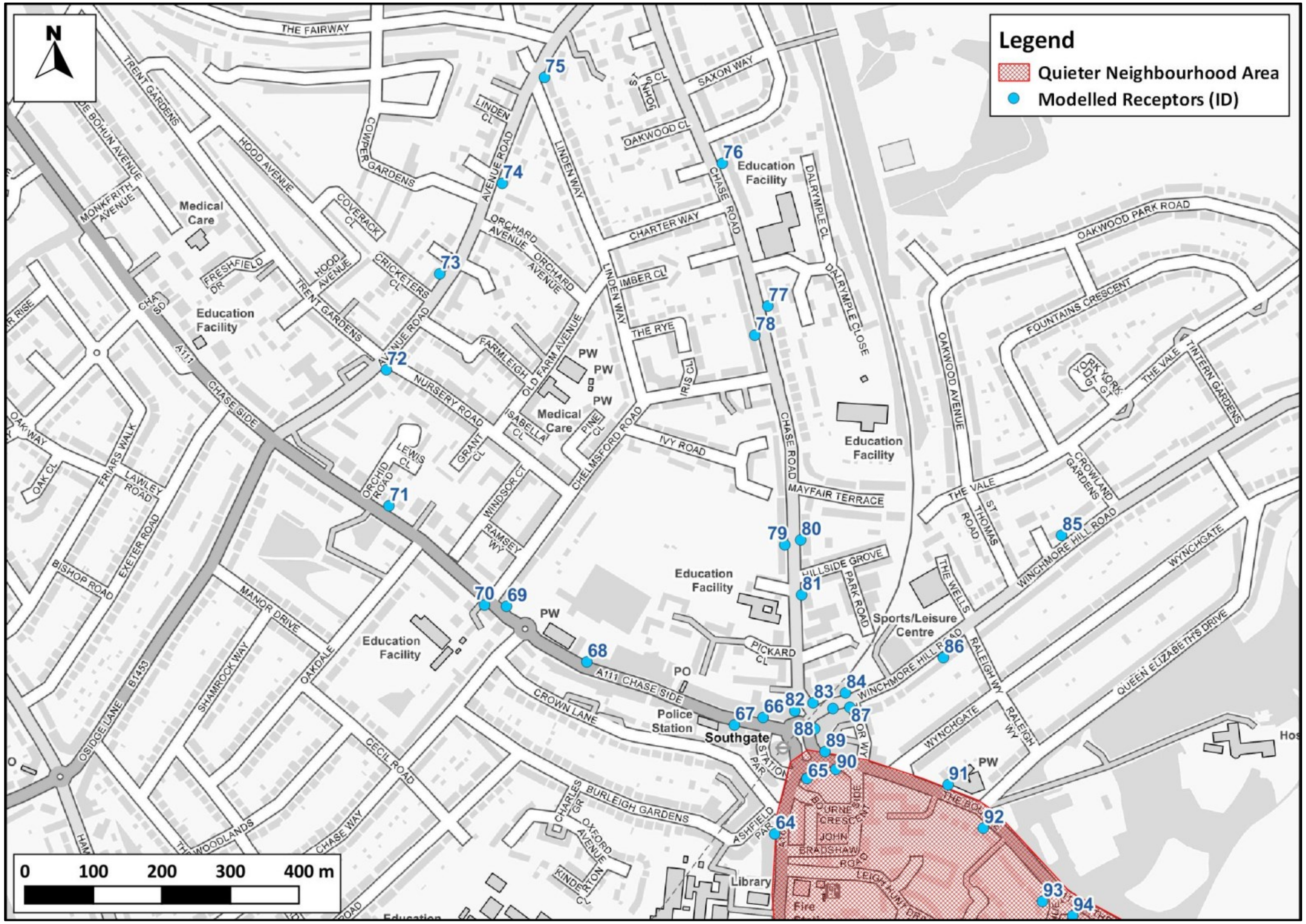

Figure A1.1: Modelled Receptors – North West

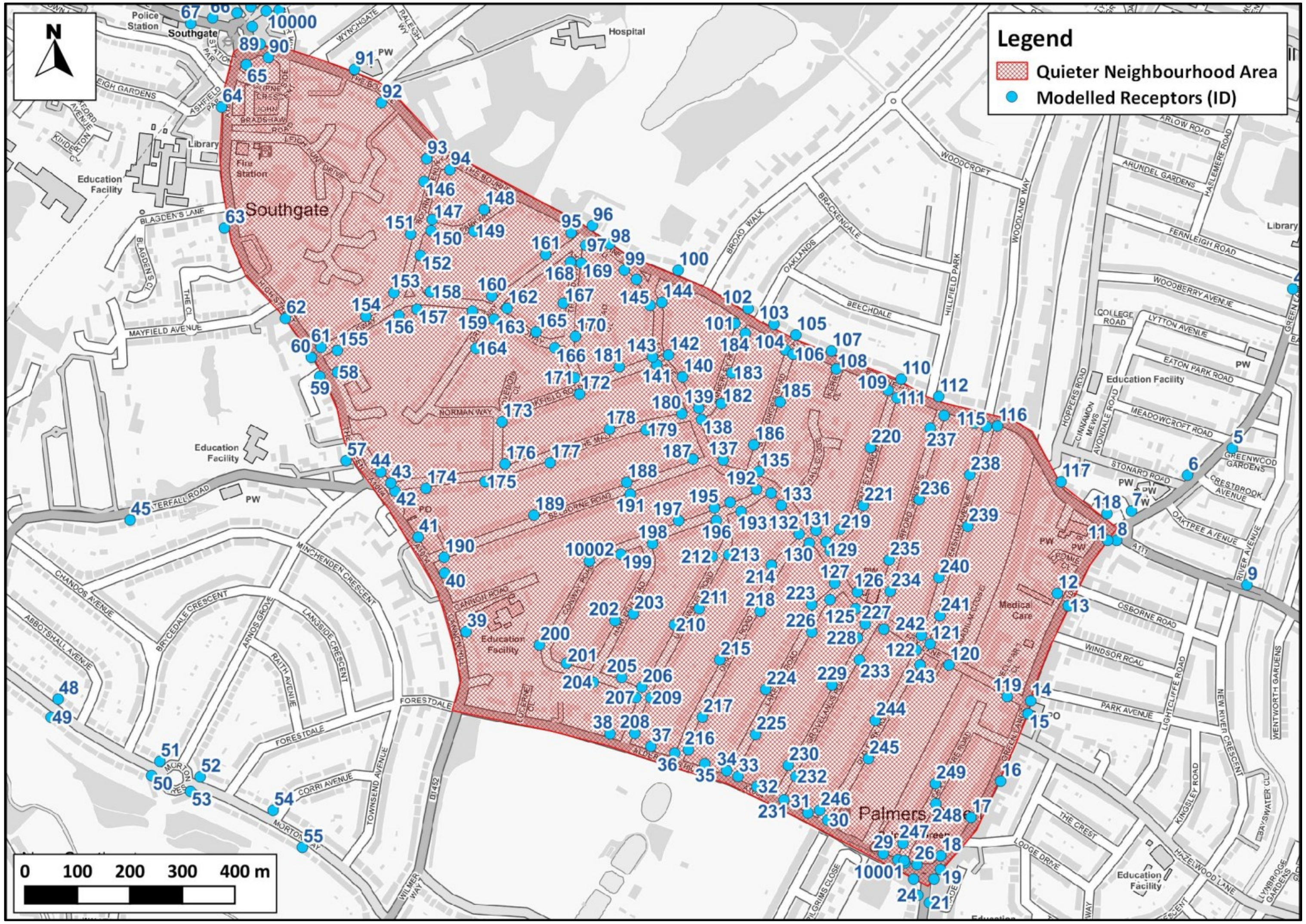

Figure A1.2: Modelled Receptors - Central

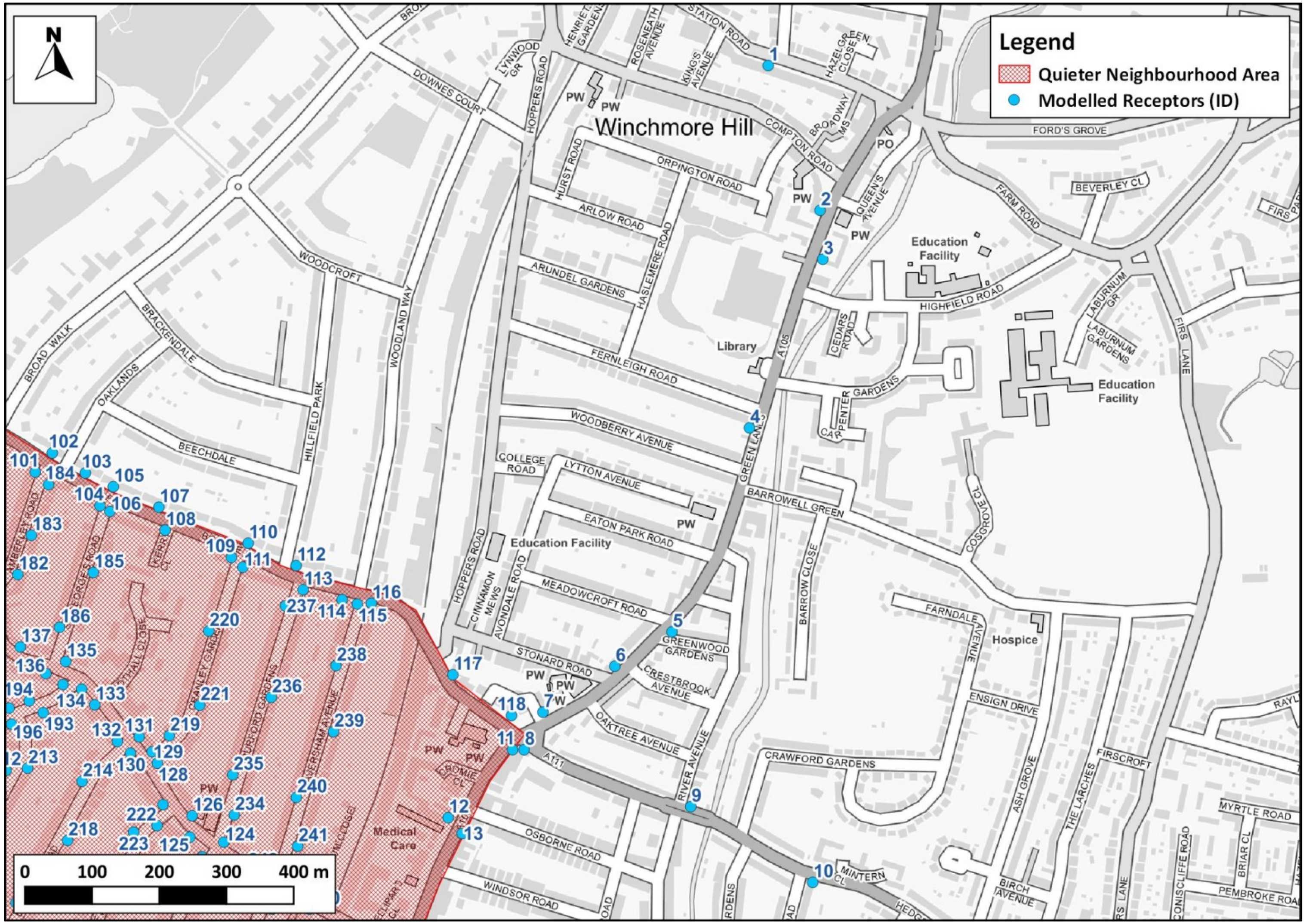

Figure A1.3: Modelled Receptors with Labels – North East

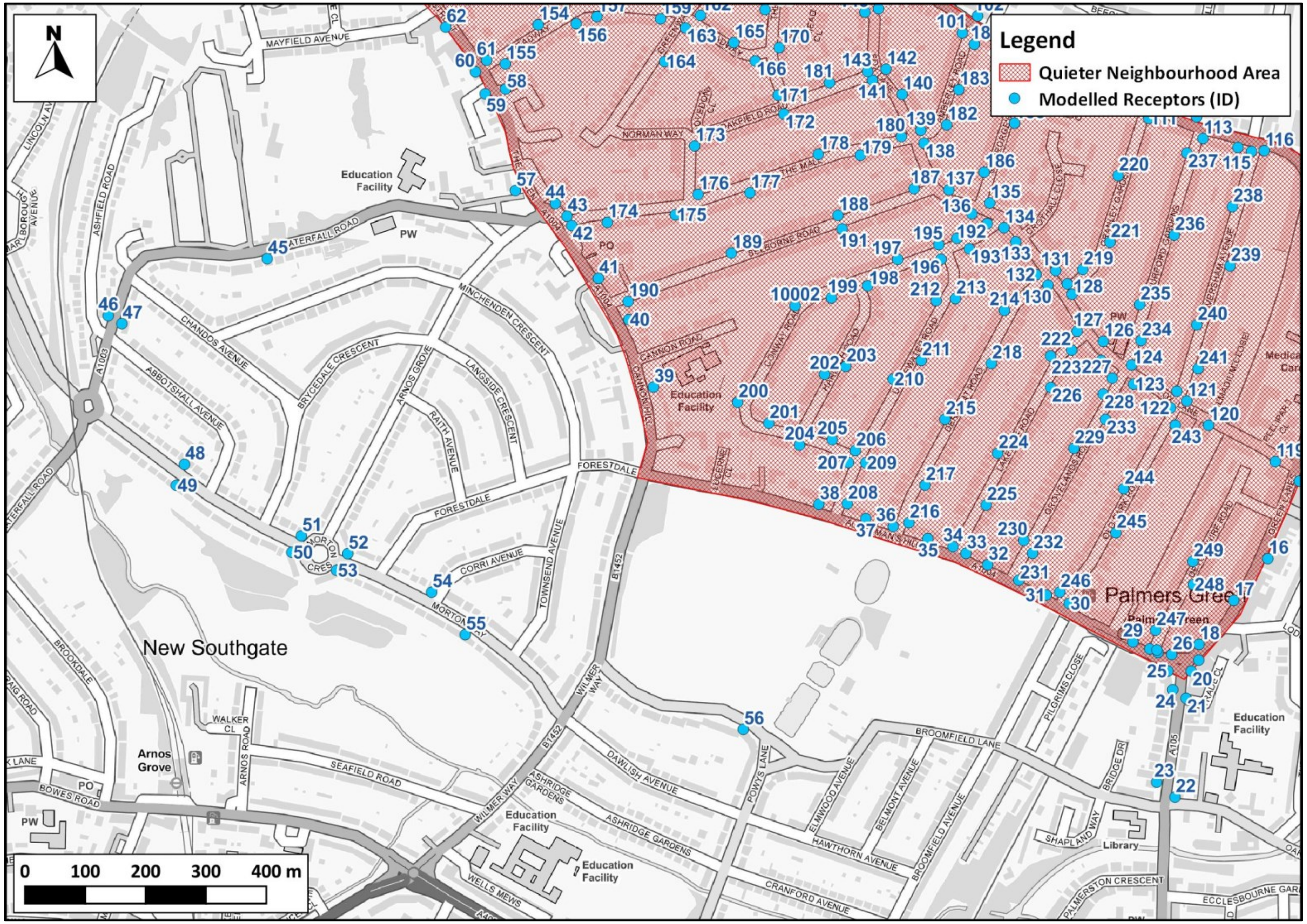

Figure A1.4: Modelled Receptors – South

A2 London-Specific Policies and Measures

London Environment Strategy

A2.1 The air quality chapter of the London Environment Strategy sets out three main objectives, each of which is supported by sub-policies and proposals. The Objectives and their sub-policies are set out below:

"Objective 4.1: Support and empower London and its communities, particularly the most disadvantaged and those in priority locations, to reduce their exposure to poor air quality.

- *Policy 4.1.1 Make sure that London and its communities, particularly the most disadvantaged and those in priority locations, are empowered to reduce their exposure to poor air quality*
- *Policy 4.1.2 Improve the understanding of air quality health impacts to better target policies and action*

Objective 4.2: Achieve legal compliance with UK and EU limits as soon as possible, including by mobilising action from London Boroughs, government and other partners

- *Policy 4.2.1 Reduce emissions from London's road transport network by phasing out fossil fuelled vehicles, prioritising action on diesel, and enabling Londoners to switch to more sustainable forms of transport […]*
- *Policy 4.2.4 The Mayor will work with the government, the London boroughs and other partners to accelerate the achievement of legal limits in Greater London and improve air quality*
- *Policy 4.2.5 The Mayor will work with other cities (here and internationally), global city and industry networks to share best practice, lead action and support evidence based steps to improve air quality*

Objective 4.3: Establish and achieve new, tighter air quality targets for a cleaner London by transitioning to a zero emission London by 2050, meeting world health organization health-based guidelines for air quality

- *Policy 4.3.1 The Mayor will establish new targets for $PM_{2.5}$ and other pollutants where needed. The Mayor will seek to meet these targets as soon as possible, working with government and other partners*
- *Policy 4.3.2 The Mayor will encourage the take up of ultra low and zero emission technologies to make sure London's entire transport system is zero emission by 2050 to further reduce levels of pollution and achieve WHO air quality guidelines*

- *Policy 4.3.3 Phase out the use of fossil fuels to heat, cool and maintain London's buildings, homes and urban spaces, and reduce the impact of building emissions on air quality*
- *Policy 4.3.4 Work to reduce exposure to indoor air pollutants in the home, schools, workplace and other enclosed spaces"*

A2.2 While the policies targeting transport sources are significant, there are less obvious ones that will also require significant change. In particular, the aim to phase out fossil-fuels from building heating and cooling and from Non-Road Mobile Machinery (NRMM) will demand a dramatic transition.

Low Emission Zone (LEZ)

A2.3 The LEZ was implemented as a key measure to improve air quality in Greater London. It entails charges for vehicles entering Greater London not meeting certain emissions criteria, and affects diesel-engined lorries, buses, coaches, large vans, minibuses and other specialist vehicles derived from lorries and vans. Since 1 March 2021, a standard of Euro VI has applied for HGVs, buses and coaches, while a standard of Euro 3 has applied for large vans, minibuses and other specialist diesel vehicles since 2012.

Ultra Low Emission Zone (ULEZ)

A2.4 London's ULEZ was introduced on 8 April 2019. The ULEZ currently operates 24 hours a day, 7 days a week in the same area as the current Congestion Charging zone. All cars, motorcycles, vans, minibuses are required to meet exhaust emission standards (ULEZ standards) or pay an additional daily charge to travel within the zone. The ULEZ standards are Euro 3 for motorcycles; Euro 4 for petrol cars, vans and minibuses and Euro 6 for diesel cars, vans and minibuses. The ULEZ does not include any requirements relating to heavy vehicle (HGV, coach and bus) emissions, as these are addressed by the amendments to the LEZ described in Paragraph A2.3.

A2.5 Since 25 October 2021, the ULEZ covers the entire area within the North and South Circular roads, applying the emissions standards set out in Paragraph A2.4.

Other Measures

A2.6 Since 2018, all taxis presented for licencing for the first time had to be zero emission capable (ZEC). This means they must be able to travel a certain distance in a mode which produces no air pollutants, and all private hire vehicles (PHVs) presented for licensing for the first time had to meet Euro 6 emissions standards. Since January 2020, all newly manufactured PHVs presented for licensing for the first time had to be ZEC (with a minimum zero emission range of 10 miles). The Mayor's aim is that the entire taxi and PHV fleet will be made up of ZEC vehicles by 2033.

A2.7 The Mayor has also proposed to make sure that TfL leads by example by cleaning up its bus fleet, implementing the following measures:

- TfL will procure only hybrid or zero emission double-decker buses from 2018;
- a commitment to providing 3,100 double decker hybrid buses by 2019 and 300 zero emission single-deck buses in central London by 2020;
- introducing 12 Low Emission Bus Zones by 2020;
- investing £50m in Bus Priority Schemes across London to reduce engine idling; and
- retrofitting older buses to reduce emissions (selective catalytic reduction (SCR) technology has already been fitted to 1,800 buses, cutting their NOx emissions by around 88%).

A3 EPUK & IAQM Planning for Air Quality Guidance

A3.1 The guidance issued by EPUK and IAQM (Moorcroft and Barrowcliffe et al, 2017) is comprehensive in its explanation of the place of air quality in the planning regime and contains impact descriptors for the assessment of significance.

A3.2 There is no official guidance in the UK in relation to development control on how to describe the nature of air quality impacts, nor how to assess their significance. The approach within the EPUK/IAQM guidance has, therefore, been used in this assessment. This approach involves a two-stage process:

- a qualitative or quantitative description of the impacts on local air quality arising from the development; and
- a judgement on the overall significance of the effects of any impacts.

Impact Descriptors

A3.3 Impact description involves expressing the magnitude of incremental change as a proportion of a relevant assessment level and then examining this change in the context of the new total concentration and its relationship with the assessment criterion. Table A3.1 sets out the method for determining the impact descriptor for annual mean concentrations at individual receptors, having been adapted from the table presented in the guidance document. For the assessment criterion the term Air Quality Assessment Level (AQAL) has been adopted, as it covers all pollutants, i.e. those with and without formal standards. Typically, as is the case for this assessment, the AQAL will be the air quality objective value. Note that impacts may be adverse or beneficial, depending on whether the change in concentration is positive or negative.

Table A3.1: Air Quality Impact Descriptors for Individual Receptors for All Pollutants [a]

Long-Term Average Concentration At Receptor In Assessment Year [b]	Change in concentration relative to AQAL [c]				
	0%	1%	2-5%	6-10%	>10%
75% or less of AQAL	Negligible	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Negligible	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Negligible	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Negligible	Moderate	Substantial	Substantial	Substantial

[a] Values are rounded to the nearest whole number.

[b] This is the "Without Scheme" concentration where there is a decrease in pollutant concentration and the "With Scheme" concentration where there is an increase.

[c] AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'.

Assessment of Significance

A3.4 The guidance recommends that the assessment of significance should be based on professional judgement, with the overall air quality impact of the development described as either 'significant' or 'not significant'. In drawing this conclusion, the following factors should be taken into account:

- the existing and future air quality in the absence of the development;
- the extent of current and future population exposure to the impacts;
- the influence and validity of any assumptions adopted when undertaking the prediction of impacts;
- the potential for cumulative impacts and, in such circumstances, several impacts that are described as '*slight*' individually could, taken together, be regarded as having a significant effect for the purposes of air quality management in an area, especially where it is proving difficult to reduce concentrations of a pollutant. Conversely, a '*moderate*' or '*substantial*' impact may not have a significant effect if it is confined to a very small area and where it is not obviously the cause of harm to human health; and
- the judgement on significance relates to the consequences of the impacts; will they have an effect on human health that could be considered as significant? In the majority of cases, the impacts from an individual development will be insufficiently large to result in measurable changes in health outcomes that could be regarded as significant by health care professionals.

A3.5 The guidance is clear that other factors may be relevant in individual cases. It also states that the effect on the residents of any new development where the air quality is such that an air quality objective is not met will be judged as significant. For people working at new developments in this situation, the same will not be true as occupational exposure standards are different, although any assessment may wish to draw attention to the undesirability of the exposure.

A3.6 A judgement of the significance should be made by a competent professional who is suitably qualified. A summary of the professional experience of the staff contributing to this assessment is provided in Appendix A4.

A4 Professional Experience

[redacted], BSc (Hons) MSc PhD CSci MIEnvSc MIAQM

[redacted] is an Associate Director with AQC, with more than 20 years' relevant experience. She has been involved in air quality management and assessment, and policy formulation in both an academic and consultancy environment. She has prepared air quality review and assessment reports, strategies and action plans for local authorities and has developed guidance documents on air quality management on behalf of central government, local government and NGOs. She has led on the air quality inputs into Clean Air Zone feasibility studies and has provided support to local authorities on the integration of air quality considerations into Local Transport Plans and planning policy processes. [redacted] has appraised local authority air quality assessments on behalf of the UK governments, and provided support to the Review and Assessment helpdesk. She has carried out numerous assessments for new residential and commercial developments, including the negotiation of mitigation measures where relevant. She has also acted as an expert witness for both residential and commercial developments. She has carried out BREEAM assessments covering air quality for new developments. [redacted] has also managed contracts on behalf of Defra in relation to allocating funding for the implementation of air quality improvement measures. She is a Member of the Institute of Air Quality Management, Institution of Environmental Sciences and is a Chartered Scientist.

[redacted], MSci PhD MIEnvSc MIAQM

[redacted] is a Senior Consultant with AQC with over eight years' relevant experience. Prior to joining AQC, she spent four years carrying out postgraduate research into atmospheric aerosols at the University of Bristol. [redacted] has experience preparing air quality assessments for a range of projects, including residential and commercial developments, road traffic schemes, energy centres, energy from waste schemes and numerous power generation schemes. She has experience in producing air quality assessments for EIA schemes, and has also assessed the impacts of Local Plans on designated ecological areas, prepared Annual Status Reports for Local Authorities, and undertaken diffusion tube monitoring studies. She is a Member of both the Institute of Air Quality Management and the Institution of Environmental Sciences.

[redacted], MChem (Hons) AMIEnvSc AMIAQM

[redacted] is a Senior Consultant with AQC, having joined the company in November 2017. She has carried out assessments of air quality impacts for a range of projects, including EIA schemes, residential, commercial and mixed-use schemes, energy centres and power generation schemes. [redacted] has also prepared construction dust risk assessments, Air Quality Neutral assessments, local authority Annual Status Reports (ASRs) and odour assessments. She has carried out numerous passive nitrogen dioxide monitoring surveys, and construction dust monitoring, at sites across Greater London.

A5 Modelling Methodology

Model Inputs

A5.1 Predictions have been carried out using the ADMS-Roads dispersion model (v5). The model requires the user to provide various input data, including emissions from each section of road and the road characteristics (including road width, street canyon width, street canyon height and porosity, where applicable). Vehicle emissions have been calculated based on vehicle flow, composition and speed data using the EFT (Version 10.1) published by Defra (2022)[4]. Model input parameters are summarised in Table A5.1 and, where considered necessary, discussed further below.

Table A5.1: Summary of Model Inputs

Model Parameter	Value Used
Terrain Effects Modelled?	No
Variable Surface Roughness File Used?	No
Urban Canopy Flow Used?	No
Advanced Street Canyons Modelled?	Yes
Noise Barriers Modelled?	No
Meteorological Monitoring Site	London City Airport
Meteorological Data Years	2019
Dispersion Site Surface Roughness Length (m)	1.0
Dispersion Site Minimum MO Length (m)	75
Met Site Surface Roughness Length (m)	0.2
Met Site Minimum MO Length (m)	75
Gradients?	No

Traffic Data

A5.2 Traffic counts over two separate seven-day periods in March 2019 (prior to scheme implementation) and September 2021 (post-scheme implementation) were commissioned by LB Enfield. The raw traffic data were processed into the appropriate format for air quality modelling through adjustments to represent an AADT flow by NRP Ltd (as described in Section 3).

Fleet Composition

A5.3 The emissions calculated within the model are calculated by vehicle type, split by heavy duty vehicle (HDV) and light duty vehicle (LDV). These are split by being over/under 3.5 tonnes. The ATC data apportions the vehicle counts into a series of categories, based on axle number, length and weight. Data provided by NRP Ltd were, therefore, split into the relative proportions of HDVs and LDVs for input into the dispersion model.

Time Varying Emissions

A5.4 As counts were available at each ATC for 15-minute periods, hourly variations in traffic flow specific to each modelled road were input into the model. This allowed for the potential capture of the scheme's impact on daily flow variation to be taken account of, as profiles specific to the pre- and post- scheme conditions were used. Examples of these time varying emission factors are provided in Figure A5.1.

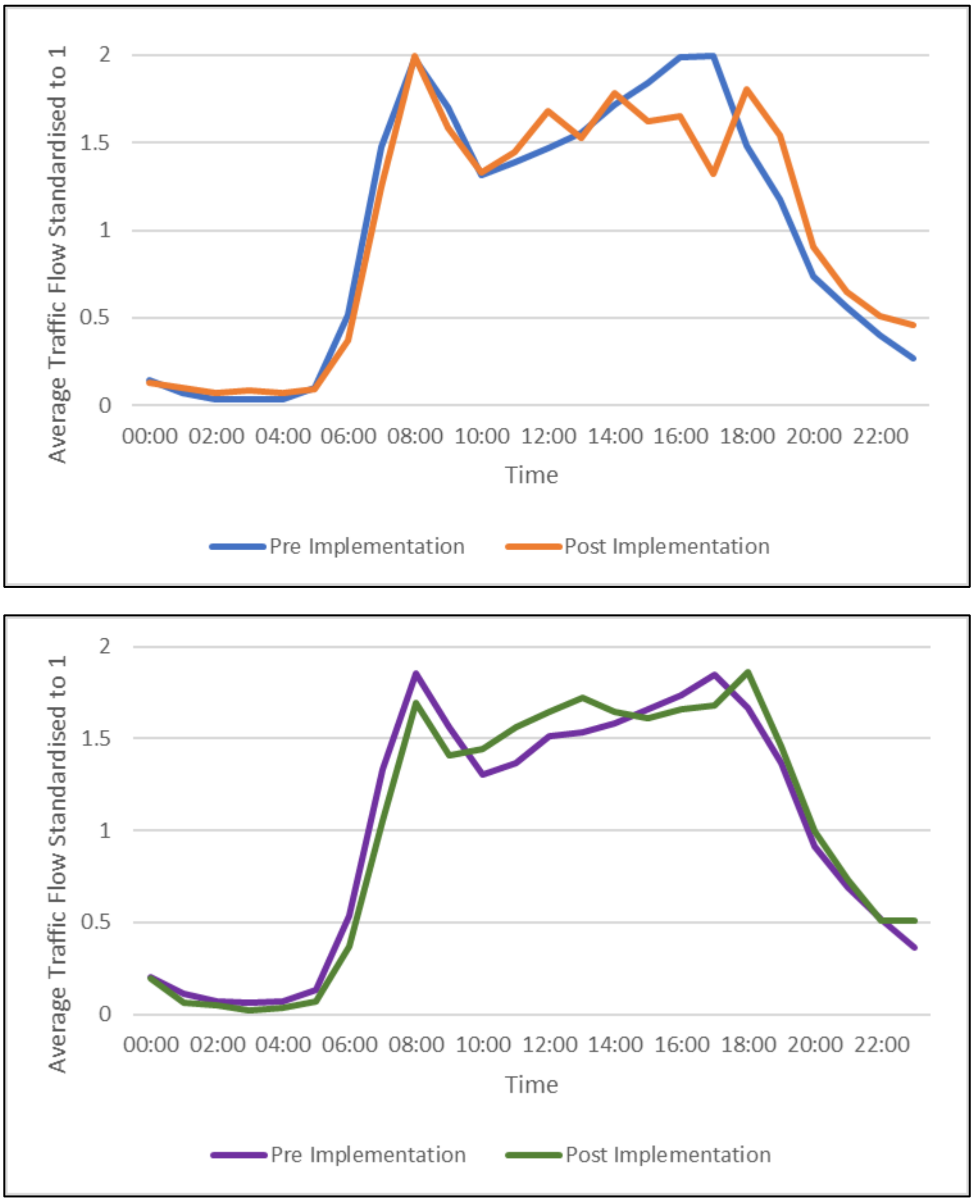

Figure A5.1: Average Time Varying Emission Factors[7] for ATC4 (Amberley Road), Top, and ATC13 (Fox Lane), Bottom, Before and After the Implementation of the Quieter Neighbourhood Scheme.

7 The y-axis represents the average traffic flow across the 7 days of traffic data capture, at each hour, standardised to 1.

A5.5 While the effect of the scheme on daily total traffic volumes has, as far as possible, been isolated from other concurrent drivers of change, it has not been possible to separate the effect of external factors, such as seasonal effects and changes to behaviour as a result of Covid-19, from those of the scheme on the distribution of traffic flows throughout the day.

Missing Data

A5.6 There were a number of ATCs which had periods of data missing. This is not unusual and could be due to cars parked on the device's tube for long periods of time. A judgment was made as to whether periods of missing data were genuine (such as periods of zero flows on residential streets between midnight and early morning), or whether they were a result of a fault with the ATC.

A5.7 Where data were identified as missing periods, these were 'patched' based on an average profile generated from profiles with full data capture. Separate average profiles were generated to patch internal residential roads and external key distributor roads, and for each assessment scenario (pre and post implementation). Once the missing data had been patched, the profiles were re-standardised to one for consistency with complete diurnal profiles.

A5.8 There were no external roads with missing data. A list of ATCs for the internal roads with missing data are provided in Table A5.2; in most cases several hours were missing, rather than complete days.

Table A5.2: Summary of Missing Data in Traffic Counts on Internal Roads

Scenario	Internal Roads
Pre-Implementation	Site 3, on Thursday and Friday Site 6, on Tuesday Site 8, Thursday through to Sunday Site 9, Monday through to Wednesday Site 10, Monday through to Thursday Site 15, Tuesday to Thursday Site 18, Thursday Site 21, Wednesday, Thursday and Sunday Site 23, Wednesday to Thursday Site 26, Monday, Thursday and Friday Site 31, Tuesday to Wednesday and Friday to Saturday Site 34, Tuesday and Sunday
Post Implementation	Site 3, on Saturday Site 11, Tuesday, Wednesday and Saturday Site 19, on Tuesday Site 26, on several days Site 32, on Thursday Site 35, on Wednesday

Data Summary

A5.9 The traffic data used in this assessment are summarised in Table A5.3. Although data in 2019 and 2021 were collected by the same contractor, count point locations were provided with different IDs in each scenario. Throughout this report, cross references to traffic count point locations have been made to the 2019 IDs, however, for consistency with the Post Scheme Monitoring Data Analysis Report completed by NRP Ltd, Table A5.3 also provides the 2021 ID.

Table A5.3: Summary of Annualised Traffic Data used in the Assessment

Road Name	ATC ID		2019		2021 Without Scheme		2021 With Scheme	
	2019	2021	AADT	%HDV	AADT	%HDV	AADT	%HDV
Key Distributor (External) Roads								
Avenue Road	14	1	10,359	3.2	10,359	3.2	10,757	7.5
Chase Side	16	2	19,976	5.3	19,976	5.3	19,027	8.0
Chase Road	15	3	9,477	5.6	9,477	5.6	8,902	8.6
Winchmore Hill Road	17	14	11,985	4.0	11,985	4.0	13,220	7.6
Station Road	27	13	9,499	2.0	9,499	2.0	7,021	5.3
The Bourne	28	5	18,012	4.2	18,012	4.2	19,113	8.2
High Street	29	4	17,447	6.2	17,447	6.2	19,401	8.3
Waterfall Road	30	6	11,107	3.7	11,107	3.7	7,882	8.1
Morton Way	31	7	6,727	3.5	6,727	3.5	7,250	8.6
Powys Lane	37	8	15,187	3.2	15,187	3.2	12,790	8.1
Aldermans Hill	38	9	12,894	3.6	12,894	3.6	13,304	8.1
Green Lanes (South of Oakthorpe Road)	42	45	15,225	4.2	15,225	4.2	15,679	6.7
Green Lanes at Park Avenue	43	10	17,124	4.8	17,124	4.8	17,705	8.1
Green Lanes at River Avenue	44	12	16,514	4.5	16,514	4.5	15,926	8.7
Hedge Lane	45	11	19,550	2.7	19,550	2.7	19,219	9.5
Internal Roads								
Devonshire Road	3	35	918	5.2	918	5.2	1,192	7.2
Amberley Road	4	37	3,616	3.3	3,616	3.3	602	6.0
Bourne Avenue	5	20	2,046	23.4	2,046	23.4	521	7.8
Burford Gardens	6	40	939	5.4	939	5.4	440	10.8
Canon Road	7	7	293	2.8	293	2.8	293	2.8
Caversham Avenue	8	41	1,733	6.8	1,733	6.8	843	9.9

Road Name	ATC ID		2019		2021 Without Scheme		2021 With Scheme	
	2019	2021	AADT	%HDV	AADT	%HDV	AADT	%HDV
Conway Road	10	28	376	4.9	376	4.9	306	10.0
Cranley Gardens	11	39	747	22.0	747	22.0	617	24.7
Derwent Road	12	31	944	6.4	944	6.4	635	8.0
Fox Lane	13	36	6,287	6.4	6,287	6.4	1,120	16.3
Fox Lane	15	42	5,029	5.6	5,029	5.6	738	9.8
Greenway	17	23	2,895	8.4	2,895	8.4	683	8.2
Grovelands Road	19	33	1,435	5.7	1,435	5.7	263	9.0
Harlech Road	20	29	371	6.4	371	6.4	435	7.8
Lakeside Road	21	32	961	5.9	961	5.9	503	9.3
Meadway	22	19	4,981	7.2	4,981	7.2	234	6.6
Meadway	23	22	3,046	8.0	3,046	8.0	433	9.3
Oakfield Road	25	25	497	4.0	497	4.0	331	8.5
Old Park Road	26	34	2,870	7.5	2,870	7.5	619	11.1
Parkway	27	21	252	8.1	252	8.1	136	15.1
Ridgeway	28	24	247	7.3	247	7.3	300	6.4
Selborne Road	30	27	2,057	2.8	2,057	2.8	513	8.1
St George's Road	32	38	1,449	5.1	1,449	5.1	553	8.5
The Mall	34	26	3,868	5.0	3,868	5.0	819	9.2
Ulleswater Road	35	30	824	39.4	824	39.4	443	10.3

A5.10 Figure A5.2 and Figure A5.3 show the road network included within the model, both pre-and post-implementation of the scheme. Figure A5.2 shows the average pre-implementation speeds at which each link was modelled, whereas Figure A5.3 shows the average post-implementation speeds for each modelled road link.

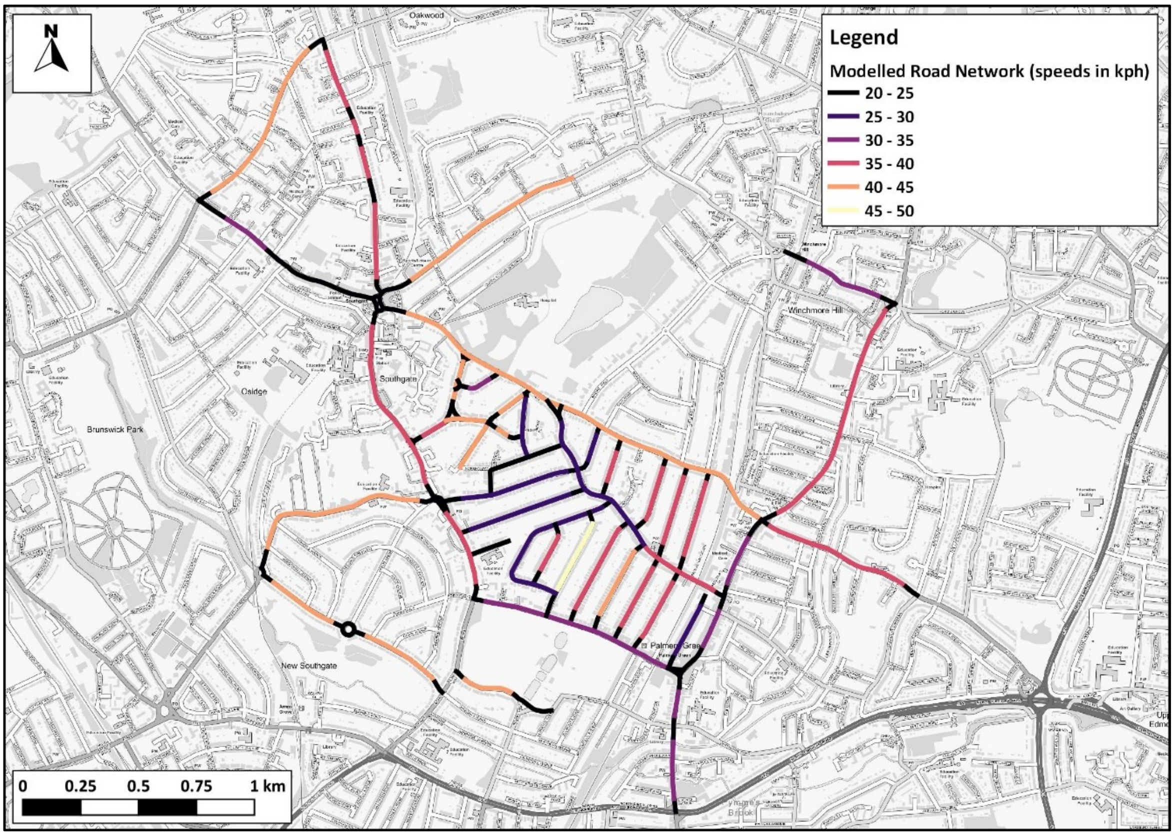

Figure A5.2: Modelled Road Network & Speeds (kph) – Pre-implementation of Scheme

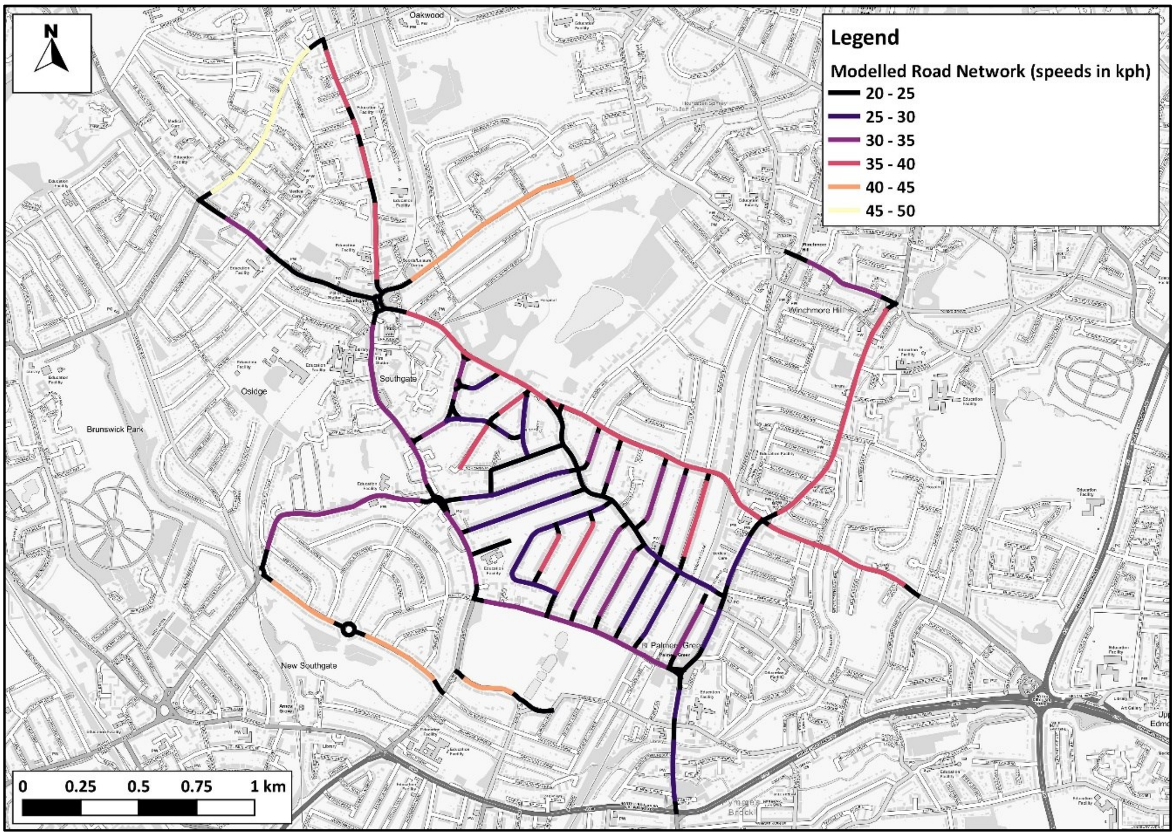

Figure A5.3: Modelled Road Network & Speeds (kph) – Post-implementation of Scheme

Street Canyons

A5.11 For the purposes of modelling, it has been assumed that all of the roads within the study area are within street canyons formed by the building facades on either side of the roads. These have a number of canyon-like features, which reduce dispersion of traffic emissions, and can lead to concentrations of pollutants being higher here than they would be in areas with greater dispersion. All roads have, therefore, been modelled as street canyons using ADMS-Roads' advanced canyon module, with appropriate input parameters determined from plans and local mapping.

Model Verification

A5.12 In order to ensure that ADMS-Roads accurately predicts local concentrations, it is necessary to verify the model against local measurements. The model has been run to predict annual mean NO_2 concentrations during 2019 at the LB Enfield diffusion tube monitoring sites 'Enfield 2' and 'Enfield 4'.

NO_2

A5.13 Most NO_2 is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions of nitrogen oxides (NOx = NO + NO_2).

A5.14 The model output of road-NOx (i.e. the component of total NOx coming from road traffic) has been compared with the 'measured' road-NOx. Measured road-NOx has been calculated from the measured NO_2 concentration and the predicted background NO_2 concentration using the NOx from NO_2 calculator (Version 8.1) available on the Defra LAQM Support website (Defra, 2022).

A5.15 The unadjusted model has over-predicted the road-NOx contribution as the initial model adjustment factor is less than 1 (0.8815, see Figure A5.4). Therefore, to allow for a conservative assessment, the model outputs have remained unadjusted (i.e. applying an adjustment factor of 1).

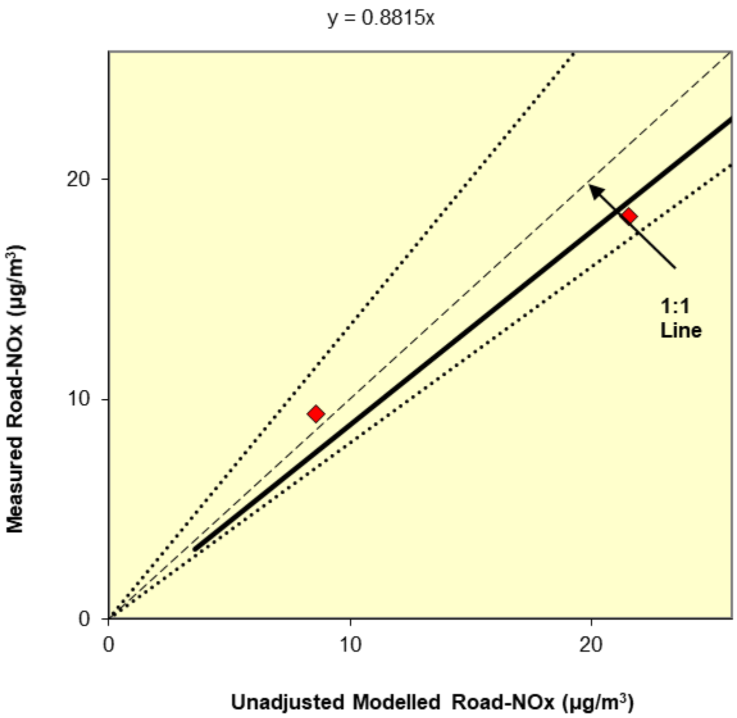

Figure A5.4: Comparison of Measured Road NOx to Unadjusted Modelled Road NOx Concentrations. The dashed lines show ± 25%.

PM_{10} and $PM_{2.5}$

A5.16 The approach described above for NOx and NO_2 determines the road increment of concentrations by subtracting the predicted local background from the roadside measurements. This works well for NOx because the differences between roadside and background concentrations typically represent a large proportion of the total measured value. The same is not true for PM_{10} and $PM_{2.5}$ concentrations, which are dominated by non-road emissions, even at the roadside. In practice, the influence of a local road on concentrations can often be smaller than the uncertainty in the mapped background concentration. As an example of this, 31% of all roadside and kerbside sites in London which measured $PM_{2.5}$ in 2019 with >75% data capture, recorded an annual mean concentration lower than the equivalent Defra mapped background value. Using measured background concentrations does not provide any significant benefit, owing largely to the spatial resolution of available measurements, but also because of measurement uncertainty. For example, hourly-mean $PM_{2.5}$ concentrations measured at roadside sites are often lower than those measured at nearby urban background sites, while concentrations at urban background sites are often lower than those measured at rural sites.

A5.17 For these reasons, it is not appropriate to calculate the annual mean road-increment to PM_{10} and $PM_{2.5}$ concentrations by subtracting either the mapped background or a local measured background concentration. This, in turn, means that the approach to model adjustment which is described for NOx and NO_2 is not appropriate for PM_{10} and $PM_{2.5}$. Historically, many studies have derived a model adjustment factor for NOx and applied this to PM_{10} and $PM_{2.5}$. This is also not appropriate, since there is no reason to expect the same bias in emissions of NOx, PM_{10} and $PM_{2.5}$.

A5.18 While there is very strong evidence that EFT-based models have consistently under-predicted road-NOx concentrations in urban areas, there is no equivalent evidence for PM_{10} and $PM_{2.5}$. There is currently no strong basis for applying any adjustment to the model outputs. Predicted concentrations of PM_{10} and $PM_{2.5}$ have thus also not been adjusted.

Post-processing

A5.19 The model predicts road-NOx concentrations at each receptor location. These concentrations along with the background NO_2, has been processed through the NOx to NO_2 calculator available on the Defra LAQM Support website (Defra, 2022). The traffic mix within the calculator has been set to “All London traffic”, which is considered suitable for the study area. The calculator predicts the component of NO_2 based on the adjusted road-NOx and the background NO_2.