



AIR QUALITY IMPACT ASSESSMENT

AT: Holiday Inn Express - Manchester

CLIENT: August Consulting Group Ltd

DATE: January 2024

STROMA PROJECT REF: PR-A482

Please find below the link to the online feedback form:

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1 INTRODUCTION

1.1 Scope

Stroma Built Environment Ltd has been commissioned to undertake an air quality impact assessment based on the potential impacts of existing and future traffic levels on the proposed Holiday Inn Express extension. The pollutants modelled as part of this assessment are nitrogen oxides (NO_x) and particulate matter (PM₁₀).

The impacts of vehicle emissions have been assessed using the techniques detailed within the 'LA105 Air Quality' of the Design Manual for Roads and Bridges (DMRB)¹ and the Local Air Quality Management Technical Guidance (LAQM.TG22)². The impact of road traffic emissions will be assessed using the ADMS-Roads air dispersion model. This model has been devised by Cambridge Environmental Research Consultants (CERC) and is described as a "comprehensive tool for investigating air pollution problems due to small networks of roads".

It should be noted that the short-term impacts of NO₂ and PM₁₀ emissions have not been modelled as dispersion models are inevitably poor at predicting short-term peaks in pollutant concentrations, which are highly variable from year to year, and from site to site. Notwithstanding this, general assumptions have been made about short term concentrations based on the modelled annual mean concentrations.

An assessment on the potential impact on local air quality from demolition and construction activities at the site has not been undertaken as the necessary information was unavailable at the time of reporting.

1.2 Site Description

The proposed development site is located on the corner of Oxford Road and Hulme Street in Manchester. A location plan can be found in Figure 1.

Figure 1 – Site Location Plan



¹ Design Manual for Roads and Bridges, Sustainability & Environment Appraisal LA 105 Air Quality

² Part IV of the Environment Act 2021, Local Air Quality Management Technical Guidance (TG22), Defra, August 2022

2 POLLUTANTS & LEGISLATION

2.1 Pollutant Overview

In most urban areas of the UK, traffic generated pollutants have become the most common pollutants. These are nitrogen dioxide (NO₂), fine particulates (PM₁₀), carbon monoxide (CO), 1,3-butadiene and benzene, as well as carbon dioxide (CO₂). This air quality assessment focuses on NO₂ and PM₁₀, as these pollutants are least likely to meet their Air Quality Strategy objectives near roads. Table 1 provides an overview of NO₂ and PM₁₀.

Table 1 – Overview of NO₂ and PM₁₀

Pollutant	Properties	Anthropogenic Sources	Natural Sources	Potential Effects
Particles (PM₁₀)	Tiny particulates of solid or liquid nature suspended in the air	Road transport; Power generation plants; Production processes e.g. windblown dust	Soil erosion; Volcanoes; Forest fires; Sea salt crystals	Asthma; Lung cancer; Cardiovascular problems
Nitrogen Dioxide (NO₂)	Reddish-brown coloured gas with a distinct odour	Road transport; Power generation plants; Fossil fuels – extraction & distribution; Petroleum refining	No natural sources, although nitric oxide (NO) can form in soils	Pulmonary edema; Various environmental impacts e.g. acid rain

2.2 Air Quality Strategy

The UK Government and the devolved administrations published the latest Air Quality Strategy for England on 28 April 2023³. The Strategy provides an over-arching strategic framework for air quality management in the UK.

With regards to this assessment, the Air Quality Strategy contains national air quality standards and objectives established by the Government to protect human health. The objectives for nitrogen dioxide and particulates (PM₁₀ and PM_{2.5}) have been set, along with seven other pollutants (benzene, 1,3-butadiene, carbon monoxide, lead, PAHs, sulphur dioxide and ozone). Those which are limit values required by EU Daughter Directives on Air Quality have been transposed into UK law through the Air Quality Standards Regulations 2016 which came into force on 31st December 2016. Table 2 provides the UK Air Quality Objectives for NO₂ and PM₁₀.

³ Air Quality Strategy: framework for local authority, 28 April 2023

Table 2 – UK Air Quality Objectives for Nitrogen Dioxide and Particulate Matter

Pollutant	Objective	Concentration measured as
Nitrogen Dioxide (NO₂)	200µg/m ³ not to be exceeded more than 18 times a year	1 hour mean
	40µg/m ³	Annual mean
Particles (PM₁₀)	50µg/m ³ not to be exceeded more than 35 times a year	24 hour mean
	40µg/m ³	Annual mean
Particles (PM_{2.5})	25µg/m ³ (except Scotland)	Annual Mean

Objectives for PM_{2.5} were also introduced by the UK Government and the Devolved Administrations in 2010. However, these are not included in Regulations as the Air Quality Strategy has adopted an “exposure reduction” approach for PM_{2.5} in order to seek a more efficient way of achieving further reductions in the health effects of air pollution by providing a driver to improve air quality everywhere in the UK rather than just in a small number of localised hotspot areas.

As defined in Table 4, background PM_{2.5} concentrations are well below the limit value of 25 µg/m³. As such, no further consideration has been given to PM_{2.5} within this assessment.

2.3 Local Air Quality Management (LAQM)

At the core of LAQM delivery are three pollutant objectives; these are: nitrogen dioxide (NO₂), particulate matter (PM₁₀) and sulphur dioxide (SO₂). All current Air Quality Management Areas (AQMAs) across the UK are declared for one or more of these pollutants, with NO₂ accounting for the majority. It is a statutory requirement for local authorities to regularly review and assess air quality in their area and take action to improve air quality when objectives set out in regulation cannot be met.

2.3.1 Manchester City Council

Manchester City Council has declared an Air Quality Management Area (AQMAs) covering Manchester City Centre, the area around Manchester Airport and the main links into the city. This was amended in 2016 to reduce some of the areas affected but the core principles of affected areas remain consistent. As such, the proposed development is located within an AQMA.

3 PLANNING POLICY & GUIDANCE

3.1 National Planning Policy & Guidance

3.1.1 National Planning Policy Framework

On a national level, air quality can be a material consideration in planning decisions. The National Planning Policy Framework (NPPF)⁴ for England, revised and released on 5th September 2023, is considered a key part of the Governments reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth. The NPPF replaces the Planning Policy Statement 23 (PPS23) Planning and Pollution Control⁵.

Paragraph 174 within the NPPF states that “planning policies and decisions should contribute to and enhance the natural and local environment” and that developments “should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans”

It goes on to state in paragraph 186 that “planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan”.

3.1.2 Planning Practise Guidance (PPG)

As defined within section 2, the UK Government has legally binding limits for concentrations of outdoor air pollutants. Development of any size can influence air quality through the construction and in use phases. The PPG for air quality outlines the considerations for developments in relation to air quality and the scenarios to be considered where appropriate.

Furthermore the PPG outlines that any new or existing development should not adversely affect the natural environment which encompasses air quality. Where there are opportunities to improve air quality or mitigate the impact, these should be identified and considered at the “plan-making stage”.

3.1.3 Land-Use Planning & Development Control

In January 2017, Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) produced guidance to ensure that air quality is adequately considered in the land-use planning and development control processes⁶.

The guidance document is particularly applicable to assessing the effect of changes in exposure of members of the public resulting from residential and mixed-use developments, especially those within urban areas where air quality is poorer. It is also relevant to other

⁴ National Planning Policy Framework, Department for Levelling Up, Housing & Communities, September 2023

⁵ Planning Policy Statement 23: Planning and Pollution Control, Office of the Deputy Prime Minister (ODPM), November 2004

⁶ Land-Use Planning & Development Control: Planning for Air Quality. Guidance from Environmental Protection UK and the Institute of Air Quality Management for the consideration of air quality within the land-use planning and development control processes. EPUK & IAQM. January 2017

forms of development where a proposal could affect local air quality and for which no other guidance exists.

3.1.4 Local Air Quality plan

The site location is in Manchester, which is part of the Greater Manchester Clean Air Plan. There are numerous goals set out which include:

- The plan will meet legal NO₂ limits on local roads by 2025
- Investment in electric buses and EV charging stations at bus depots
- Introducing a 'clean taxi fund'
- Traffic management measures

4 ASSESSMENT METHODOLOGY

4.1 Operational Phase

4.1.1 Modelled Scenarios

A modelled baseline year of 2019 has been used as this corresponds with the latest year of monitoring undertaken by the Council. The future year has also been chosen (2027) representing the first full year with the proposed development in place. Three scenarios have been adopted as part of the assessment. These are as follows:

- **Scenario 1** – existing levels of air quality / model verification (2019); and
- **Scenario 2** – future impact of traffic emissions on the proposed development i.e. introduction of new exposure (2027).
- **Scenario 3** – 2027 Future Baseline + Proposed Development

Predicted concentrations will be compared to the Air Quality Strategy objectives. Background pollutant concentrations and vehicle emission rates for all modelled years are based on the latest data issued by Defra. These background concentrations and emission factors are discussed further in the following sections.

4.1.2 ADMS-Roads

Modelling the impact of traffic emissions on the proposed development will be undertaken using the latest version of the ADMS-Roads model⁷. ADMS-Roads is significantly more advanced than that of most other air dispersion models in that it incorporates the latest understanding of the boundary layer structure, and goes beyond the simplistic Pasquill-Gifford stability categories method with explicit calculation of important parameters. The model uses advanced algorithms for the height-dependence of wind speed, turbulence and stability to produce improved predictions.

4.1.3 Emission Factors

Defra and the Devolved Administrations have provided an updated Emission Factors Toolkit (Version 12.0) which incorporates updated NO_x emissions factors and vehicle fleet information⁸. These emission factors have been integrated into the latest ADMS-Roads modelling software. However, in order to undertake a worst-case assessment emission factors for 2019 have been used for all modelled years.

4.1.4 Traffic Data

Traffic flow data has been provided by the DfT website and is summarised in Table 3. From this traffic data, roads which are changing by greater than 100AADT have been identified to obtain the 'Affected Road Network'. As projected traffic impacts on local links was unavailable, it has been assumed that the extension would generate 100AADT, which has been equally distributed on Oxford Street going north and south.

Roads around the verification locations will be modelled for the purposes of model verification. Baseline flows for these links have been downloaded from the Department for Transport (DfT). Baseline data has been projected to the model scenario years with the projection of traffic data undertaken using growth factors specific to Manchester, obtained from TEMPro11.

⁷ Model Version: 5.0.01. Interface Version 5.0.0.5313 (16/03/2020)

⁸ https://laqm.defra.gov.uk/documents/EFT2010_v12.0.xlsb

For the modelled speeds, the figures provided in Table 3 have been used. However, where a link approaches a junction a speed of between of 20 kmph has been modelled in order to represent queuing traffic at a junction. This is the approach recommended by the Local Air Quality Management Technical Guidance (LAQM.TG22) for modelling queuing traffic at junctions by way of reducing the modelled vehicle speeds.

Table 3 – Annual Average Daily Traffic Flows, Percentage HDV and Speeds for Modelled Roads

Modelled Year/ Scenario	Link	Future Baseline Flows			Future Baseline + Development Flows		
		24-Hr AADT	% HGV	Average Speed (kmph)	24-Hr AADT	% HGV	Average Speed (kmph)
First year of completion (2027)	Oxford Road	5,990	43.6	32	6,040	43.6	32
	Lower Mosley Street	18,421	3.5	48	18,446	3.5	48
	A57	65,297	3.8	80	65,297	3.8	80

4.2 Background Concentrations

Background NO_x, NO₂ and PM₁₀ concentrations have been obtained from Defra⁹. These 1 km x 1 km grid resolution maps are derived from a base year of 2018 (for NO_x, NO₂, PM₁₀ and PM_{2.5} only), which are then projected to future years up to 2030. Background concentrations of NO₂, PM₁₀ and PM_{2.5} derived from Defra are provided in Table 4.

Table 4 – Background NO_x, NO₂, PM₁₀ and PM_{2.5} Concentrations

Location	Pollutant	X	Y	2019
Proposed Development	NO ₂	384500	397500	28.3
	NO _x			44.5
	PM ₁₀			14.4
	PM _{2.5}			9.1

In order to undertake a worst-case assessment, 2019 background concentrations have been assumed for all modelled scenarios.

4.3 Surface Roughness

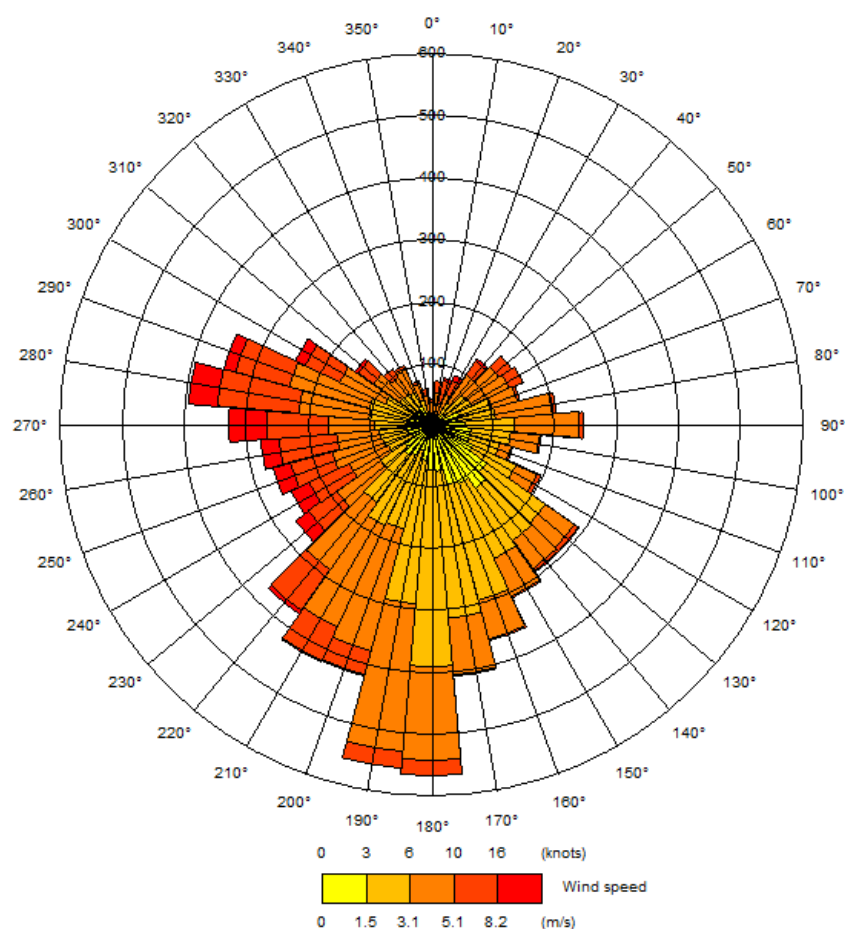
A surface roughness of 1.5 metre has been used in the model. This value is provided by ADMS-Roads as a typical roughness length for large urban areas. This value has been used across the modelled domain.

4.4 Meteorological Data

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

⁹ <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018>

Figure 2 – Wind Speed and Direction Data, Manchester Airport (2019)



4.5 Model Output

4.5.1 NO_x/NO₂ Relationship

Following recent evidence that shows the proportion of primary NO₂ in vehicle exhaust has increased¹⁰. As such, a new NO_x to NO₂ calculator has been devised¹¹. This new calculator has been used to determine NO₂ concentrations for this assessment, based on predicted NO_x concentrations using ADMS-Roads. Converted NO₂ concentrations are initially compared to local monitoring data in order to verify the model output. If the model performance is considered unacceptable then the NO_x concentrations are adjusted before conversion to NO₂.

4.5.2 Predicted Short Term Concentrations

As discussed in the introduction, it has not been possible to model the short-term impacts of NO₂ and PM₁₀. Research undertaken in 2003¹² has indicated that the hourly NO₂ objective is unlikely to be exceeded at a roadside location where the annual mean NO₂ concentration is less than 60 µg/m³.

¹⁰ Trends in Primary Nitrogen Dioxide in the UK, Air Quality Expert Group, 2007

¹¹ https://laqm.defra.gov.uk/documents/NOx_to_NO2_Calculator_v8.1.xlsm

¹² Analysis of Relationship between 1-Hour and Annual Mean Nitrogen Dioxide at UK Roadside and Kerbside Monitoring Sites, Laxen and Marnar, 2003

For PM₁₀, a relationship between the annual mean and the number of 24-hour mean exceedances has been devised and is as follows:

- No. 24-hour mean exceedances = $-18.5 + 0.00145 \times \text{annual mean}^3 + (206/\text{annual mean})$

This relationship has been applied to the modelled annual mean concentrations in order to estimate the number of 24-hourly exceedances.

4.5.3 Model Verification

The monitoring sites listed in Table 5 have been used for the purposes of model verification. These are the closest monitoring sites to the proposed development.

Table 5 – Modelled Verification Locations

Site ID	Location	X	Y	Height (m)
MA28NO	Ashton Old Road	387951	397430	3.0
MA29ANO	Oxford Street	384119	397503	3.0
MA71NO	Great Ancoats Street	385161	398290	3.0
MA82NO	Manchester Oxford Road	384239	397276	2.0
MA86ANO	Pottery Lane	387150	396808	3.0
MA95NO	Ashton Old Road	386668	397167	3.0
MA96NO	Ardwick Green	385189	397167	3.0

4.5.4 Receptor Locations

In order to assess the potential impact of the proposed development, receptor locations at the proposed development and receptors located on roads which are changing in traffic as result of the proposed development has been modelled. The location of these model points, together with their height above ground level is provided in Table 6 and represented in Figures 3 and 4.

Table 6 – Modelled Receptor Locations

Air Quality Assessment ID	X	Y	Height (m)
Proposed Development			
D1	384124	397403	37.5, 40.5
D2	384136	397409	37.5, 40.5
D3	384147	397415	37.5, 40.5
D4	384156	397423	37.5, 40.5
D5	384140	397430	37.5, 40.5
D6	384135	397423	37.5, 40.5
Existing Receptors			
E1	384068	397637	1.5, 4.5, 7.5
E2	384089	397555	1.5, 4.5, 7.5
E3	384135	397513	1.5, 4.5, 7.5
E4	384144	397452	1.5, 4.5, 7.5
E5	384197	397404	1.5, 4.5, 7.5
E6	384198	397349	1.5, 4.5, 7.5

E7	384246	397317	1.5, 4.5, 7.5
E8	384235	397276	1.5, 4.5, 7.5
E9	384277	397253	1.5, 4.5, 7.5
E10	384265	397206	1.5, 4.5, 7.5
E11	384315	397175	1.5, 4.5, 7.5
E12	384305	397123	1.5, 4.5, 7.5
E13	384124	397403	1.5, 4.5, 7.5
E14	384136	397409	1.5, 4.5, 7.5
E15	384147	397415	1.5, 4.5, 7.5
E16	384156	397423	1.5, 4.5, 7.5
E17	384140	397430	1.5, 4.5, 7.5
E18	384135	397423	1.5, 4.5, 7.5

Figure 3 – Proposed Development modelled receptor locations

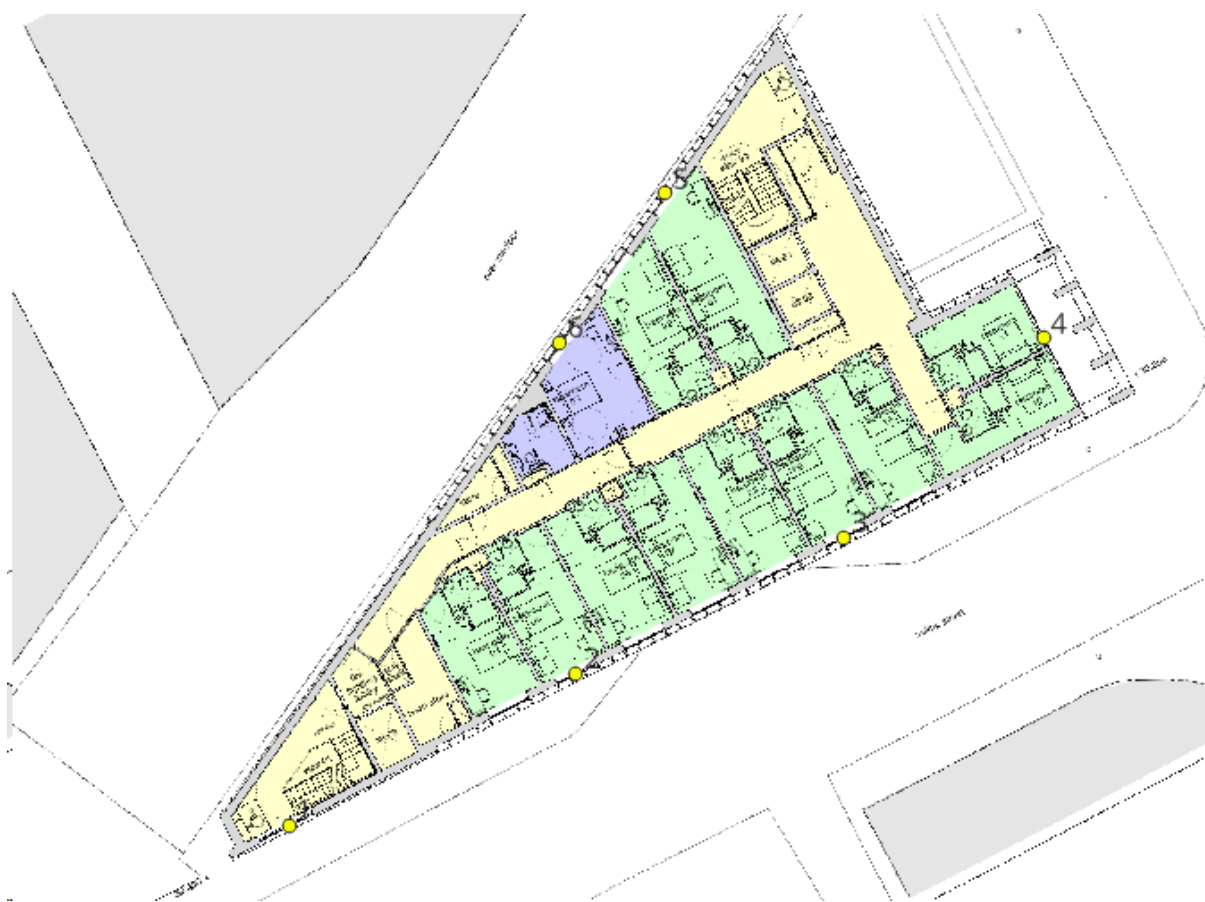
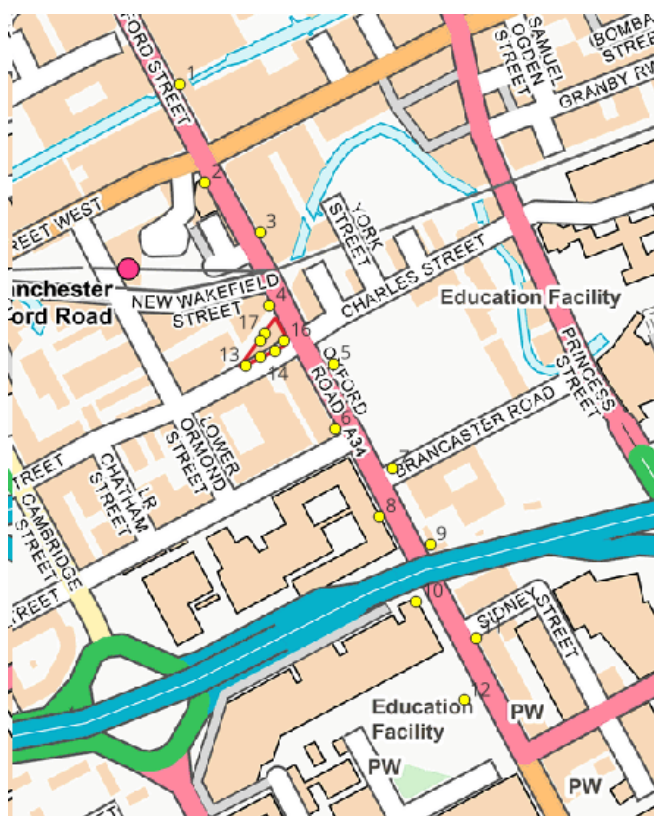


Figure 4 – Existing modelled receptor locations



4.6 Significance Criteria

4.6.1 Operational Phase

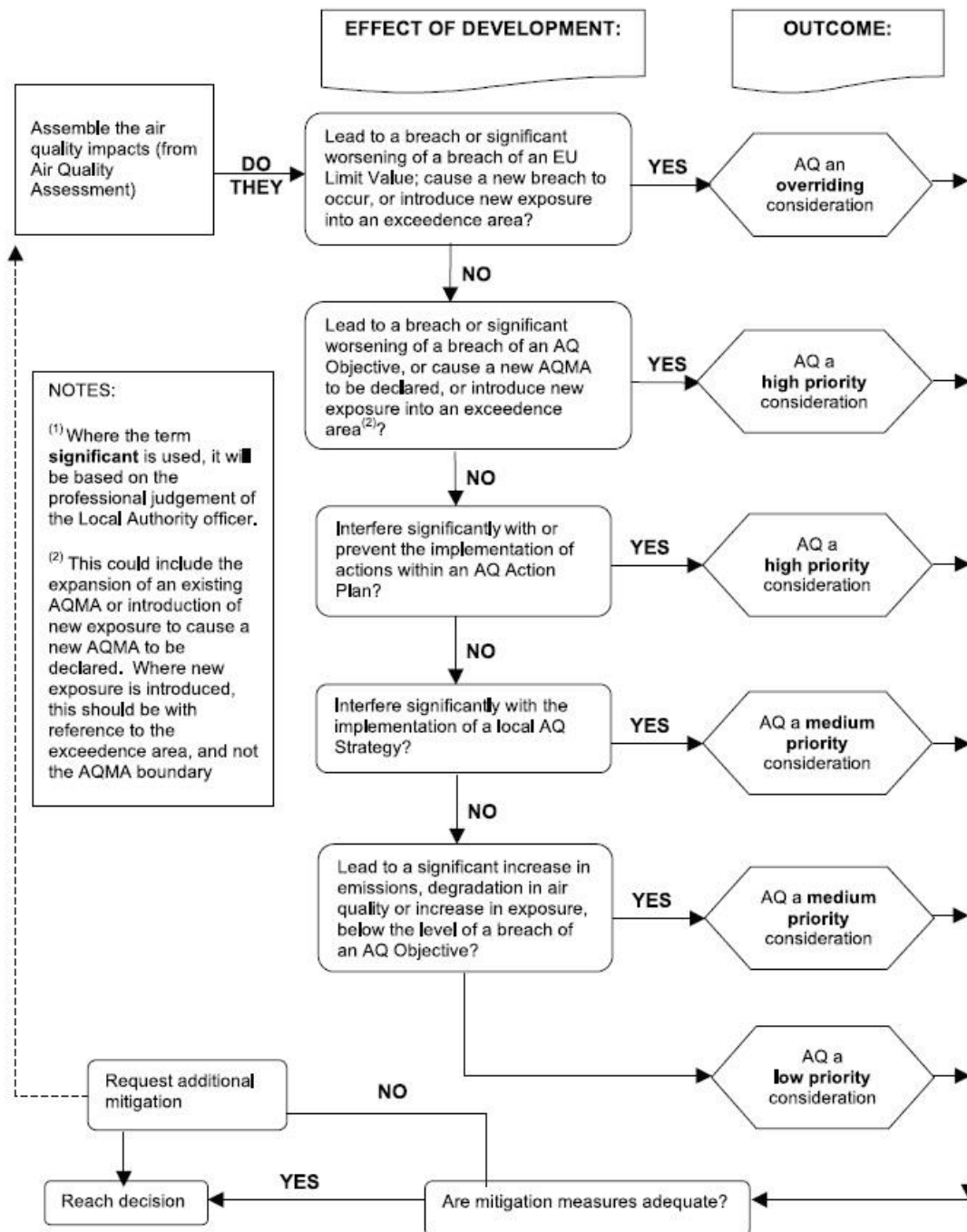
The guidance released by Environmental Protection UK (EPUK) provides steps for a Local Authority to follow in order to assess the significance of air quality impacts of a development proposal. This procedure, shown in Figure 5, will be applied to the modelled results.

The joint guidance released by EPUK and the IAQM provides impact descriptors for individual receptors. These descriptors are provided in Table 7.

Table 7 – Impact Descriptors for Individual Receptors

Long term average concentration at receptor in assessment year	% Change in concentration relative to AQ objective			
	1%	2-5%	6-10%	>10%
75% or less of AQ objective	Negligible	Negligible	Slight	Moderate
76-94% of AQ objective	Negligible	Slight	Moderate	Moderate
95-102% of AQ objective	Slight	Moderate	Moderate	Substantial
103-109% of AQ objective	Moderate	Moderate	Substantial	Substantial
110% or more of AQ objective	Moderate	Substantial	Substantial	Substantial

Figure 5 – Assessing the Significance of Air Quality Impacts of a Development Proposal



5 AIR QUALITY ASSESSMENT

5.1 Impact of Vehicle Emissions

5.1.1 Model Verification

Using the guidance provided within the Local Air Quality Management Technical Guidance TG(22), the modelled output has been verified against the monitoring data obtained from the site listed in Table 8. The following tables provide a summary of the model verification process for NO_x/NO₂ and PM₁₀ concentrations.

Table 8 – Comparison of Modelled and Monitored NO₂ Concentrations (µg/m³)

Verification Location	Modelled Concentration	Monitored Concentration	Difference [(modelled - monitored)/monitored] x100
MA28NO	26.0	36.1	-28.0%
MA29ANO	35.2	55.4	-36.4%
MA71NO	34.7	45.3	-23.5%
MA82NO	40.1	52.0	-22.9%
MA86ANO	26.9	33.6	-19.9%
MA95NO	32.4	43.4	-25.3%
MA96NO	31.1	46.0	-32.5%

As described in the Technical Guidance (LAQM.TG22), in order to provide more confidence in the model predictions and the decisions based on these, the majority of results should be within $\pm 25\%$ (ideally $\pm 10\%$) of the monitored concentrations. In order to improve the confidence in modelled concentrations across the modelled domain the model output has been adjusted. This is described further in the next section.

5.1.2 Model Adjustment

In order to undertake model adjustment, it is first necessary to derive the monitored and modelled road contributions of NO_x (excluding background). The modelled road contribution NO_x is taken directly from the ADMS-Roads output before it has been converted to NO₂ using the NO_x to NO₂ calculator described in Section 4.6.1. The NO_x to NO₂ calculator can also be used to derive monitored road contributions of NO_x from NO₂ diffusion tube results. A summary of these calculations is provided in Table 9.

Table 9 – Monitored NOx and NO₂ concentrations

Verification Location	Monitored Total NO ₂	Defra Background NO ₂	Monitored road contribution NO ₂ (total – background)	Monitored road contribution NOx (total – background)	Modelled road contribution NOx (excludes background)	Ratio of monitored road contribution NOx / modelled road contribution NOx
MA28NO	36.1	20.5	15.6	32.2	10.8	2.97
MA29ANO	55.4	28.2	27.2	61.9	14.3	4.32
MA71NO	45.3	23.4	21.9	47.4	23.0	2.06
MA82NO	52.0	28.2	23.8	53.2	24.9	2.14
MA86ANO	33.6	18.6	15.0	30.5	16.3	1.87
MA95NO	43.4	19.6	23.8	51.0	25.9	1.97
MA96NO	46.0	24.6	21.4	46.4	13.0	3.58

Once the monitored and modelled road contributions of NOx (excluding background) have been derived the contributions of NOx are compared and a ratio derived. In this case it is 2.355 and is used to adjust the modelled road contribution of NOx. This is shown in Table 10.

Figure 6 – Linear Regression of Modelled and Monitored NO₂

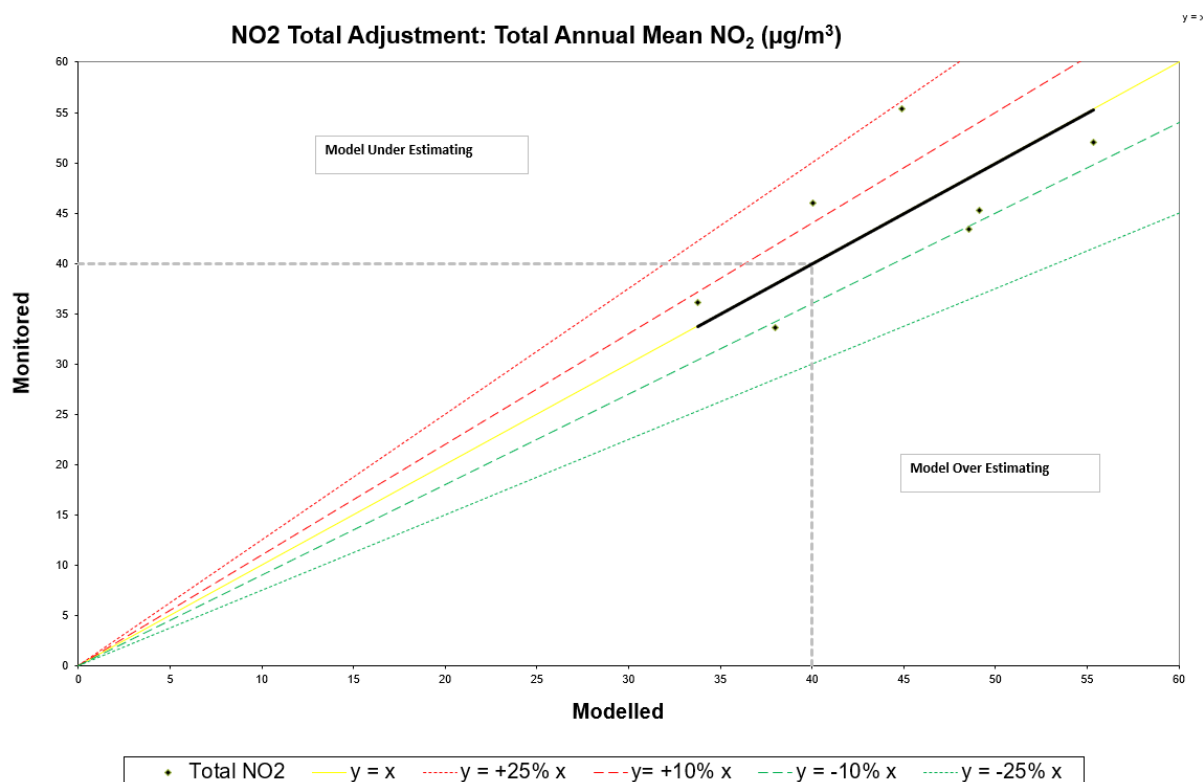


Table 10 – Adjustment of Modelled NO_x Contributions

Verification Location	Adjustment factor for modelled road contribution	Adjusted modelled road contribution NO _x	Modelled total NO ₂ (based on empirical NO _x /NO ₂ relationship)	Monitored total NO ₂	% Difference [(modelled – monitored) / monitored] x 100
MA28NO	2.355	25.5	33.0	36.1	-8.5%
MA29ANO	2.355	33.7	44.0	55.4	-20.6%
MA71NO	2.355	54.1	48.1	45.3	6.1%
MA82NO	2.355	58.6	54.1	52.0	4.1%
MA86ANO	2.355	38.4	37.2	33.6	10.6%
MA95NO	2.355	61.1	47.5	43.4	9.4%
MA96NO	2.355	30.5	39.2	46.0	-14.8%

Following adjustment of the modelled NO_x concentrations by a factor of 2.355 the total NO₂ concentration at the model verification location has been calculated using the method described in Section 4.6.1. The revised NO₂ concentration, shown in Table 10, indicates a more acceptable model performance when compared against the monitored NO₂ concentrations. As such, an adjustment factor of 2.355 has been applied to all modelled NO_x concentrations across the model domain before conversion to NO₂.

5.1.3 Nitrogen Dioxide

Predicted annual mean concentrations for NO₂ at the proposed development in 2019 and 2027 are provided in Table 11. As mentioned in Section 4.6.1, NO₂ concentrations have been calculated from the predicted NO_x concentrations using the latest NO_x-NO₂ conversion spreadsheet available from the Air Quality Archive.

Table 11 – Comparison of Predicted Annual Mean NO₂ Concentrations (µg/m³)

Receptor ID	Baseline (2019)	Future Baseline (2027)	Future Baseline + Development Flows (2027)	% of AQ Objective	Impact Descriptor
Proposed Development Receptors					
D1_12F	30.4	30.6	30.7	76.6	Negligible
D2_12F	30.5	30.7	30.7	76.6	Negligible
D3_12F	30.5	30.7	30.7	76.6	Negligible
D4_12F	30.5	30.7	30.7	76.7	Negligible
D5_12F	30.4	30.6	30.7	76.6	Negligible
D6_12F	30.4	30.6	30.7	76.6	Negligible
D1_13F	30.2	30.4	30.4	75.9	Negligible
D2_13F	30.2	30.4	30.4	75.9	Negligible
D3_13F	30.2	30.4	30.4	76.0	Negligible
D4_13F	30.2	30.4	30.4	76.0	Negligible
D5_13F	30.2	30.4	30.4	76.0	Negligible
D6_13F	30.2	30.4	30.4	76.0	Negligible
Existing Receptors					

Receptor ID	Baseline (2019)	Future Baseline (2027)	Future Baseline + Development Flows (2027)	Change	Impact Descriptor
E1_GF	47.0	48.6	48.7	0.1	Negligible
E2_GF	45.0	46.5	46.6	0.1	Negligible
E3_GF	48.3	50.0	50.2	0.1	Negligible
E4_GF	44.6	46.0	46.1	0.1	Negligible
E5_GF	45.8	47.4	47.5	0.1	Negligible
E6_GF	46.2	47.7	47.8	0.1	Negligible
E7_GF	49.4	51.2	51.3	0.1	Negligible
E8_GF	52.2	54.2	54.3	0.1	Negligible
E9_GF	70.2	73.6	73.7	0.1	Negligible
E10_GF	52.4	54.5	54.6	0.1	Negligible
E11_GF	50.2	52.1	52.2	0.1	Negligible
E12_GF	39.0	40.0	40.0	0.1	Negligible
E13_GF	36.5	37.3	37.3	0.0	Negligible
E14_GF	37.6	38.5	38.5	0.0	Negligible
E15_GF	39.6	40.6	40.7	0.0	Negligible
E16_GF	44.0	45.4	45.5	0.1	Negligible
E17_GF	39.3	40.3	40.3	0.1	Negligible
E18_GF	38.1	39.0	39.0	0.0	Negligible
E1_1F	42.6	43.8	43.9	0.1	Negligible
E2_1F	41.2	42.3	42.4	0.1	Negligible
E3_1F	43.6	45.0	45.1	0.1	Negligible
E4_1F	41.5	42.7	42.7	0.1	Negligible
E5_1F	43.1	44.4	44.5	0.1	Negligible
E6_1F	43.3	44.7	44.7	0.1	Negligible
E7_1F	46.6	48.2	48.3	0.1	Negligible
E8_1F	49.1	50.9	51.0	0.1	Negligible
E9_1F	62.3	65.0	65.1	0.1	Negligible
E10_1F	48.6	50.4	50.4	0.0	Negligible
E11_1F	45.7	47.2	47.3	0.1	Negligible
E12_1F	37.8	38.7	38.8	0.0	Negligible
E13_1F	36.2	37.0	37.0	0.0	Negligible
E14_1F	37.1	37.9	37.9	0.0	Negligible
E15_1F	38.6	39.5	39.6	0.1	Negligible
E16_1F	41.3	42.5	42.5	0.1	Negligible
E17_1F	38.3	39.2	39.2	0.0	Negligible
E18_1F	37.4	38.3	38.3	0.0	Negligible
E1_2F	37.5	38.4	38.4	0.1	Negligible
E2_2F	36.9	37.7	37.7	0.0	Negligible
E3_2F	38.3	39.2	39.3	0.1	Negligible
E5_2F	39.5	40.5	40.6	0.1	Negligible
E6_2F	39.8	40.9	40.9	0.0	Negligible
E7_2F	42.8	44.1	44.1	0.0	Negligible
E8_2F	44.8	46.2	46.3	0.0	Negligible
E9_2F	51.6	53.5	53.6	0.0	Negligible
E10_2F	43.4	44.8	44.8	0.0	Negligible

E11_2F	40.4	41.4	41.5	0.1	Negligible
E12_2F	36.2	36.9	36.9	0.0	Negligible
E13_2F	35.7	36.4	36.4	0.0	Negligible
E14_2F	36.3	37.0	37.0	0.0	Negligible
E15_2F	37.1	37.9	37.9	0.0	Negligible
E16_2F	38.0	38.9	39.0	0.0	Negligible
E17_2F	36.8	37.6	37.7	0.0	Negligible
E18_2F	36.4	37.2	37.2	0.0	Negligible

The ADMS predictions for annual mean NO₂ concentrations in 2019 and 2027 indicate that the annual mean objective (40 µg/m³) would be achieved at the modelled receptor locations.

Nitrogen dioxide also has an hourly objective of 200 µg/m³ not to be exceeded more than 18 times in one year. However, the hourly mean concentration has not been calculated directly by ADMS Roads. This is as a result of an evaluation of continuous monitoring data from across the UK that revealed that the relationship between the annual mean and hourly mean NO₂ concentrations was very weak. Nonetheless, research undertaken in 2003¹³ has indicated that the hourly NO₂ objective is unlikely to be exceeded at a roadside location where the annual mean NO₂ concentration is less than 60 µg/m³. Given that predicted NO₂ concentration in 2019 and 2027 are well below 60 µg/m³ at the modelled receptor the likelihood of the short-term objective for NO₂ being exceeded is considered low.

5.1.4 Particulate Matter

Predicted annual mean concentrations for PM₁₀ in 2019 and 2027 are provided in Table 12.

Table 12 – Predicted PM₁₀ Concentrations, Annual Mean (µg/m³)

Receptor ID	Baseline (2019)	Future Baseline (2027)	Future Baseline + Development Flows (2027)	% of AQ Objective	Impact Descriptor
Proposed Development Receptors					
D1_12F	14.7	14.8	14.8	36.9	Negligible
D2_12F	14.7	14.8	14.8	36.9	Negligible
D3_12F	14.7	14.8	14.8	36.9	Negligible
D4_12F	14.7	14.8	14.8	36.9	Negligible
D5_12F	14.7	14.8	14.8	36.9	Negligible
D6_12F	14.7	14.8	14.8	36.9	Negligible
D1_13F	14.7	14.7	14.7	36.8	Negligible
D2_13F	14.7	14.7	14.7	36.8	Negligible
D3_13F	14.7	14.7	14.7	36.8	Negligible
D4_13F	14.7	14.7	14.7	36.8	Negligible
D5_13F	14.7	14.7	14.7	36.8	Negligible
D6_13F	14.7	14.7	14.7	36.8	Negligible
Existing Receptors					

¹³ Analysis of Relationship between 1-Hour and Annual Mean Nitrogen Dioxide at UK Roadside and Kerbside Monitoring Sites, Laxen and Marner, 2003

Receptor ID	Baseline (2019)	Future Baseline (2027)	Future Baseline + Development Flows (2027)	Change	Impact Descriptor
E1_GF	17.4	17.6	17.7	0.0	Negligible
E2_GF	17.0	17.3	17.3	0.0	Negligible
E3_GF	17.6	17.9	17.9	0.0	Negligible
E4_GF	17.0	17.2	17.3	0.0	Negligible
E5_GF	17.2	17.5	17.5	0.0	Negligible
E6_GF	17.3	17.6	17.6	0.0	Negligible
E7_GF	17.9	18.3	18.3	0.0	Negligible
E8_GF	18.5	18.9	18.9	0.0	Negligible
E9_GF	22.4	23.1	23.1	0.0	Negligible
E10_GF	18.6	19.0	19.0	0.0	Negligible
E11_GF	18.0	18.3	18.3	0.0	Negligible
E12_GF	16.1	16.2	16.2	0.0	Negligible
E13_GF	15.7	15.8	15.8	0.0	Negligible
E14_GF	15.9	16.0	16.0	0.0	Negligible
E15_GF	16.2	16.4	16.4	0.0	Negligible
E16_GF	16.9	17.1	17.1	0.0	Negligible
E17_GF	16.1	16.3	16.3	0.0	Negligible
E18_GF	16.0	16.1	16.1	0.0	Negligible
E1_1F	16.6	16.8	16.9	0.0	Negligible
E2_1F	16.4	16.6	16.6	0.0	Negligible
E3_1F	16.8	17.0	17.1	0.0	Negligible
E4_1F	16.5	16.7	16.7	0.0	Negligible
E5_1F	16.8	17.0	17.0	0.0	Negligible
E6_1F	16.8	17.1	17.1	0.0	Negligible
E7_1F	17.4	17.7	17.7	0.0	Negligible
E8_1F	17.9	18.3	18.3	0.0	Negligible
E9_1F	20.6	21.2	21.2	0.0	Negligible
E10_1F	17.9	18.2	18.2	0.0	Negligible
E11_1F	17.2	17.5	17.5	0.0	Negligible
E12_1F	15.9	16.0	16.0	0.0	Negligible
E13_1F	15.7	15.8	15.8	0.0	Negligible
E14_1F	15.8	15.9	15.9	0.0	Negligible
E15_1F	16.0	16.2	16.2	0.0	Negligible
E16_1F	16.5	16.7	16.7	0.0	Negligible
E17_1F	16.0	16.1	16.1	0.0	Negligible
E18_1F	15.8	16.0	16.0	0.0	Negligible
E1_2F	15.8	16.0	16.0	0.0	Negligible
E2_2F	15.7	15.9	15.9	0.0	Negligible
E3_2F	16.0	16.1	16.1	0.0	Negligible
E5_2F	16.2	16.4	16.4	0.0	Negligible
E6_2F	16.3	16.4	16.4	0.0	Negligible
E7_2F	16.8	17.0	17.0	0.0	Negligible
E8_2F	17.2	17.4	17.4	0.0	Negligible
E9_2F	18.5	18.8	18.9	0.0	Negligible
E10_2F	16.9	17.2	17.2	0.0	Negligible

E11_2F	16.3	16.5	16.5	0.0	Negligible
E12_2F	15.6	15.8	15.8	0.0	Negligible
E13_2F	15.6	15.7	15.7	0.0	Negligible
E14_2F	15.7	15.8	15.8	0.0	Negligible
E15_2F	15.8	15.9	15.9	0.0	Negligible
E16_2F	15.9	16.1	16.1	0.0	Negligible
E17_2F	15.8	15.9	15.9	0.0	Negligible
E18_2F	15.7	15.8	15.8	0.0	Negligible

The ADMS predictions for annual mean PM₁₀ concentrations in 2019 and 2027 indicate that the annual mean objective (40 µg/m³) would be achieved at all the modelled receptor locations. In addition, the maximum number of days when PM₁₀ concentrations are more than 50 µg/m³ is 9, less than the 35 exceedances allowed in the regulations.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Impact of Vehicle Emissions

In terms of introducing new exposure, predicted NO₂ and PM₁₀ concentrations across the proposed development are below the relevant air quality objectives. Using the flow chart presented in Figure 5, air quality is a low priority consideration with regards to the impact of the proposed development.

All additional modelled receptors are having a negligible impact in the future year.