63 WAKEFIELD ROAD HUDDERSFIELD

Proposed Residential Development

Air Quality Assessment

Prepared for: Huddersfield Taxis Ltd

SLR Ref: 410.11918.00001
Version No: REV1
April 2021

BASIS OF REPORT

This document has been prepared by SLR Consulting Limited with reasonable skill, care and diligence, and taking account of the manpower, timescales and resources devoted to it by agreement with Huddersfield Taxis Ltd (the Client) as part or all of the services it has been appointed by the Client to carry out. It is subject to the terms and conditions of that appointment.

SLR shall not be liable for the use of or reliance on any information, advice, recommendations and opinions in this document for any purpose by any person other than the Client. Reliance may be granted to a third party only in the event that SLR and the third party have executed a reliance agreement or collateral warranty.

Information reported herein may be based on the interpretation of public domain data collected by SLR, and/or information supplied by the Client and/or its other advisors and associates. These data have been accepted in good faith as being accurate and valid.

The copyright and intellectual property in all drawings, reports, specifications, bills of quantities, calculations and other information set out in this report remain vested in SLR unless the terms of appointment state otherwise.

This document may contain information of a specialised and/or highly technical nature and the Client is advised to seek clarification on any elements which may be unclear to it.

Information, advice, recommendations and opinions in this document should only be relied upon in the context of the whole document and any documents referenced explicitly herein and should then only be used within the context of the appointment.

CONTENTS

1.0 INTRODUCTION 1
1.1 Scope of Assessment 1
2.0 RELEVANT AIR QUALITY LEGISLATION AND GUIDANCE 2
2.1 Air Quality Strategy 2
2.2 Air Quality Standards 2
2.3 Local Air Quality Management 3
2.4 Clean Air Strategy 3
2.5 General Nuisance Legislation 3
2.6 Planning Policy 4
2.7 Assessment Guidance 5
3.0 ASSESSMENT METHODOLOGY 7
3.1 Development Classification 7
3.2 Baseline Review – Exposure Assessment 8
3.3 Site Suitability Assessment 8
4.0 BASELINE ENVIRONMENT 11
4.1 Location 11
4.2 Sensitive Receptors 11
4.3 Baseline Air Quality 12
4.4 DEFRA PCM 17
5.0 REQUIREMENT FOR EXPOSURE ASSESSMENT 19
6.0 SITE SUITABILITY ASSESSMENT – ASSESSMENT OF EFFECTS AND SIGNIFICANCE 20
6.1 Road Traffic Emissions Dispersion Modelling Outputs 20
6.2 Significance of Effects 22
7.0 MITIGATION MEASURES 23
8.0 CONCLUSIONS 24
APPENDIX A – MODEL INPUT AND VERIFICATION 25
Model Input Summary 25

Site Suitability Receptors 26
Traffic Data 27
Model Verification 1

APPENDIX B – SITE SUITABILITY MODELLING RESULTS 2

DOCUMENT REFERENCES

TABLES

Table 2-1 Relevant UK AQS Standards and Objectives 2
Table 2-2 Relevant Exposure 3
Table 4-1 Site Suitability, Modelled Floor Heights 11
Table 4-2 Dewsbury Ashworth Grove AURN: NO_2 Monitoring Results 13
Table 4-3 NO_2 Diffusion Tube Monitoring Results, KC 14
Table 4-4 DEFRA Adjusted Mapped Background Pollutant Concentrations 16
Table 6-1 Summary of Predicted Annual Mean Concentrations – Baseline Site Suitability Assessment: Maximum Modelled NO_2 Concentration on Each Floor 20
Table 6-2 Summary of Predicted Annual Mean Concentrations – Baseline Site Suitability Assessment: Maximum Modelled PM_{10} Concentration on Each Floor 21
Table A-1 Summary of Modelling Inputs 25
Table A-2 Modelled Site Suitability Receptor Locations 26
Table A-3 Traffic Flow (AADT) 27
Table A-4 2019 Traffic Flow (AADT) 27
Table A-5 Verification Data 2019, Final Comparison 1
Table B-1 Modelled Site Suitability Receptor Locations 2

FIGURES

Figure 3-1 WY Air Quality Assessment and Mitigation Flow chart 7
Figure 4-1 Site Suitability Receptors 12
Figure 4-2 Local Monitoring Locations 15
Figure 4-3 Wind Rose for Leeds Bradford Meteorological Station (2019) 17
Figure 4-4 DEFRA PCM Model Output 18
Figure A-1 Modelled Road Links 29

1.0 INTRODUCTION

SLR Consulting Ltd (SLR) has been commissioned by Huddersfield Taxis Ltd to undertake an Air Quality Assessment (AQA) for a development at 63 Wakefield Road, Huddersfield.

The planning application for 12 x one bed flats on land at 63 Wakefield Road, Huddersfield has been granted by Kirklees Council (KC) (planning reference: 2019/62/93920/W) subject to a number of conditions.

Of these conditions, Condition 8 relates to air quality:

> *"8. Prior to development commencing, a full Air Quality Impact Assessment shall be submitted to, and approved in writing by, the Local Planning Authority. The assessment shall determine the impact that the poor air quality in the area will have on the future occupiers of the proposed development and provide details of the required mitigation measures that will be provided to address any such adverse impact. The approved mitigation measures shall be implemented before the development is brought into use & retained thereafter Reason: In the interest of the amenity and health of future occupiers, to mitigate potential harmful air pollution in the area, to comply with the aims and objectives of LP24 and LP51 of the Kirklees Local Plan and Chapters 12 and 15 of the National Planning Policy Framework."*

The assessment describes the scope, relevant legislation, assessment methodology and the baseline conditions currently existing in the area. It then presents the potential impacts resulting operational phases of the Proposed Development to ensure that future site users are not subject to elevated pollutant concentrations.

1.1 Scope of Assessment

Pre-assessment discussion[1] was undertaken with the KC in order to agree the extent and methodology of the Air Quality Assessment. However, at the time of submission of this Air Quality Assessment, no comments had been received from KC. The following scope of works have been undertaken as part of this Air Quality Assessment as proposed to KC:

- Baseline Evaluation – Assessment of existing air quality in the local area;
- Site Suitability Assessment – Assessment to ensure that future site users are not subject to elevated pollutant concentrations; and
- Mitigation Measures– Identification of appropriate mitigation measures for incorporation within the 'design' based upon the above proposed scope.

[1] E-mail correspondence between SLR Consulting Ltd and Andrew Jameson, Environmental health Officer at Kirklees Council, dated 1st April 2021.

2.0 RELEVANT AIR QUALITY LEGISLATION AND GUIDANCE

2.1 Air Quality Strategy

The United Kingdom Air Quality Strategy (UK AQS) 2007 for England, Scotland, Wales and Northern Ireland[2] sets out the Government's policies aimed at delivering cleaner air in the United Kingdom (UK). It provides the over-arching strategic framework for air quality management in the UK and contains national air quality standards and objectives established by the UK Government and Devolved Administrations to protect and improve human health.

2.2 Air Quality Standards

The Air Quality Standards Regulations 2010 (the regulations) transpose both the EU Ambient Air Quality Directive (2008/50/EC), and the Fourth Daughter Directive (2004/107/EC) within UK legislation. The regulations include Limit Values, Target Values, Objectives, Critical Levels and Exposure Reduction Targets for the protection of human health and the environment (collectively termed Air Quality Assessment Levels (AQAL) throughout this report). Those relevant to this AQA are presented within Table 2-1.

Table 2-1
Relevant UK AQS Standards and Objectives

Pollutant	Standard (µg/m^3)	Measured As	Equivalent percentile
Nitrogen Dioxide (NO_2)	40	Annual Mean	-
	200	1-hour Mean	99.79th percentile of 1-hour means (equivalent to 18 1-hour exceedences)
PM_{10} (gravimetric)	40	Annual Mean	-
	50	24-hour mean	90.41th percentile of 24-hour means (equivalent to 35 24-hour exceedences)
Particulate matter within an aerodynamic diameter of less than 2.5µm ($PM_{2.5}$) (gravimetric)	25	Annual Mean	-

2.2.1 Relevant Exposure

In accordance with the Department for Environment, Food and Rural Affairs' (DEFRA) technical guidance on Local Air Quality Management (LAQM.TG(16))[3], the AQALs should be assessed at locations of relevant exposure i.e. where members of the public are regularly present and might reasonably be expected to be exposed to pollutant concentrations over the relevant averaging period. A summary of relevant exposure for the objectives presented in Table 2-1 are shown below in Table 2-2.

[2] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, DEFRA. July 2007.

[3] Local Air Quality Management Technical Guidance 16, Published by DEFRA in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland. February 2018.

Table 2-2
Relevant Exposure

AQAL Averaging Periods	Relevant Locations	AQALs should apply at	AQALs should not apply at
Annual Mean	Where individuals are exposed for a cumulative period of 6-months in a year	Building facades of residential properties, schools, hospitals etc.	Facades of offices Hotels Gardens of residences Kerbside sites
24-hour mean	Where individuals may be exposed for eight hours or more in a day	As above together with hotels and gardens of residential properties	Kerbside sites where public exposure is expected to be short term
1-hour mean	Where individuals might reasonably be expected to spend one hour or longer	As above together with kerbside sites of regular access, car parks, bus stations etc.	Kerbside sites where public would not be expected to have regular access

2.3 Local Air Quality Management

Section 82 of the Environment Act 1995 (Part IV) requires Local Authorities (LA) to periodically review and assess the quality of air within their administrative area. The reviews have to consider the present and future air quality and whether any AQALs prescribed in regulations are being achieved or are likely to be achieved in the future.

Where any of the prescribed AQALs are not likely to be achieved the authority concerned must designate an Air Quality Management Area (AQMA). For each AQMA the LA has a duty to draw up an Air Quality Action Plan (AQAP) setting out the measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the AQAL. As such, LAs, have formal powers to control air quality through a combination of LAQM and by use of their wider planning policies.

2.4 Clean Air Strategy

The Clean Air Strategy (CAS)[4], published in 2019, sets out the Government's proposals aimed at delivering cleaner air in England, and also indicates how devolved administrations intend to make emissions reductions. It sets out the comprehensive action that is required from across all parts of government and society to deliver clean air.

2.5 General Nuisance Legislation

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

Fractions of dust greater than 10µm (i.e. greater than PM_{10}) in diameter typically relate to nuisance effects as opposed to potential health effects and therefore are not covered within the UK AQS. In legislation there are

[4] The Clean Air Strategy, DEFRA. January 2019.

currently no numerical limits in terms of what level of dust deposition constitutes a nuisance.

2.6 Planning Policy

2.6.1 National Policy

The 2019 update to the National Planning Policy Framework (NPPF) describes the policy context in relation to pollutants including air pollutants:

> *'Para 170: Planning policies and decisions should contribute to and enhance the natural and local environment by:*
>
> *e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of […] air […] pollution […]. Development should, wherever possible, help to improve local environmental conditions such as air […] quality […]'*
>
> *'Para 180: 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.'*

Specifically, in terms of development with regards to air quality:

> *'Para 181: 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.'*

The NPPF is accompanied by web based supporting Planning Practice Guidance (PPG) which includes guiding principles on how planning can take account of the impacts of new development on air quality. In regard to air quality, the PPG states:

> *"Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with EU 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."*
>
> *"Whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impact in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife)."*

The PPG sets out the information that may be required within the context of a supporting air quality assessment, stating that "*assessments should be proportional to the nature and scale of development proposed and the level of*

concern about air quality […] *Mitigation options where necessary, will depend on the proposed development and should be proportionate to the likely impact*".

The policies within the NPPF and accompanying PPG in relation to air pollution are considered within this AQA.

2.6.2 Local Policy

The Kirklees Local Plan was adopted on 27th February 2019 and is used to guide development within the District.

A review of the Local Plan indicated the following policies relating to air quality:

> *"Policy LP24*
>
> *Design*
>
> *Good design should be at the core of all proposals in the district and should be considered at the outset of the development process, ensuring that design forms part of pre-application consultation of a proposal. Development briefs, design codes and masterplans should be used to secure high quality, green, accessible, inclusive and safe design, where applicable. Where appropriate and in agreement with the developer schemes will be submitted for design review.*
>
> *Proposals should promote good design by ensuring:*
>
> *[…]*
>
> *b. they provide a high standard of amenity for future and neighbouring occupiers; including maintaining appropriate distances between buildings and the creation of development-free buffer zones between housing and employment uses incorporating means of screening where necessary […]"*

and

> *"Policy LP51*
>
> *Protection and improvement of local air quality*
>
> *1. Development will be expected to demonstrate that it is not likely to result, directly or indirectly, in an increase in air pollution which would have an unacceptable impact on the natural and built environment or to people.*
>
> *2. Proposals that have the potential to increase local air pollution either individually or cumulatively must be accompanied by evidence to show that the impact of the development has been assessed in accordance with the relevant guidance. Development which has the potential to cause levels of local air pollution to increase must incorporate sustainable mitigation measures that reduce the level of this impact. If sustainable measures cannot be introduced the development will not be permitted.*
>
> *3. Where the development introduces new receptors into Air Quality Management Areas or Areas of Concern or near other areas of relatively poor air quality, for example near roads or junctions, the development must incorporate sustainable mitigation measures that protect the new receptors from unacceptable levels of air pollution. Where sustainable mitigation measures cannot be introduced which prevent receptors from being exposed to unsafe levels of air pollution, development will not be permitted."*

The policies stated within the Local Plan in relation to air quality are considered within this Air Quality Assessment.

2.7 Assessment Guidance

The AQA has been carried out in accordance with the following principles contained within the guidance documents below.

2.7.1 West Yorkshire – Air Quality and Emissions, Technical Planning Guidance

Air Quality and Emissions, Technical Planning Guidance has been published for use within West Yorkshire[5] (the 'WY AQ guidance') as part of the WY Low Emission Strategy; KC has adopted this guidance and as such it has been applied within this assessment.

2.7.2 DEFRA's 'LAQM.TG(16)'

DEFRA's Local Air Quality Management Technical Guidance (LAQM.TG(16))[3] was published for use by LAs in their LAQM review and assessment work. The document provides key guidance in aspects of air quality assessment, including screening, model verification, use of monitoring data, and use of background data that are applicable to all AQAs. Methodologies prescribed within LAQM.TG(16)[3] have been employed throughout the assessment, in order to provide consistency with the Council's own work on air quality.

2.7.3 Environmental Protection UK and Institute of Air Quality Management Guidance

Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) have together published guidance[6] to help ensure that air quality is properly accounted for in the development control process. It clarifies when an AQA should be undertaken, what it should contain, and how impacts should be described and assessed including guidelines for assessing the significance of impacts.

The guidance also states that best-practice design and operational measures should be recommended and applied to all developments that require an AQA, to reduce emissions and human exposure to poor air quality. Additional measures are also suggested to off-set emissions, depending on the nature and scale of the development proposals.

2.7.4 Design Manual for Roads and Bridges

The Design Manual for Roads and Bridges (DMRB) LA 105[7] states receptors, including ecological designations, within 200m of an 'affected road' source, require further assessment of potential impacts.

[5] Air Quality & Emissions, Technical Planning Guidance. Part of the West Yorkshire Low Emission Strategy.

[6] Environmental Protection UK and Institute of Air Quality Management, 'Land-Use Planning and Development Control: Planning for Air Quality', v1.2 2017.

[7] DMRB, LA 105-Air Quality, Highways England, 2019.

3.0 ASSESSMENT METHODOLOGY

3.1 Development Classification

The assessment has been undertaken in accordance with the requirements of the WY AQ guidance as summarised Figure 3-1 and the following sections.

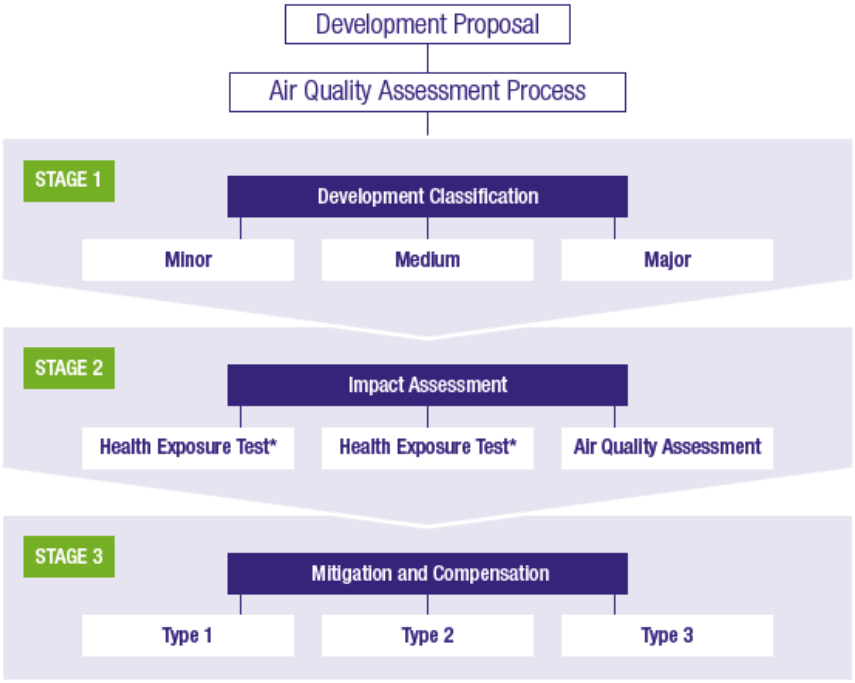


Figure 3-1
WY Air Quality Assessment and Mitigation Flow chart

The classification of the development is initially determined based on thresholds (developed by the Department for Transport (DfT) in determining where a Transport Assessment is required) which depend on the area of the proposed land use (i.e. residential, retail, office etc.; in relation to residential the threshold criteria is >50 units) and the following additional criteria:

- any development generating 30 or more two-way vehicle movements in any hour;
- any development generating 100 or more two-way vehicle movements per day;
- any development proposing 100 or more parking spaces;
- any relevant development proposed in a location where local transport infrastructure is inadequate; or
- any relevant development proposed in a location adjacent to an AQMA.

Any development that is below these criteria is classified as 'minor'; developments that meet the criteria are classified as 'medium' unless they also meet the following additional criteria, in which case they are classified as 'major':

- where the proposed development requires an Environmental Impact Assessment;
- proposals located within an AQMA;
- proposals that could increase the existing traffic flows on roads of >10,000 AADT by 5% or more;

- proposals that increase traffic by 5% on road canyons with >5000 AADT;
- proposals that could introduce or significantly alter congestion and includes the introduction of substantial road infrastructure changes;
- proposal that reduce average speeds by more than 10km/h
- proposal that include additional HGV movements by more than 10% of total trips; or
- where significant demolition and construction works are proposed.

Based on the above thresholds and in line with Condition 8, the proposed development is considered to be classified as 'medium'. As such, an Air Quality Assessment has been undertaken in line with the WY AQ guidance.

3.2 Baseline Review – Exposure Assessment

An 'health exposure test' has been undertaken following the WY AQ guidance to determine whether future occupants of the scheme are likely to be exposed to existing levels of poor air quality.

3.3 Site Suitability Assessment

3.3.1 Dispersion Modelling

Detailed air dispersion modelling has been undertaken using the Cambridge Environmental Research Consultants (CERC) ADMS-Roads air dispersion model, following guidance provided in LAQM.TG(16) to predict concentrations of NO_2 and PM_{10} for the various scenarios. The model requires various input data, including emissions from each section of road (based upon vehicle flows and vehicle type), and the road characteristic (including road width and street canyon height, where applicable).

The following scenarios have been modelled:

- 2019 verification year; and
- 'Do Something' scenario (DS): situation if the scheme is taken forward (opening year 2021).

3.3.2 Traffic Emission Factors and Sensitivity Assessment

DEFRA provides an Emission Factor Toolkit (EfT) in order to calculate emissions from a given length of road based on the traffic composition (number of vehicles of each type) and speed data. Emission factors improve with time as new vehicles registered in the UK have to meet progressively tighter European type approval emissions categories, referred to as "Euro" standards. As the proportion of vehicles in the fleet meeting a particular Euro standard increases, the vehicle emissions from the fleet theoretically improve. In order to reflect this, the EfT provides projected emission factors for future years.

Emission factors were determined for each scenario using the latest EfT (v10.1).

Reference should be made to Appendix A for presentation of the traffic data entered into the assessment. Speeds used in the model were based on posted limits and adjusted for junctions following guidance in LAQM.TG(16).

Modelled traffic exhaust concentrations of NOx have been subject to verification in accordance with LAQM.TG(16) and annual mean NO_2 concentrations calculated using the latest DEFRA 'NOx-NO_2 Calculator' (v8.1). The traffic mix within the calculator has been set to "All other UK traffic" for a 2021 year (i.e. the predicted development opening year). 'Kirklees' was selected as the local authority.

In summary, the assessment has utilised the following inputs:

- 2021 emission factors from v10.1 of the EFT; and

- 2021 mapped background concentrations sourced from the latest 2018 base year DEFRA mapping study (August 2020 publication).

Recent evidence indicates a disparity between the emission factors and ambient monitoring data[8]. To help minimise any associated uncertainty when forming conclusions from the results, this assessment has utilised the latest EFT version v10.1 (COPERT 5 emission factors), and associated tools/datasets published by DEFRA.

Notwithstanding the above, in consideration of the potential uncertainty in predictions of future year NOx / NO_2 emissions, as well as the current national and local sensitivities seen in response to elevated roadside NO_2 concentrations, an additional modelling scenario has been assessed in which it has been assumed there is no improvement in NOx vehicle emissions or NOx / NO_2 background concentrations within Kirklees, from a precautionary 2019 baseline year.

These modelled scenarios are likely to represent an overly conservative approach as, despite uncertainty in quantification, it is generally accepted that variables such as background concentrations and / or vehicle emission factors will improve to some degree in future years as per national forecasts, with local monitoring trends somewhat supporting this as indicated by KC's NO_2 monitoring datasets which indicate levels of monitored pollutants have fallen over the last 5 years. Additionally, KC's 2020 ASR states *'Current 5 year trends for NO_2 indicate that the levels fell significantly between 2012 & 2013 within the Kirklees District and stagnated between 2014 to 2016, but since 2016 there has been a gradual fall year on year. Over the five years it has been observed that NO_2 concentration have fallen by 13% across this district and this has been slightly higher within the AQMA's at 15-19%'.*

3.3.3 Meteorological Data

To calculate pollutant concentrations at identified sensitive receptor locations the dispersion model uses sequential hourly meteorological data, including wind direction, wind speed, temperature, cloud cover and stability, which exert significant influence over atmospheric dispersion.

The dispersion modelling has been undertaken using 2019 data from Leeds Bradford Airport. This site is located approximately 26.5km north of the Application Site. It is the most relevant meteorological station that records all of the parameters necessary for dispersion modelling.

The meteorological dataset used in this assessment was provided by ADM Ltd. A windrose is presented in Figure 4-3.

3.3.4 Background Concentrations

DEFRA provides annual mean modelled background pollutant concentration data on a 1km x 1km spatial resolution across the UK that is routinely used to support LAQM and Air Quality Assessments[9]. Background pollutant concentrations are based upon the 2018 base year (August 2020 publication) (the year in which comparisons between modelled and monitoring are made) and projected forward. Mapped background concentrations for NO_2 and PM_{10} were obtained for the grid squares containing the Application Site, and surrounding study area, reflective of the assessment scenario years.

To avoid double counting of potential source contributions already contained within the ADMS-Roads dispersion model, 'Primary A Road in' (where relevant) was removed from each grid square.

As the relationship between NO_2 and NOx is not linear, the NO_2 Adjustment for NO_x Sector Removal Tool[10] has been used – in accordance with LAQM.TG(16).

[8] Carslaw, et al. (2011). Trends in NOx and NO_2 emissions and ambient measurements in the UK.

[9] Defra, UK Air Information Resource (UK-AIR) website, http://uk-air.defra.gov.uk/, accessed April 2021.

[10] Defra NO_2 Adjustment for NO_x Sector Removal Tool version 7.0 (2018), available at https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxsector.

3.3.5 Sensitive Receptors

LAQM.TG(16) provides guidance on assessing air quality against the regulations, stating that the AQALs should be assessed at locations where members of the public are likely to be regularly present and are likely to be exposed for a period of time appropriate to the averaging period of the standard.

Human receptor locations have been characterised with reference to LAQM.TG(16) Box 1.1. According to LAQM.TG(16) exceedences of the AQALs should be assessed in relation to:

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

The receptor locations considered representative of potential exposure within the Air Quality Assessment of road traffic emissions are shown in Appendix A and detailed in Section 4.2.1, based upon relevant exposure locations outlined in Table 2-2.

Annual mean NO_2 concentrations were calculated at relevant receptor locations. The risk of exceeding the 1-hour mean AQAL was assessed according to the guidance in LAQM.TG(16). This Guidance states that:

> *"exceedances of the NO_2 1-hour mean are unlikely to occur where the annual mean is below 60µg/m^3".*

Annual mean PM_{10} concentrations for PM_{10} were calculated for these receptor locations. The risk of exceeding the 24-hour mean AQAL was assessed according to the guidance in LAQM.TG(16). This Guidance provides the calculation below to determine compliance:

> No. 24-hour mean exceedances = -18.5 + 0.00145 × annual mean^3 + (206/annual mean)

3.3.6 Assessing Significance

The EPUK-IAQM guidance also requires a judgment on the significance of the 'effect', this is based upon consideration, as necessary, of the following factors:

- the existing and future air quality in the absence of the development;
- the extent of current and future population exposure to the impacts;
- the worst-case assumptions adopted when undertaking the prediction of impacts; and
- the extent to which the proposed development has adopted best practice to eliminate and minimise emissions.

4.0 BASELINE ENVIRONMENT

4.1 Location

The Application Site is located on the eastern periphery of Huddersfield city centre at the approximate National Grid Reference (NGR): x415245, y416350 and is bounded by:

- A629 Wakefield Road to the south, beyond which are commercial, residential and leisure uses;
- commercial uses immediately to the east, beyond which is Silver Street;
- Silver Street West immediately to the north, beyond which is Silver Court industrial estate; and
- commercial uses immediately to the west, beyond which is Huddersfield centre.

4.2 Sensitive Receptors

4.2.1 Site Suitability Receptors

Annual mean concentrations of NO_2 and PM_{10} have been predicted at locations of potential exposure, corresponding to discrete residential units of the proposed development site. Concentrations have been predicted at varying heights corresponding to different floors of the proposed development, as identified in the scheme drawings provided by Acumen Designers and Architects [11], the architects for the scheme.

Pollutant concentrations were predicted at an additional 1.5m elevation within each floor of the proposed development, corresponding to potential exposure and breathing zone. The following heights above ground level were therefore assessed as part of the baseline site-suitability Air Quality Assessment, corresponding to potential exposure within each residential unit within each floor.

Table 4-1
Site Suitability, Modelled Floor Heights

Floor	Modelled Floor Height (m)
Ground	1.7
1	4.3
2	6.8

Within this assessment, receptors have been selected at every window of every floor of the proposed development. As such, there are 24 modelled receptors. Figure 4-1 below highlights the location of each receptor. The NGRs associated with each receptor are detailed in Appendix A.

[11] 63 Wakefield road, Drawing Numbers 2019-93920, 2629_ACU_L(200)01, 2629_ACU_L(200)02, 2629_ACU_L(200)03, 2629_ACU_L(200)04, 2629_ACU_L(200)05, 2629_ACU_L(200)06 Acumen Designers and Architects.



Figure 4-1
Site Suitability Receptors

4.2.2 Ecological Receptors

A review using the Magic web-based mapping service[12] was undertaken to identify any designated sites of ecological or nature conservation importance required for consideration within the assessment, as follows:

- operational phase assessment – any Ramsar, Special Areas of Conservation (SAC), Special Protection Areas (SPA) or Sites of Special Scientific Interest (SSSI) within 200m of any 'affected road' as part of the scheme, that could be affected by any change in vehicle emissions associated with the proposed development.

The closest ecological designation to the Application is the Honley Station Cutting SSSI, located approximately 3.7km south of the Application Site and therefore unaffected by the proposed development.

4.3 Baseline Air Quality

4.3.1 Local Authority Review and Assessment

As required under Section 82 of the Environment Act (1995) (Part IV), KC has conducted an on-going exercise to review and assess air quality within their administrative area.

This process has indicated that annual mean NO_2 and PM_{10} concentrations are above, and likely to remain above the relevant AQO at locations of relevant public exposure within KC's administrative area. As such, nine AQMAs have been declared within the Council's area.

The closest of these AQMAs to the proposed development is Kirklees AQMA 9, *"The designated area incorporates Roads bordering and within the Huddersfield Ring Road"*, which is located approximately 30m west of the Application Site. The AQMA has been declared due to exceedances of the annual mean NO_2 AQAL, the main source

[12]Natural England, www.magic.gov.uk, accessed April 2021.

of which is considered to be road traffic emissions. As a result, Condition 8 of the Planning Application Decision has requested a Site Suitability Assessment to ensure that new residents are not subject to elevated pollutant concentrations.

All other Air Quality Strategy pollutants were below the relevant AQALs at locations of relevant public exposure, as such no further AQMAs have been declared within the Council's administrative area.

4.3.2 Automatic Air Quality Monitoring

The UK Automatic Urban and Rural Network (AURN) is a countrywide network of air quality monitoring stations operated on behalf of the DEFRA. Monitoring data for AURN sites is available from the UK Air Information Resource (AIR) website.

The closest and most relevant AURN monitor to the Application Site is the Dewsbury Ashworth Grove AURN (NGR: x424060, y421912) located approximately 10km north-east of the site boundary. The Dewsbury Ashworth Grove AURN is classified as an 'urban background' monitor, defined as: "*An urban location distanced from sources and therefore broadly representative of city-wide background conditions, e.g. urban residential areas*". The NO_2 monitoring results for this AURN are presented in Table 4-2 below. The Dewsbury Ashworth Grove AURN does not monitor PM_{10}.

Table 4-2
Dewsbury Ashworth Grove AURN: NO_2 Monitoring Results

Year	Annual Mean NO_2 Concentration (µg/m^3)	Number of Hours >200µg/m^3	Data Capture (%)
2018 (A)	27.2	0	31.3
2019 (B)	29.5	0	18.1
2020	15.6	0	89.1

Notes:
(A) Monitoring began the 8th September 2018 and therefore data capture for 2018 is low and data should be treated with caution.
(B) Data capture for 2019 is below the 75% suggested by LAQM.TG(16) as suitable for use and therefore results should be treated with caution.

4.3.3 Passive Diffusion Tube Monitoring

Passive diffusion tube monitoring is currently undertaken by KC at numerous locations throughout the Council's area as part of their commitment to LAQM. The diffusion tubes are located in areas which are deemed to require further assessment of NO_2 concentrations.

A summary of recent NO_2 monitoring results from the closest diffusion tube monitoring locations to the Application Site are presented within Table 4-3. The location of the monitoring sites are shown in Figure 4-2.

Table 4-3
NO_2 Diffusion Tube Monitoring Results, KC

Monitoring Location		Site Classification	Approximate Distance / Direction to the Site	NGR (m)		Annual Mean Concentration (µg/m³) (A)		
				X	Y	2017	2018	2019
K56	Wakefield Road, Huddersfield	Roadside (B)	245m west	415009	416420	39.56	39.47	34.87
K86	Kings Mill Lane	Roadside (B)	65m south	415164	416323	-(C)	32.59	29.07

Notes:
(A) Bias Corrected
(B) Roadside sites defined as *'a site sampling typically within one to five metres of the kerb of a busy road'*.
(C) Monitoring at this location began in 2018.

For the non-automatic locations of relevance to the Application Site, all diffusion tubes monitored annual mean NO_2 concentrations to be 'below' the AQAL limit (40µg/m³) during the considered monitoring period 2017-2019.

Concentrations monitored are considered to be comparable to the Application Site and suitable for site suitability model verification.

The empirical relationship given in LAQM.TG(16)[3] states that exceedences of the 1-hour mean AQAL for NO_2 is unlikely to occur where annual mean concentrations are <60µg/m³. This indicates that an exceedance of the 1-hour mean AQAL is unlikely to have occurred at these sites between 2017 and 2019.



Figure 4-2
Local Monitoring Locations

4.3.4 DEFRA Mapped Background Concentrations

Background pollutant concentration data on a 1km x 1km spatial resolution is provided by DEFRA through the UK Air Information Resource (AIR) website and is routinely used to support LAQM and Air Quality Assessments.

Mapped background concentrations of NO_X, NO_2 and PM_{10} were downloaded for the grid squares containing the Application Site, diffusion tubes presented within Table 4-3 and site suitability receptors presented within Appendix A and detailed in Section 4.2.1. Mapped background concentrations have been obtained based upon the 2018 base year DEFRA update (August 2020 publication)[13].

Background pollutant concentrations for 2019 verification year / mapping base year and for 2021 (the completed development opening year) are displayed in Table 4-4. It is noted that the concentrations presented are subsequent to the source sector removal.

Table 4-4
DEFRA Adjusted Mapped Background Pollutant Concentrations

Grid Square (X, Y)	Year	Annual Mean Background Concentration (µg/m³)			
		NO_X	NO_2	PM_{10}	$PM_{2.5}$
415500, 416500	2019	22.4	16.0	12.6	8.66
	2021	20.9	15.0	12.3	8.40
AQAL			***40***	***40***	***25***

4.3.5 Wind Speed and Direction Data

As discussed in Section 3.3.3, the most comparable observation station to the Application Site is Leeds Bradford Airport, located approximately 26.5km south east of the Application Site. A wind rose is presented in Figure 4-3.

[13] Background mapping data for local authorities – http://uk-air.defra.gov.uk/data/laqm-background-home, accessed April 2021.

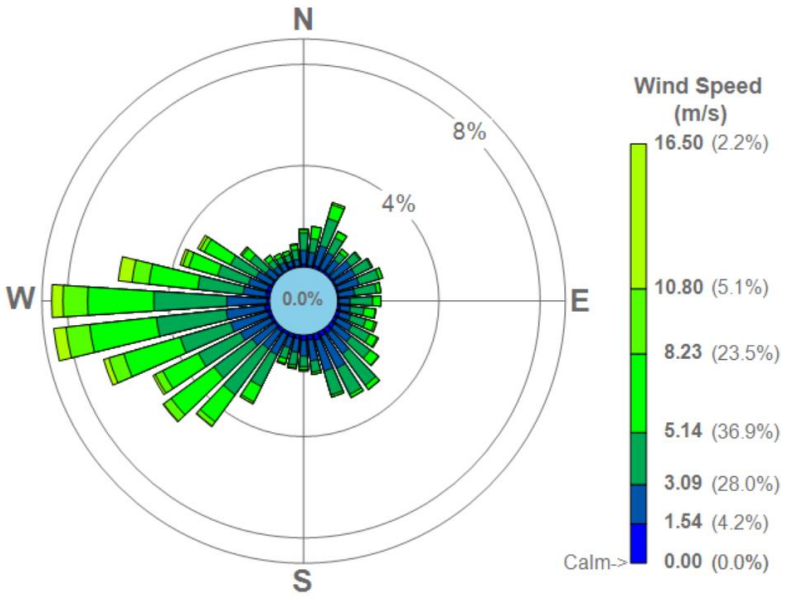


Figure 4-3
Wind Rose for Leeds Bradford Meteorological Station (2019)

4.4 DEFRA PCM

The WY AQ guidance indicates that DEFRA's National Pollutant Climate Mapping (PCM) GIS website[14] should be used to ascertain if the development is located within 20m of roads at or above the relevant national objective.

Figure 4-4 illustrates that the A629 Wakefield Road (adjacent to the southern Site boundary) is the closest road with mapped roadside NO_2 concentration in 2019. The NO_2 roadside concentrations were 30-40µg/m^3 in 2019.

[14] https://uk-air.defra.gov.uk/data/gis-mapping, accessed April 2021.



Figure 4-4
DEFRA PCM Model Output

5.0 REQUIREMENT FOR EXPOSURE ASSESSMENT

This section presents consideration of and requirements for an 'exposure assessment' following the West Yorkshire Technical Guidance. This is to determine any potential exceedences of any considered AQALs at the Proposed Development and requirements for embedded into the scheme design.

Stage 2 of the West Yorkshire Technical Guidance includes a requirement for an 'exposure assessment' to determine whether future occupants of the scheme are likely to be exposed to existing levels of poor air quality. An 'exposure assessment' is required if the development meets any of the following criteria:

- the proposal is within an area of concern or within an AQMA;
- the proposal is in a location 20m from roads at or above the relevant national objective highlighted on the DEFRA GIS modelled maps;
- the proposal is one of the following land-use types, and within 20m of roads with >10,000 AADT (Annual Average Daily Traffic):
    - Hotels (C1); residential institutions (C2) or dwelling houses (C3);
    - Homes of Multiple Occupations (C4); or
    - Non-residential institutions (D1).
- where a Transport Statement or Assessment is provided, the calculated increase in trip generation associated with the proposal should inform the Travel Plan as to the required reduction in trips necessary to achieve compliance with NPPF and Local Plan policies.

In consideration of the above criterion:

- the proposed scheme is located approximately 30m east of the Kirklees AQMA 9, as discussed within Section 4.3.1;
- as illustrated in Figure 4-4, A629 Wakefield Road (adjacent to the southern Site boundary) is the closest road with mapped roadside NO_2 concentration in 2019. The NO_2 roadside concentrations were 30-40µg/m^3 in 2019;
- the proposed scheme is a C3 use-class scheme, and it is located adjacent to the A629 which has a baseline traffic flow is in excess of 10,000AADT; and
- the proposed scheme will not result in an increase in the number of operational phase development trips in comparison to the existing use of the site. No Transport Assessment was required for the planning application (planning reference: 2019/62/93920/W) and has not been requested as part of the decision notice.

Therefore, based upon the above and in line with Condition 8 of the decision notice, an associated 'exposure assessment' is required. This is detailed in Section 6.0.

6.0 SITE SUITABILITY ASSESSMENT – ASSESSMENT OF EFFECTS AND SIGNIFICANCE

This section presents the potential baseline site-suitability air quality impacts at the location of the Proposed Development, to identify appropriate mitigation options.

6.1 Road Traffic Emissions Dispersion Modelling Outputs

The baseline scenario for year 2019 has been used to verify the model by comparing modelled outputs against KC monitoring data, following the guidance in LAQM.TG(16). Paragraph 7.508 of LAQM.TG(16) states that: *'The model used should have some form of published validation assessment available and/or should be recognised as being fit for purpose by the regulatory authorities'*.

An adjustment factor has been calculated for the assessment scenarios in line with this guidance. Reference should be made to Appendix A for the details of the verification process.

6.1.1 Site Suitability Results

Nitrogen Dioxide Annual Mean

A summary of the maximum predicted annual mean NO_2 concentration at each floor of the Proposed Development is presented in Table 6-1.

Full details of the predicted annual mean NO_2 concentrations at each modelled receptor are presented in Appendix B.

This Air Quality Assessment has assumed that those mapped background concentrations presented within Table 4-4 equate to all floors of the Proposed Development. It is considered that background concentrations at each floor of the Proposed Development would decrease with height and would be lower than those utilised. Therefore, impacts predicted at 1st floor of the Proposed Development and above would be considered to be lower than those presented.

Table 6-1
Summary of Predicted Annual Mean Concentrations – Baseline Site Suitability Assessment: Maximum Modelled NO_2 Concentration on Each Floor

Floor	2021 Maximum NO_2 Annual Mean Concentration ($\mu g/m^3$) (A)	Percentage of Annual Mean AQO (%)	2019 Sensitivity Maximum NO_2 Annual Mean Concentration ($\mu g/m^3$) (B)	Percentage of Annual Mean AQO (%)
Ground	37.5	93.8	42.9	107
1	31.2	78.0	35.5	88.6
2	25.0	62.4	28.0	70.0

Note:
(A) Scenario modelled as an assumed 2021 development opening year, with 2021 emission factors and 2021 mapped background pollutant concentrations.

Floor	2021 Maximum NO_2 Annual Mean Concentration (µg/m^3) (A)	Percentage of Annual Mean AQO (%)	2019 Sensitivity Maximum NO_2 Annual Mean Concentration (µg/m^3) (B)	Percentage of Annual Mean AQO (%)
(B) Scenario modelled as an assumed 2021 development opening year with 2021 traffic but with 2019 emission factors and 2019 mapped background pollutant concentrations in order to provide a worst-case assessment.				

Nitrogen Dioxide 1-hour Mean

The maximum annual mean NO_2 2021 'do-something' concentration is 37.5µg/m^3 (ground floor level within Apartment 2). The maximum annual mean NO_2 2019 sensitivity 'do-something' concentration is 42.9µg/m^3 (ground floor level within Apartment 2). This location is not considered to be comparable to relevant exposure to the 1-hour mean NO_2 AQAL, in accordance with DEFRA guidance the maximum predicted annual mean NO_2 concentration indicates that exceedences of the 1-hour mean NO_2 AQAL are considered 'unlikely' at existing and proposed receptors as a result of proposed development trips.

Particulate Matter Annual Mean

Predicted annual mean PM_{10} concentrations were assessed against the $PM_{2.5}$ AQO of 25µg/m^3 in accordance with the EPUK and IAQM guidance.

Results of the dispersion modelling illustrates that there are no predicted exceedences of the annual mean PM_{10} or $PM_{2.5}$ AQO on any floor of the Proposed Development.

A summary of the maximum predicted annual mean PM_{10} concentration at each floor of the Proposed Development is presented in Table 6-2.

Table 6-2
Summary of Predicted Annual Mean Concentrations – Baseline Site Suitability Assessment: Maximum Modelled PM_{10} Concentration on Each Floor

Floor	2021 Maximum PM_{10} Annual Mean Concentration (µg/m^3) (A)	Percentage of Annual Mean $PM_{2.5}$ AQO (%)	2019 Sensitivity Maximum PM_{10} Annual Mean Concentration (µg/m^3) (B)	Percentage of Annual Mean $PM_{2.5}$ AQO (%)
Ground	16.9	67.5	17.4	69.5
1	15.5	62.2	16.0	64.1
2	14.3	57.2	14.7	58.9

Note:
(A) Scenario modelled as an assumed 2021 development opening year, with 2021 emission factors and 2021 mapped background pollutant concentrations.
(B) Scenario modelled as an assumed 2021 development opening year with 2021 traffic but with 2019 emission factors and 2019 mapped background pollutant concentrations in order to provide a worst-case assessment.

Particulate Matter 24-hour Mean Modelling Results

Based upon the maximum predicted 2021 'do-something' annual mean PM_{10} concentration of 16.9µg/m^3 (ground floor within Apartment 2). this equates to 0 days where 24-hour mean PM_{10} concentrations are greater than 50µg/m^3. The maximum predicted 2019 sensitivity 'do-something' annual mean PM_{10} concentration is 17.2µg/m^3 (ground floor within Apartment 2) this equates to 1 day where 24-hour mean PM_{10} concentrations are greater than 50µg/m^3. The number of maximum exceedences is in compliance with the 24-hour mean AQAL, that allows 35-days a year where 24-hour mean concentrations are in excess of 50µg/m^3. Therefore, following LAQM.TG(16) guidance there is no predicted exceedence of the 24-hour mean PM_{10} AQAL.

6.2 Significance of Effects

Consistent with EPUK-IAQM guidelines, given that the impacts at all receptors are below the relevant AQAL, the significance of the effects can be considered negligible and 'not significant'.

As shown in Table 6-1, the 2019 sensitivity assessment predicted exceedences of the annual mean NO_2 AQAL at locations on the ground floor of the proposed development within Apartment 1 and Apartment 2 (fronting onto Wakefield Road). As mentioned in Section 3.3.2, pollutant concentrations within Kirklees are showing a general downward trend. However, based on the sensitivity assessment results, it is recommended that mitigation is implemented to ensure future residents at ground level are not exposed to elevated NO_2 concentrations. Specific measures are described in Section 7.0

7.0 MITIGATION MEASURES

There are a number of mitigation options available to reduce or off-set potential air quality impacts. However, all techniques have financial implications and may therefore affect scheme viability. As such, they should only be included if necessary.

Annual mean NO_2 concentrations were predicted to exceed the AQAL of 40µg/m^3 at the ground floor of the proposed development, within Apartment 1 and Apartment 2 during the 2019 sensitivity assessment (R1 to R4). Concentrations were also very close to exceeding at ground floor level in the 2021 opening year assessment. As such, mitigation is required to ensure a supply of clean air for future residents within these ground floor apartments. This should be provided in the form of a mechanical ventilation system within Apartment 1 and Apartment 2 at ground level. The air inlet should be positioned on either first floor or above, or on the rear façade at ground floor. Alternatively, if there are design issues associated with providing inlets at the designated locations, an NO_2 absorption filter could be included within the system to reduce pollutant concentrations within the airstream prior to entering the Apartments.

The arrangement will ensure the units are kept under positive pressure by providing air into the rooms, rather than removing it. This will naturally inhibit the movement of air from outside into the units during periods of open windows, as well as flushing the internal environment after closure.

Mechanical ventilation is suggested within the EPUK and IAQM guidance[15] and as such is considered a suitable solution for a development of this size and nature.

[15] Environmental Protection UK and Institute of Air Quality Management, 'Land-Use Planning and Development Control: Planning for Air Quality', v1.2 2017.

8.0 CONCLUSIONS

SLR Consulting has undertaken an assessment of site suitability in order to discharge Condition 8 of the planning permission (planning reference: 2019/62/93920/W) for 63 Wakefield Road, Huddersfield .

Annual mean NO_2 and PM_{10} concentrations resulting from road-vehicle exhaust emissions were quantified at locations of proposed exposure using the ADMS Road v5.0 dispersion model. Modelling indicates exceedences of the NO_2 annual mean AQAL at Apartments 1 and Apartment 2 within the sensitivity assessment. NO_2 concentrations at these same apartments are also close to approaching the annual mean AQAAL at these locations during the proposed 2021 opening year assessment. There are no exceedences of the PM_{10} annual mean AQO at locations of relevant exposure corresponding to proposed residential dwellings.

In order to ensure that future residents are not affected by elevated pollutant concentration suitable mitigation in the form of mechanical ventilation has been proposed for the affected units. This should ensure future residents are not exposed to poor air quality.

As such, it is not considered that air quality represents a material constraint to the development proposals, which conform to the principles of National Planning Policy Framework or Planning Practice Guidance, and local guidance, including the WY AQ guidance, subject to the inclusion of the suggested mitigation measures.

APPENDIX A – Model Input and Verification

Model Input Summary

The modelling parameters are summarised in Table A-1.

Table A-1
Summary of Modelling Inputs

Parameter	Description	Input Variable
Surface Roughness	Surface roughness of the modelling domain as a function of land use	A roughness length z0 of 1m was used within the assessment area of this dispersion modelling study. This value is for 'cities, woodland' and therefore considered appropriate for the surface roughness of the dispersion modelling assessment area. A roughness length of z0 of 0.02m was used for the meteorological data used within this dispersion modelling study. This value is for 'open grassland' and therefore considered appropriate for the surface roughness of the area surrounding the Leeds Bradford Meteorological Station.
Road Source Emissions	Source of the emission factors used	EFT v.10.1
Emission Year	Modelling year used to factor the traffic emissions	2019 verification year and 2021 development opening year. A further sensitivity scenario was assessed which considered 2019 emission factors for the development opening year (i.e. assuming no further improvement in vehicle NOx emission factors for future years).
Road Type	Road type within the EFT emission database	Urban (not London)
Elevation of Road	Height of the road link above ground level	None
Road Width	Width of the road link	Road widths measured via use of satellite imagery.
Road Speed	Road speed in km/h	Variable based on posted limit and adjusted to take into account queues and congestion, in accordance with LAQM.TG(16).
Time Varied Emissions	Daily, weekly or monthly variations in emissions applied to road sources	None – AADT modelled to determine annual mean impacts.
Meteorology	Representative hourly sequential meteorological data	2019 Leeds Bradford meteorological data
Background	Background pollutant concentration	DEFRA supplied backgrounds maps (2018 base year) projected to 2021 for the development opening year. A further sensitivity scenario was assessed which considered 2019 DEFRA mapped

	considered during the modelling	background concentrations for the development opening year (2019) (i.e. assuming no further improvement in background NOx / NO_2 concentrations for future years).
Output	Output as gridded or specified points	At specified points as detailed.
Pollutant Output	Pollutants modelled and averaging time	NO_2 and PM_{10} annual mean. Derived 1-hour mean NO_2 and 24-hour mean PM_{10}.

Site Suitability Receptors

Table A-2
Modelled Site Suitability Receptor Locations

Receptor	Apartment	Description	NGR (m)		
			X	Y	Z
SS1	1	Bedroom	415244	416343	1.7
SS2	1	Kitchen / Living	415240	416343	1.7
SS3	2	Bedroom	415247	416342	1.7
SS4	2	Kitchen / Living	415249	416341	1.7
SS5	3	Bedroom	415247	416361	1.7
SS6	3	Kitchen / Living	415245	416362	1.7
SS7	4	Bedroom	415251	416360	1.7
SS8	4	Kitchen / Living	415254	416360	1.7
SS9	5	Bedroom	415244	416343	4.3
SS10	5	Kitchen / Living	415240	416343	4.3
SS11	6	Bedroom	415247	416342	4.3
SS12	6	Kitchen / Living	415249	416341	4.3
SS13	7	Bedroom	415247	416361	4.3
SS14	7	Kitchen / Living	415245	416362	4.3
SS15	8	Bedroom	415251	416360	4.3
SS16	8	Kitchen / Living	415254	416360	4.3
SS17	9	Bedroom	415244	416343	6.8
SS18	9	Kitchen / Living	415240	416343	6.8
SS19	10	Kitchen / Living	415247	416342	6.8
SS20	10	Kitchen / Living	415249	416341	6.8
SS21	11	Bedroom	415247	416361	6.8
SS22	11	Kitchen / Living	415245	416362	6.8
SS23	12	Kitchen / Living	415251	416360	6.8
SS24	12	Kitchen / Living	415254	416360	6.8

Traffic Data

No transport consultants were required for the planning application. Therefore, appropriate traffic data for A629 Wakefield Road was sourced from the Department for Transport (DfT) Matrix[16] which presents estimated and monitored traffic flows on every link of the 'A' road and motorway network in Great Britain. Traffic data was obtained from the DfT Matrix for a count point located on Wakefield Road (count point number 37467) based upon 2019 traffic surveys.

In order to growth the 2019 traffic data to the 2021 opening year a TEMPro growth factor of 1.0184 was applied, provided by SLR Highways and Transportation Planning Team.

Table A-3
Traffic Flow (AADT)

Ref	Description	2021 Opening Year		Speed (A) (km/h)
		AADT	HDV % (>3.5t)	
L1	A629 eastbound	17,901	3.28	48
L2	A629 westbound	18,831	3.47	48
Note: (A) Where relevant, links have been modelled with an additional slow down link modelled at 20kmph.				

Table A-4 presents the 2019 data for use within the 2019 verification assessment, sourced from the DfT Matrix.

Table A-4
2019 Traffic Flow (AADT)

Ref	Description	2019 Verification Year		Speed (A) (km/h)
		AADT	% (>3.5t)	
L1	A629 eastbound	17,577	3.28	48
L2	A629 westbound	18,490	3.47	48
Note: (A) Where relevant, links have been modelled with an additional slow down link modelled at 20kmph.				

[16] http://www.dft.gov.uk/matrix/, accessed April 2021.

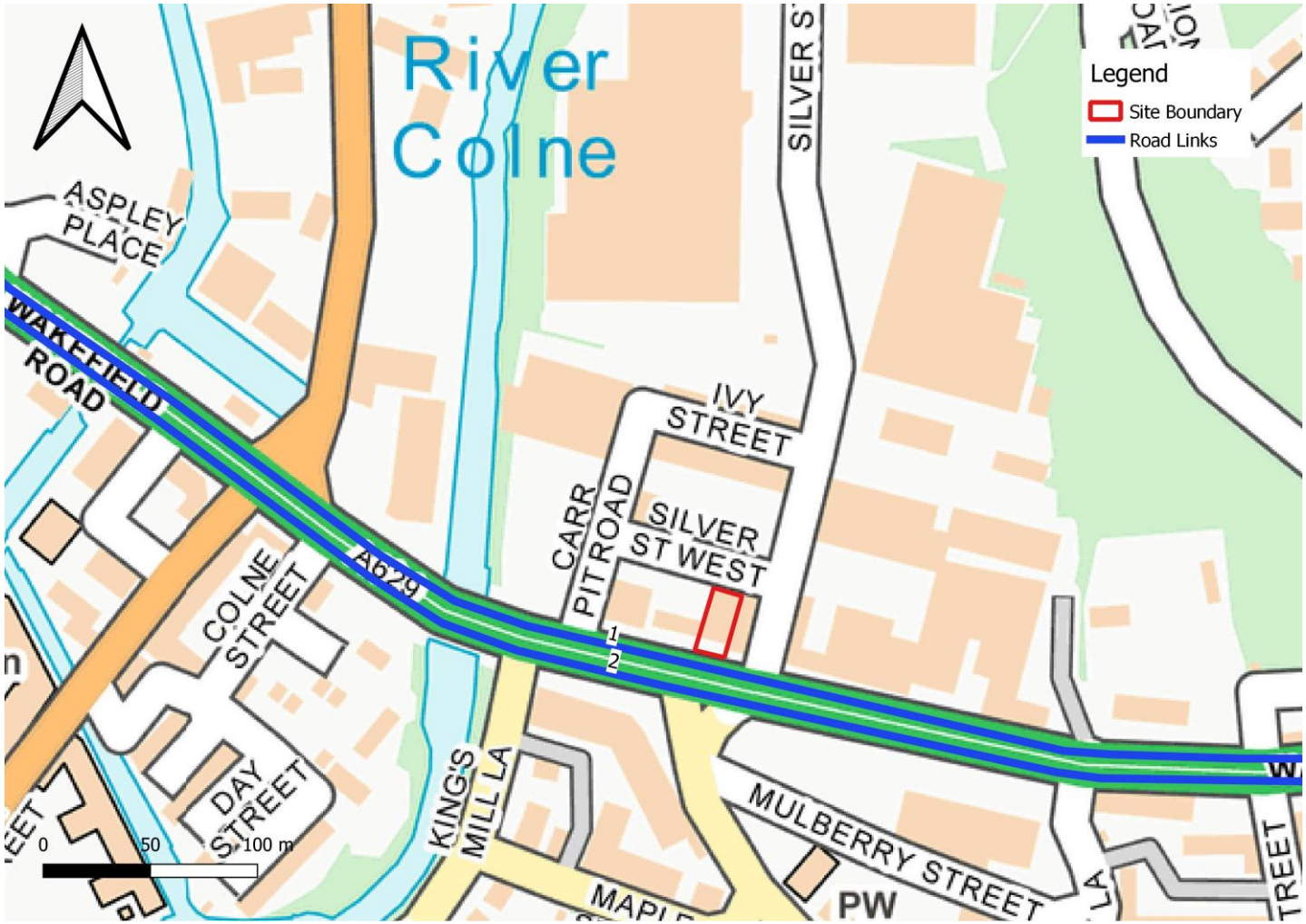

River Colne
Legend
Site Boundary
Road Links
ASPLEY PLACE
WAKEFIELD ROAD
A629
IVY STREET
CARR PIT ROAD
SILVER ST WEST
COLNE STREET
DAY STREET
KING'S MILL LA
MULBERRY STREET
PW
1
2
0
50
100 m

Figure A-1
Modelled Road Links

Model Verification

Calculation of Correction Factors

The model output of road-NO_x (i.e. the component of total NO_x coming from road traffic exhaust emissions) has been compared with the 'measured' road-NO_x.

For this calculation, the following assessment inputs were used, which are considered to be representative of the development locale:

- DEFRA's NOx to NO_2 calculator version 8.1;
- 'Kirklees' was selected as the 'Local Authority';
- 2019 NO_2 monitoring locations K56 and K86 from the KC monitoring network; and
- 2019 DEFRA mapped background concentrations (2018 base year) for the grid square containing the above diffusion tubes.

Prior to undertaking model verification, model setup parameters and input data were reviewed to maximise the performance of the dispersion model in relation to the real-world conditions.

Calculated (monitored) NOx data versus modelled NOx data is shown in Table A-5 below with the derived adjustment factor based on a linear regression forced through zero.

Table A-5
Verification Data 2019, Final Comparison

Monitoring Location	Modelled NO_X Road Contribution ($\mu g/m^3$)	Calculated NO_X Road Contribution ($\mu g/m^3$)	Adjusted Modelled NO_X Road Contribution ($\mu g/m^3$)	Monitored NO_2 Concentration ($\mu g/m^3$)	Adjusted Modelled NO_2 Concentration ($\mu g/m^3$)	Difference (%)
K56	14.5	38.2	39.8	34.9	35.6	2.2
K86	8.33	25.8	22.9	29.1	27.7	-4.8
		m-regression factor	2.747			

Refinements have been made to the model performance without "*providing unreasonable data inputs in order to reduce model adjustment factors is not an acceptable approach*" – as stated within LAQM.TG(09), which despite its status (i.e. superseded) the above extract is still considered to be relevant.

In accordance with LAQM.TG(16), the ratio of 'Calculated (Monitored) Road NOx Contribution' to 'Modelled NOx Road Contribution' has been calculated and reviewed. The calculated ratio is 1:2.747.

As presented in Table A-5, modelled NOx concentrations have therefore been verified using a factor of 2.747.

PM_{10} Verification

Given the absence of PM_{10} monitoring in the development locale, modelled PM_{10} concentrations have been verified in accordance with the above methodology i.e. as consistent with NOx, using a factor of 2.747 following the recommendations within LAQM.TG(16).

APPENDIX B – Site Suitability Modelling Results

Table B-1 below details the modelled results at each sensitive receptor for both the 2021 opening year scenario and the 2019 sensitivity scenario.

Table B-1
Modelled Site Suitability Receptor Locations

Receptor	2021 Opening Year Scenario		2019 Sensitivity Scenario	
	NO_2 Annual Mean Concentration (µg/m^3)	PM_{10} Annual Mean Concentration (µg/m^3)	NO_2 Annual Mean Concentration (µg/m^3)	PM_{10} Annual Mean Concentration (µg/m^3)
SS1	36.5	16.7	41.6	17.2
SS2	37.2	16.9	42.5	17.4
SS3	36.9	16.7	42.2	17.3
SS4	37.5	16.9	42.9	17.4
SS5	26.3	14.6	29.6	15.1
SS6	26.1	14.6	29.3	15.0
SS7	26.4	14.6	29.7	15.1
SS8	26.2	14.6	29.5	15.0
SS9	30.7	15.5	34.8	15.9
SS10	30.9	15.5	35.1	16.0
SS11	30.9	15.5	35.1	16.0
SS12	31.2	15.5	35.5	16.0
SS13	24.7	14.3	27.7	14.7
SS14	24.6	14.3	27.5	14.7
SS15	24.8	14.3	27.8	14.7
SS16	24.7	14.3	27.6	14.7
SS17	24.8	14.3	27.8	14.7
SS18	24.7	14.3	27.7	14.7
SS19	24.9	14.3	27.9	14.7
SS20	25.0	14.3	28.0	14.7
SS21	22.6	13.9	25.1	14.3
SS22	22.5	13.9	25.0	14.3
SS23	22.6	13.9	25.2	14.3

Receptor	2021 Opening Year Scenario		2019 Sensitivity Scenario	
	NO_2 Annual Mean Concentration ($\mu g/m^3$)	PM_{10} Annual Mean Concentration ($\mu g/m^3$)	NO_2 Annual Mean Concentration ($\mu g/m^3$)	PM_{10} Annual Mean Concentration ($\mu g/m^3$)
SS24	22.6	13.9	25.1	14.3

EUROPEAN OFFICES

United Kingdom

AYLESBURY
T: +44 (0)1844 337380

BELFAST
belfast@slrconsulting.com

BRADFORD-ON-AVON
T: +44 (0)1225 309400

BRISTOL
T: +44 (0)117 906 4280

CARDIFF
T: +44 (0)29 2049 1010

CHELMSFORD
T: +44 (0)1245 392170

EDINBURGH
T: +44 (0)131 335 6830

EXETER
T: + 44 (0)1392 490152

GLASGOW
glasgow@slrconsulting.com

GUILDFORD
guildford@slrconsulting.com

LONDON
T: +44 (0)203 805 6418

MAIDSTONE
T: +44 (0)1622 609242

MANCHESTER (Denton)
T: +44 (0)161 549 8410

MANCHESTER (Media City)
T: +44 (0)161 872 7564

NEWCASTLE UPON TYNE
T: +44 (0)191 261 1966

NOTTINGHAM
T: +44 (0)115 964 7280

SHEFFIELD
T: +44 (0)114 2455153

SHREWSBURY
T: +44 (0)1743 23 9250

STIRLING
T: +44 (0)1786 239900

WORCESTER
T: +44 (0)1905 751310

Ireland

DUBLIN
T: + 353 (0)1 296 4667

France

GRENOBLE
T: +33 (0)6 23 37 14 14