ROWLEY LANE, LEPTON

Proposed Residential Development

Air Quality Assessment

Prepared for: KCS Developments Ltd

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1.0 INTRODUCTION

SLR Consulting Ltd (SLR) has been commissioned by KCS Developments Ltd to undertake an Air Quality Assessment (AQA) in support of a planning application for a proposed residential development on land off Rowley Lane, Lepton (the 'Application Site'). Phase 1 seeks the development of up to 80No. C3 use-class residential dwellings ('Proposed Development'), with anticipated opening year of 2027.

Vehicular access to the Proposed Development will be via a new access point to be created off Hermitage Park.

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 during the construction and operational phases of the Proposed Development and an evaluation of the significance of the effects.

1.1 Scope of Assessment

Pre-assessment discussion[1] was undertaken with the Environment Health Officer (EHO) at Kirklees Council (KC – the Council) in order to agree the extent and methodology of the Air Quality Assessment. However, at the time of writing no written response to the proposed scope of the Air Quality Assessment had been received.

Notwithstanding, the following scope of works have been undertaken as part of this Air Quality Assessment as proposed to KC, which follows established best practice and local guidance requirements:

- Baseline Evaluation – Assessment of existing air quality in the local area;
- Construction Phase Assessment – Identification and assessment of potential air quality impacts and effects associated with the construction phase of the Proposed Development, primarily dust impacts and suspended particulate matter with an aerodynamic diameter of less than 10 micrometres (PM_{10});
- Exposure Assessment – Screening assessment of potential air quality constraints at the site following West Yorkshire guidance as part of a baseline site-suitability review;
- Operational Phase Assessment, to consider the air quality impacts associated with the Proposed Development on the existing environment; and
- Mitigation Measures – Identification of appropriate mitigation measures for incorporation within the 'design' based upon the above proposed scope.

1.2 Background

The basis of the presented operational phase impact assessment relates to a previous design iteration of the scheme, comprising 110 dwellings with an anticipated completed opening year of 2025. The Proposed Development now seeks consent for 80 dwellings with a completed opening year of 2027. The operational phase trip generation and associated impacts on air quality for the 80 dwellings Proposed Development will be correspondingly lower than those associated with a 110 dwellings scheme. Therefore, the results of the operational phase impact assessment presented herein are considered to be precautionary and worst-case in comparison to the Proposed Development for 80 dwellings.

[1] E-mail correspondence between SLR Consulting Ltd and Andrew Jameson, Environmental Protection Officer within Kirklees Council, dated 5th October 2020.

2.0 RELEVANT AIR QUALITY LEGISLATION AND GUIDANCE

2.1 Legislative Context

2.1.1 Air Quality Standards

The Air Quality Standards Regulations 2010[2] (AQSR) transpose both the EU Ambient Air Quality Directive (2008/50/EC)[3], and the Fourth Daughter Directive (2004/107/EC)[4] within UK legislation, in order to align and bring together in one statutory instrument the Government's obligations. The AQSR includes Limit Values, Target Values, Objectives, Critical Levels and Exposure Reduction Targets for the protection of human health and the environment. Limit values are legally binding and are considered to apply everywhere with the exception of the carriageway and central reservation of roads and any location where the public do not have access (e.g. industrial sites). Compliance is regulated at a national level (based upon a series of zones and agglomerations).

In the interim period the UK has formally left the EU, however despite this, EU rules and regulations referred above have subsequently been written into UK law and are still relevant.

2.1.2 Air Quality Strategy

Irrespective of the above, the UK Government and the devolved administrations are required under the Environment Act 1995 to produce a national air quality strategy to improve air quality. The latest Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland was published in 2007[5]. The AQS 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 for the protection of public health and the environment. There is no legal requirement to meet these objectives except where they mirror an equivalent legally binding Limit Value as prescribed within EU legislation, however compliance is regulated by local planning authorities.

The AQS objectives apply at locations outside buildings or other natural or man-made structures above or below ground, where members of the public are regularly present and might reasonably be expected to be exposed to pollutant concentrations over the relevant averaging period – herein referred to as relevant exposure. Table 2-2 provides an indication of those locations.

The ambient air quality standards of relevance to human receptors in this assessment (collectively termed Air Quality Assessment Levels (AQALs) throughout this report) are provided in Table 2-1.

Table 2-1
Relevant Ambient AQALs

Pollutant	AQAL (µg/m^3)	Averaging Period
Nitrogen Dioxide (NO_2)	40	Annual mean
	200	1-hour mean (not to be exceeded on more than 18 occasions per annum)
Particles (PM_{10})	40	Annual mean
	50	24-hour mean (not to be exceeded on more than 35 occasions per annum)
Particles ($PM_{2.5}$)	25	Annual mean

[2] The Air Quality Standards Regulations (England) 2010, Statutory Instrument No 1001, The Stationary Office Limited.
[3] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe.
[4] Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004.
[5] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Defra. July 2007.

Table 2-2
Human Health Relevant Exposure

AQAL Averaging Period	AQALs should apply at	AQALs should not apply at
Annual Mean	Building facades of residential properties, schools, hospitals etc.	Facades of offices Hotels Gardens of residences Kerbside sites
24-hour mean	As above together with hotels and gardens of residential properties	Kerbside sites where public exposure is expected to be short term
1-hour mean	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

2.1.3 Local Air Quality Management

As reinforced within the AQS, Part IV of the Environment Act 1995 induces a statutory duty for local authorities to undergo a process of Local Air Quality Management (LAQM). This requires local authorities to Review and Assess air quality within their boundaries to determine the likeliness of compliance, regularly and systematically.

Where any of the prescribed AQS objectives are not likely to be achieved, the authority must designate an Air Quality Management Area (AQMA). For each AQMA, the local authority is required to prepare an Air Quality Action Plan (AQAP), which details measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the objective. AQMAs can give rise to potential constraints to development, or at least a higher degree of scrutiny to air quality assessment work. Local authorities therefore have formal powers to control air quality through a combination of LAQM and through application of wider planning policies.

2.2 Clean Air Strategy

The Clean Air Strategy (CAS)[6], published in 2019, sets out the Government's proposals aimed at delivering cleaner air in England, and 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.

2.3 General Nuisance Legislation

Part III of the Environmental Protection Act (EPA) 1990 (as amended) contains the main legislation on Statutory Nuisance and allows local authorities 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 currently no numerical limits in terms of what level of dust deposition constitutes a nuisance.

2.4 Planning Policy

The following policies have been considered within this assessment.

[6] The Clean Air Strategy, Defra. January 2019.

2.4.1 National Policy

The 2021 update to the National Planning Policy Framework[7] (NPPF) sets out planning policy for England. The NPPF states that the planning system should contribute to and enhance the natural and local environment, by preventing new development from contributing to or being adversely affected by unacceptable concentrations of air pollution and development should, wherever possible, help to improve local environmental conditions such as air quality.

In specific relation to air quality policy, the document states:

Chapter 15 - Conserving and Enhancing the Natural Environment

> *"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*".

2.4.2 Local Policy

The Kirklees Local Plan was adopted on 27th February 2019 and is the statutory development plan for Kirklees which supersedes the Kirklees Unitary Development Plan.

The Local Plan comprises the strategy and policies document, allocations and designations document and associated policies map showing the allocations and designations. The Local Plan sets out the policies necessary to achieve the strategy, how much new development there should be in the district and where it will be located during the period up to 2031.

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

> *"**Policy LP20 - Sustainable Travel***

[7] National Planning Policy Framework (2021). Available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2

[…]

The council will support demand management measures which discourage single occupancy car travel within new development and encourage the use of low emission vehicles to improve areas with low levels of air quality. Proposals should include measures to encourage the use of sustainable travel options, including public transport, the promotion of personal journey planning, walking, cycling, car sharing, electronic communication and home working.

[…]"

*"**Policy LP21 - Highways and Access***

Proposals shall demonstrate that they can accommodate sustainable modes of transport and be accessed effectively and safely by all users.

New development will normally be permitted where safe and suitable access to the site can be achieved for all people and where the residual cumulative impacts of development are not severe.

Proposals shall demonstrate adequate information and mitigation measures to avoid a detrimental impact on highway safety and the local highway network. Proposals shall also consider any impacts on the Strategic Road Network.

All proposals shall:

[…]

c. be accompanied by a supporting Transport Assessment or Transport Statement where the development would generate significant trip generation, providing detail as to the impact on highway safety, air quality, noise and light restrictions;

[…]"

*"**Policy LP47 - Healthy, Active and Safe Lifestyles***

The council will, with its partners, create an environment which supports healthy, active and safe communities and reduces inequality.

Healthy, active and safe lifestyles will be enabled by:

[…]

g. ensuring that the current air quality in the district is monitored and maintained and, where required, appropriate mitigation measures included as part of new development proposals;

[…]"

*"**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 above policies stated within the Kirklees Local Plan in relation to air quality are considered within this Air Quality Assessment.

2.5 Assessment Guidance

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

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

Air Quality and Emissions, Technical Planning Guidance has been published for use within West Yorkshire[8] as part of the WY Low Emission Strategy; KC has adopted this guidance and as such it has been applied within this assessment.

As part of the guidance, the classification of the development is required to determine the appropriate level of assessment, whereby schemes are classified as either 'minor', 'medium' or 'major'. Following the appropriate level of assessment, requirements for mitigation are outlined based upon the classification of the scheme.

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

DEFRA's Local Air Quality Management Technical Guidance (LAQM.TG(16))[9] 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)[9] have been employed throughout the assessment, in order to provide consistency with the Council's own work on air quality.

2.5.3 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[10] 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.

2.5.4 Design Manual for Roads and Bridges

The Design Manual for Roads and Bridges (DMRB) LA 105[11] states receptors, including ecological designations,

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

[9] 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. April 2021.

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

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

within 200m of an 'affected road' source, require further assessment of potential impacts.

2.5.5 Construction and Demolition Dust Guidance

Guidance on the assessment of dust from demolition and construction has been published by the IAQM[12]. The guidance provides a series of matrices to determine the risk magnitude of potential dust sources associated with construction activities in order to identify appropriate mitigation measures that are defined within further IAQM guidance.

2.6 Regulation of Vehicular Exhaust Emissions

2.6.1 Road Vehicles

The emission of combustion pollutants from road vehicle exhausts is regulated by European Directives with the phasing in of more stringent standards (known as Euro standards) for new vehicles over the past 20 years for a range of pollutants including oxides of nitrogen (NOx), carbon monoxide (CO), unburnt hydrocarbons and particulate matter (PM). The actual emission limits vary depending on vehicle size (i.e. car, Light Duty Vehicles[13] (LDV i.e. cars, vans), Heavy Duty Vehicles[14] (HDV i.e. lorries and buses) and fuel type (i.e. diesel or petrol).

The latest standard, 'Euro VI / 6', applies to new type approvals from September 2014 and all new cars and LDVs from September 2015 and requires significantly lower NOx limits for diesel LDVs. Similarly, for HDVs, Euro VI / 6 is the current standard and also requires significant reductions in NOx (and PM) emissions from the previous Euro V / 5 standard.

There is a widely acknowledged discrepancy between actual vehicle exhaust emissions (under real-world driving conditions) and the Euro emission standards, particularly for NOx. To alleviate this, the latest standard (Euro VI / 6) has been allocated the subcategories b, c and d to represent stricter changes in vehicle emissions testing based on real-driving data (Real Drive Emissions (RDE)). As such, the emission standards have not changed, rather the measuring method. These subcategorised limits also refer to validity of years, for example Euro VIc were mandatory on all LDVs registered from Sept 2018.

Moreover, recent data indicates that emissions from Euro VI diesel Heavy Goods Vehicles (HGVs) are complying with the Euro VI standard[15].

2.6.2 Non-Road Mobile Machinery

Non-road mobile machinery (NRMM) refers to mobile machines, items of transportable industrial equipment or vehicles (with or without bodywork) that is:

- not intended for carrying passengers or goods on the road; and
- installed with a combustion engine - either an internal spark ignition (SI) petrol engine, or a compression ignition diesel engine.

In the UK, the legislation governing emissions produced by diesel engines fitted in NRMM is the Non-Road Mobile Machinery (Emission of Gaseous and Particulate Pollutants) Regulations 1999, as amended which sets emission standards for CO, hydrocarbons, NO_x and PM. These emission limits are defined by European Directive 97/68/EC (and subsequent amendments) and are Stage I-V depending on the capacity of the engine and date of manufacture.

[12] Institute of Air Quality Management (IAQM), Guidance on the assessment dust from demolition and construction (2016).

[13] As defined by the design manual for roads and bridges (DMRB) and includes vehicles <3.5tonnes.

[14] As defined by the design manual for roads and bridges (DMRB) and includes vehicles ≥3.5tonnes.

[15] In-service emission performance of Euro 6/VI vehicles -a summary of testing using London drive cycles. Transport for London and Mayor of London.

Pollutants emitted by NRMM that may have the most significant potential effects on local air quality are particulate matter (PM_{10}, $PM_{2.5}$) and NO_2 / NO_X.

3.0 ASSESSMENT METHODOLOGY

3.1 Construction Phase Assessment

3.1.1 Construction Dust Assessment

The assessment has been undertaken with reference to IAQM '*Guidance on the assessment of dust from construction and demolition*'[12]. The assessment of risk is determined by considering the risk of dust effects arising from four activities in the absence of mitigation:

- demolition;
- earthworks;
- construction; and
- track-out.

The assessment methodology considers three separate dust impacts with account being taken of the sensitivity of the area that may experience these effects:

- annoyance due to dust soiling;
- the risk of health effects due to an increase in exposure to PM_{10}; and
- harm to ecological receptors.

The first stage of the assessment involves a screening to determine if there are sensitive receptors within threshold distances of the site activities associated with the construction phase of the Proposed Development. A detailed assessment is required where a:

- human receptor is located within 350m of the Site, and/or within 50m of routes used by construction vehicles, up to 500m from large sites, 200m from medium sites and 50m from small sites; and/or
- ecological receptor is located within 50m of the Site, and/or within 50m of routes used by construction vehicles, up to 500m from large sites, 200m from medium sites and 50m from small sites.

In recognition of the above, the Application Site is classed as a large site.

The dust emission class (or magnitude) for each activity is determined on the basis of the guidance, indicative thresholds and expert judgement. The risk of dust effects arising is based upon the relationship between the dust emission magnitude and the sensitivity of the area. The risk of impact is then used to determine the mitigation requirements.

Descriptors for magnitude of impact and impact significance used in the assessment of construction phase dust are as presented in Appendix A.

3.1.2 Construction Phase Plant Emissions Assessment

To facilitate construction, NRMM may be used. NRMM refers to mobile machines, transportable industrial equipment or vehicles which are fitted with an internal combustion engine and not intended for transporting goods or passengers on roads.

Pollutants emitted by NRMM that may have the most significant potential effects on local air quality are particulate matter (PM_{10} and $PM_{2.5}$), and NO_x/NO_2. NRMM emissions associated with construction programmes can adversely affect local air quality.

Emissions from construction phase plant, as NRMM will be screened following LAQM.TG(16) guidance.

3.2 Baseline Review – Exposure Assessment

An 'exposure assessment' has been undertaken following the West Yorkshire *Air Quality and Emissions, Technical Planning Guidance* to determine whether future occupants of the scheme are likely to be exposed to existing levels of poor air quality.

3.3 Operational Phase Assessment

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

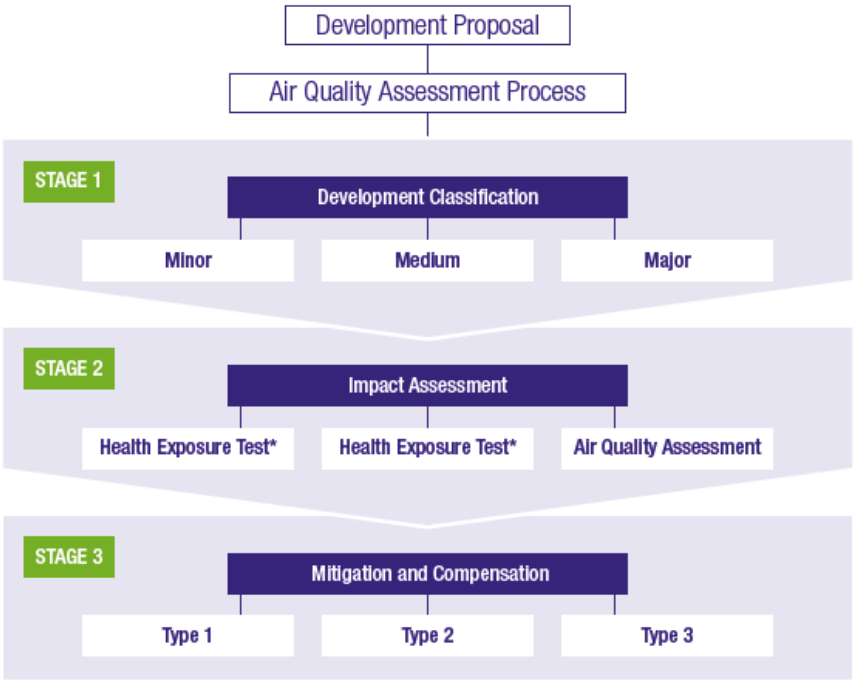

Figure 3-1
WY Air Quality Assessment and Mitigation Flow chart

3.4 Development Classification

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 Annual Average Daily Traffic (AADT) by 5% or more;
- proposals that increase traffic by 5% on road canyons with >5,000 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, the proposed development is considered to be classified as 'medium'. As such, the assessment has been undertaken to quantify the potential impact and effect on air quality arising from road vehicle emissions associated with change in development trips during the operational phase of the scheme, with reference to the following documents:

- Local Air Quality Management Technical Guidance (LAQM.TG(16));
- DMRB Volume 11, Section 3, Part 1 HA207/07- Air Quality (an Interim Advice Note);
- Land-Use Planning and Development Control: Planning for Air Quality (v1.2, 2017) – EPUK and IAQM; and
- West Yorkshire Air Quality and Emissions, Technical Planning Guidance.

However, as the Proposed Development is considered to be classified as 'medium', no 'Emission Impact Assessment' of the Proposed Development has been undertaken.

3.5 Road Traffic Emissions Screening

A screening assessment has been undertaken to identify 'significant changes' in traffic on roads with relevant receptors associated with both the construction and operational phase, by reference to EPUK & IAQM 'indicative criterion for assessment', i.e.:

- a change of HDV16 flows of more than 500 AADT (outside an AQMA);
- a change of HDV17 flows of more than 100 AADT (outside an AQMA);
- a change of LDV flows of more than 100 AADT (within an AQMA); and/or
- a change of HDV flows of more than 25 AADT (within an AQMA).

Traffic data / predicted development trip generation to the extent of the above 'indicative criterion for assessment' has been provided by Optima Highways & Transportation, transport consultants to the applicant. For all roads

[16] As defined by the design manual for roads and bridges (DMRB), and includes vehicles <3.5tonnes including cars and light duty vehicles.

[17] As defined by the design manual for roads and bridges (DMRB), and includes vehicles ≥3.5tonnes and includes heavy duty vehicles and buses.

where predicted development trip generation has been provided, detailed dispersion modelling has been undertaken to quantify impacts and an effect on air quality.

3.6 Dispersion Modelling

Detailed air dispersion modelling has been undertaken using the Cambridge Environmental Research Consultants (CERC) ADMS-Roads air dispersion model v5.0, 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;
- 'Do Minimum' scenario (DM): situation if the scheme is not taken forward (opening year 2025); and
- 'Do Something' scenario (DS): situation if the scheme is taken forward (opening year 2025).

As discussed in Section 1.2, the approach taken within this operational phase assessment relates to a previous design iteration for 110 dwellings with a completed opening year of 2025. The Proposed Development and revised layout seeks consent for 80 dwellings with a completed opening year of 2027. Therefore, the applied trip generation for 110 dwellings, and emission factors and background concentrations for 2025 are precautionary in comparison to those associated with the Proposed Development for 80 dwellings and a completed opening year of 2027.

3.6.1 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). At the time of submission, it is acknowledged that a subsequent update to the EfT has been released (EfT v11), however the emissions remain unchanged for the scenarios considered (i.e. up to 2030).

Reference should be made to Appendix B 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 road traffic emission 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 2025 year (i.e. the predicted development opening year). 'Kirklees' was selected as the local authority.

In summary, the assessment has utilised the following inputs:

- 2025 emission factors from v10.1 of the EFT; and
- 2025 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[18]. 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.

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

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 a continued downward trend in monitored concentrations.

Reference should be made to Appendix C for presentation of the sensitivity modelling scenario.

3.6.2 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 26km 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 4-1.

3.6.3 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[19]. 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[20] has been used – in accordance with LAQM.TG(16).

3.6.4 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".*

[19] Defra, UK Air Information Resource (UK-AIR) website, http://uk-air.defra.gov.uk/, accessed October 2020.

[20] Defra NO_2 Adjustment for NO_x Sector Removal Tool version 8.0 (2020), available at https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxsector.

The receptor locations, which are considered representative of potential exposure within the Air Quality Assessment of road traffic emissions, are shown in Table 4-1 and illustrated in Drawing AQ1, based upon relevant exposure locations as 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)

3.6.5 Assessing Significance

The EPUK & IAQM guidance 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 approximated 5km to the south-east of Huddersfield Town Centre, at approximate National Grid Reference (NGR): x419223, y414721. The Application Site is bounded by:

- existing residential dwellings to the north-west to north-east. A primary school and associated playing fields are located directly north by approximately 100m at the shortest distance;
- Lepton Great Wood is located immediately east along the whole eastern boundary of the site. Beyond that are agricultural fields;
- agricultural fields are located southwards, along with a few sparse residential dwellings approximate 220m at the shortest distance; and
- existing residential dwellings are located to the west along with a couple of agricultural fields before you come to the A629. A factory is located approximately 250m west from the south end of the Application Site.

Primary vehicular access to the Application Site will be via a new road off Hermitage Park, a cul-de-sac located directly north / north-west of the site.

4.2 Sensitive Receptors

4.2.1 Construction Dust Receptors

The main receptors likely to be affected by the generation of construction dust are those existing receptors within approximately 350m of the Application Site boundary and/or within 50m of the route(s) used by vehicles on the public highway, up to 500m from the site entrance(s), according to the IAQM guidance[21]. However, for those receptors sited in a downwind location from the development site boundary, potential dust impacts may be witnessed at a distance of greater than 350m on occasion under worst case conditions.

Reference should be made to Drawing AQ1 for an illustration of buffer zones of all sensitive receptors with the potential to be impacted upon by construction phase dust in accordance with the stated IAQM assessment methodology.

4.2.2 Human Receptors

The sensitive receptor locations considered representative of potential exposure for the Air Quality Assessment are shown in Table 4-1. Where these receptors are referenced within the reporting text, they are termed R1 – R11.

These are worst-case locations within the development locale based upon their proximity to the surrounding road links. Receptors have been modelled at a height of 1.5m above ground level to represent exposure (i.e. breathing) height, unless otherwise stated. Reference should be made to Drawing AQ2 for an illustration of the location of these receptors relative to the Application Site and affected road network.

[21] IAQM, Guidance on the assessment dust from demolition and construction v1.1, 2016.

Table 4-1
Operational Phase Human Sensitive Receptors

Receptor		NGR (m)		Height (m)
		X	Y	
R1	Residential - 65 Penistone Road	418634	414601	1.5
R2	Residential - Rowley Lane	418674	414595	1.5
R3	Residential - Woodsome Park	418871	414580	1.5
R4	Residential - Rowley Lane	418984	414663	1.5
R5	Educational - Rowley Lane Junior Infant & Nursery School	419141	414864	1.5
R6	Residential - Rowley Lane	419257	414801	1.5
R7	Residential - Rowley Lane	419500	414957	1.5
R8	Residential - Rowley Lane	419699	415115	1.5
R9	Residential - Rowley Lane	420000	415176	1.5
R10	Residential - Wakefield Road	420201	415170	1.5
R11	Residential - Wakefield Road	420350	415130	1.5

4.2.3 Ecological Receptors

A review using the Magic web-based mapping service[22] was undertaken to identify any designated sites of ecological or nature conservation importance required for consideration within the assessment, as follows:

- construction phase assessment – any ecological designation within 50m of the Application Site boundary, or 50m of any road projected to witness construction phase road traffic movements, that could potentially be affected by dust from the construction phases of the proposed development; and
- operational phase assessment – any ecological designation, but with particular reference to 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.

A search within 50m of the development boundary / any road projected to witness construction phase road traffic movements identifies one ecological receptor (Lepton Great Wood, Ancient Woodland (AW)) within 50m of the development boundary which could potentially be affected by construction dust. This local ecological receptor has been included within the construction phase dust assessment.

A search within 200m of any 'affected road' surrounding the Application Site identifies no receptors.

4.3 Baseline Air Quality

Monitoring data collected prior to the COVID-19 pandemic (i.e. pre-2020) has been used to characterise the baseline environment, as pollutant concentrations monitored during 2020 and 2021 are expected to be atypical,

[22] Natural England, www.magic.gov.uk, accessed October 2020.

and not representative of the local environment and have therefore not been considered as per Defra supplementary guidance[23] and IAQM position statement[24].

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 AQAL at locations of relevant public exposure within KC's administrative area. As such, 9 AQMAs have been declared throughout the Council's area. The closest to the Application Site is AQMA 9 at approximately 4.1km to the north-west.

A Detailed Assessment of air quality has determined that the combustion of fossil fuels, principally from road traffic emissions, are the dominant source of ambient NO_2 concentrations within the declared KC AQMAs. However, due to the stand-off distance / buffer between the Application Site and the AQMAs, development trips are considered to distribute sufficiently on the surrounding highway network and will be lower than the EPUK & IAQM guidance 'indicative criterion for assessment' as presented within Section 3.5. As such, the proposals are not considered to impact air quality within any of the AQMA designated areas, and no consideration is provided within this assessment.

All other AQS pollutants were below the relevant AQALs at locations of relevant public exposure, and 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 AURN monitor to the Application Site is the Dewsbury Ashworth Grove AURN (NGR: x424060, y421912) located approximately 8.7km north-east of the proposals. The Dewsbury Ashworth Grove AURN is of an '*urban background*' classification, defined as "*An urban location distanced from sources and therefore broadly representative of city-wide background conditions, e.g. urban residential areas".* It is noted that data capture only commenced at the AURN on 07/09/2018 and ended on 11/03/2019. Therefore, no complete calendar year of annual mean monitoring data is available at the time of assessment. Therefore, monitoring data from the Dewsbury Ashworth Grove AURN is not considered further within this assessment.

KC operate two automatic monitoring locations across its administrative area as part of their commitment to LAQM. The closest automatic monitor to the Application Site is station 'RS3 Bradley' (NGR: x417255, y420761), classified as a 'roadside' monitor, defined as: '*a site sampling typically within one to five metres of the kerb of a busy road*'. The 'RS3 Bradley' monitor is located approximately 6.3km north north-west of the Application Site. Given the distance between the Application Site and the 'RS3 Bradley' automatic monitor, similar background pollutant concentrations are not anticipated. Therefore, data from the 'RS3 Bradley' automatic monitor has not been considered within this assessment.

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.

[23] Defra and the Greater London Authority, COVID-19: Supplementary Guidance. Local Air Quality Management Reporting in 2021. April 2021.

[24] Institute of Air Quality Management, Position Statement, 2020 and 2021 Monitoring Datasets. 2021

A summary of recent NO_2 monitoring results from the closest diffusion tube monitoring locations to the Application Site are presented within Table 4-2.The closest diffusion tube to the Application Site is located approximately 2.4km north north-west. Beyond that, the next nearest is 4.4km north-west and within AQMA 9 (Huddersfield Town Centre). Due to its distance and locale, concentrations monitored at other diffusion tube locations are not considered representative of the Application Site.

Table 4-2
KC NO_2 Passive Diffusion Tube Monitoring Sites: Details

Site ID	Site Location	Site Type	NGR (m)		Height (m)	Within AQMA	Distance and Direction to Site
			X	Y			
52	Penistone Road Waterloo	Roadside (A)	417627	416472	2.0	No	2.4km, north north-west

Note:
(A) Roadside classification as defined by LAQM.TG(16) as "*a site in an urban area at least 25 metres from the edge of major junctions and no more than 10 metres from the kerbside*".

Table 4-3
KC NO_2 Passive Diffusion Tube Monitoring Sites: Results

Site ID	2019 Data Capture %	Annual Mean NO_2 Concentration (µg/m^3)				
		2015	2016	2017	2018	2019
52	100	36.2	36.5	34.6	34.2	30.7

As shown, diffusion tube 52 monitored annual mean NO_2 concentrations 'below' the AQAL limit (40µg/m^3) during the considered monitoring period 2015-2019.

The empirical relationship given in LAQM.TG(16)[9] states that exceedences of the 1-hour mean AQAL for NO_2 are unlikely to occur where annual mean concentrations are <60µg/m^3. Therefore, monitored concentrations at the '52 Penistone Road Waterloo' diffusion tube indicate that exceedences of the 1-hour mean AQAL are unlikely to have occurred between 2015 and 2019.

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 / Table 4-2 and operational phase road traffic emission receptors presented within Table 4-1. Mapped background concentrations have been obtained based upon the 2018 base year DEFRA update (August 2020 publication)[25].

In accordance with the methodology presented within LAQM.TG(16), the NO_X and PM_{10} proportions from the 'Primary A road in' sector of the grid square (where relevant), were removed from the 'total' background concentrations downloaded for each respective pollutant from the Air Quality Information Resource.

Background NO_2 concentrations were updated and revised according to the methodology prescribed within LAQM.TG(16), in light of the source apportioned background NOx concentration. This 'calculated' background

[25] Background mapping data for local authorities – http://uk-air.defra.gov.uk/data/laqm-background-home, accessed October 2020.

concentration was then input into the Air Quality Assessment avoiding double counting of potential source contributions (i.e. existing baseline traffic flows included within the detailed dispersion modelling assessment).

Background pollutant concentrations for 2019 verification year / mapping base year and for 2025 (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/m^3)		
		NO_X	NO_2	PM_{10}
x418500, y414500	2019	11.9	9.15	9.95
	2025	9.58	7.46	9.24
x419500, y414500	2019	11.6	8.92	10.2
	2025	9.29	7.25	9.49
x419500, y415500	2019	12.6	9.62	11.3
	2025	10.1	7.80	10.5
x420500, y415500	2019	11.8	9.03	11.1
	2025	9.45	7.36	10.4
AQAL		**-**	***40***	***40***

4.3.5 Wind Speed and Direction Data

The most comparable observation station to the proposed development site is Leeds Bradford Airport, located approximately 26km north of the Application Site. A wind rose is presented in Figure 4-1.

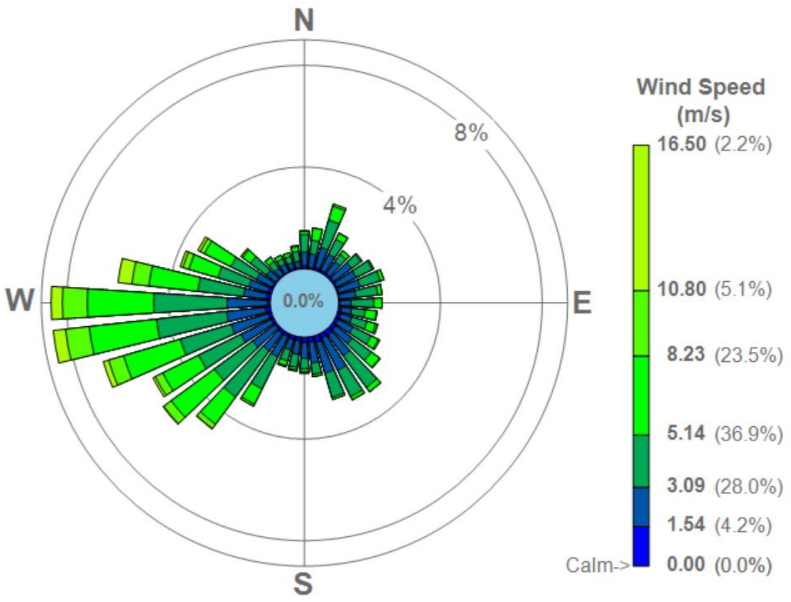

Figure 4-1
Wind rose for Leeds Bradford Airport (2019)

4.4 DEFRA PCM

The *West Yorkshire Air Quality and Emissions Technical Planning Guidance* states that DEFRA's National Pollutant Climate Mapping (PCM) GIS website[26] should be used to ascertain if the development is located within 20m of roads at or above the relevant national objective.

Figure 4-2 illustrates that the A629 Penistone Road (west of the Application Site) and the A642 Wakefield Road (north of the Application Site) are the closest roads with mapped roadside NO_2 concentration in 2017. The NO_2 roadside concentrations are 10 – 20µg/m^3 (A642 Wakefield Road) and 20 – 30µg/m^3 (A629 Penistone Road) in 2019: these roads are approximately 610m and 320m, respectively, from the Application Site.

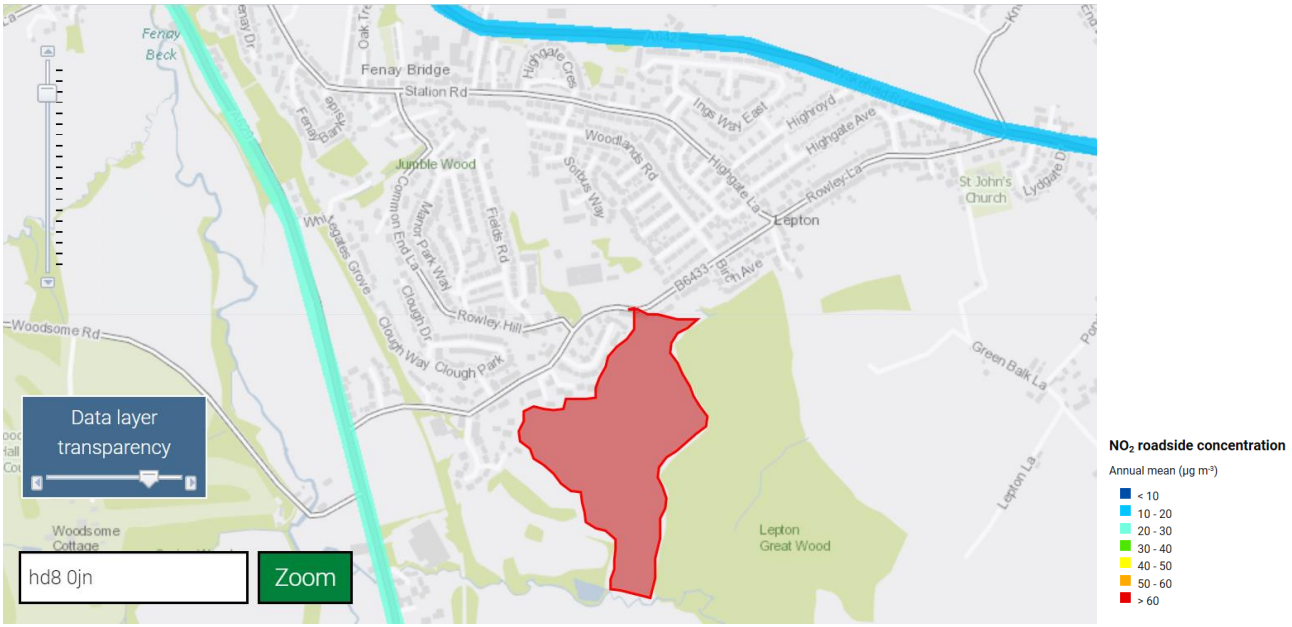

Figure 4-2
DEFRA PCM Model Output

[26] https://uk-air.defra.gov.uk/data/gis-mapping, accessed October 2020.

5.0 CONSTRUCTION PHASE ASSESSMENT

This section presents the potential air quality impacts and effects associated with the construction of the development in terms of dust and vehicle emissions.

5.1 Construction Dust Assessment

Construction activities will include:

- material export and import;
- temporary stockpiling of materials;
- groundwork for foundations and services;
- construction of buildings;
- landscaping works; and
- vehicle movements (with the potential to track-out material from site).

The following subsections provide a consideration of potential construction dust and conclude with a determined emission class and risk category, from each of the categories identified by the IAQM Guidance.

Where figures relating to area of the site, volume of the site, approximate number of construction vehicles or distances to receptors are given, these relate to thresholds as defined in the IAQM guidance[12] to guide the assessor to define the dust emissions magnitude and sensitivity of the area (as detailed in Section 3.1).

5.1.1 Assessment Screening

As shown in Drawing AQ1, there are 'human receptors' within 20m of the Site and an ecological receptor (Lepton Great Wood AW) within 50m of the site boundary / within 50m of the site access roads (assessed up to 500m from the site entrance). Therefore, an assessment of construction dust on both human and ecological receptors is required.

5.1.2 Potential Dust Emissions Magnitude

The most significant potential source of dust emissions during construction would be the earthworks, construction and trackout activities. Dust is potentially generated by the action of heavy vehicles (bulldozer, front-end loader, hydraulic excavator, and dump trucks), as well as by the movement of the vehicles on potentially dusty surfaces. Handling and storage of construction materials (aggregates / hard core), haulage across unsurfaced areas are also potential sources of dust generation.

Demolition

The Site is currently vacant green land; therefore, no demolition activities are required. As such, impacts associated with demolition have been scoped out.

Earthworks

The proposals comprise the development of up to 80No. residential dwellings and associated infrastructure. Site earthworks are therefore required over an area greater than 10,000m^2. In addition, given the size of the Site, between 5 – 10 heavy earth moving vehicles are considered to be potentially required on site at once. The dust emission magnitude for earthworks is therefore initially considered to be 'Large'. However, due to the typical phased nature of the construction of residential schemes, the total site area requiring earthworks at any given time is likely to be less and as such, represents a worst-case emission magnitude.

Construction

Due to the phased nature of construction of residential schemes and taking into account the number and size of proposed units, total building volume associated with the Proposed Development is predicted to be between 25,000m^3 and 100,000m^3. The dust emission magnitude for construction is therefore initially considered to be 'Medium'.

Trackout

Construction vehicles will most likely access the site via a new access road off Hermitage Park. No details are available at the time of assessment on the number of additional HDV movements associated with construction works in each phase, however, taking a conservative approach, the number of predicted outward HDV movements in any one day could be greater than 50 at any point during construction. The dust emission magnitude for trackout is therefore considered to be 'Large'.

Summary

A summary of the dust emission magnitude for the three activities is detailed in Table 5-1.

Table 5-1
Potential Dust Emission Magnitude

Activity	Dust Emission Magnitude
Earthworks	Large
Construction	Medium
Trackout	Large

5.1.3 Sensitivity of the Area

The sensitivity of the area takes account of a number of factors:

- the specific sensitivities of receptors in the area;
- the proximity and number of those receptors;
- in the case of PM_{10}, the local background concentration; and
- site-specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.

Sensitives need to be determined in relation to dust soiling effects onto people and property, as well as upon human health (i.e. relative to existing conditions).

Dust Soiling Impacts

The surroundings predominantly comprise existing residential dwellings, that are classified as of high sensitivity to dust soiling. There are between 10 – 100 high sensitivity receptors within 20m of the Application Site boundary. The sensitivity of the area with respect to dust soiling effects on people and property in relation to earthworks, construction and trackout activities is therefore 'High'.

Human Health Impacts

The 2019 mapped background PM_{10} concentration (2018 base year) for the 1km^2 grid square centred on the development (centroid NGR: x419500, y414500) is estimated to be 10.2µg/m^3 (i.e. falls into the <24µg/m^3 class). As discussed, no local background PM_{10} monitoring exists within the development locale. Given the above information regarding the number of residential receptors within 20m of the site boundary and within 500m from the Site entrance on the access roads, the sensitivity of the area with respect to human health impacts in relation to earthworks, construction and trackout is therefore considered to be 'Low'.

Ecological

Lepton Great Wood is within 50m of the site boundary and is of 'local' (i.e. AW) designation. The sensitivity of the area with respect to ecological receptors in relation to earthworks, construction and trackout activities is therefore 'Low'.

Summary

A summary of the sensitivity of the surrounding area is detailed in Table 5-2, whilst the spatial density of nearby receptors is provided in Drawing AQ1.

Table 5-2
Sensitivity of the Area

Potential Impact	Sensitivity of Surrounding Area		
	Earthworks	Construction	Trackout
Dust Soiling Impacts	High	High	High
Human Health Impacts	Low	Low	Low
Ecological	Low	Low	Low

5.1.4 Risk of Impacts (Unmitigated)

The outcome of the assessment of the potential 'magnitude of dust emissions', and the 'sensitivity of the area' are combined in Table 5-3 below to determine the risk of impact which is used to inform the selection of appropriate mitigation.

Table 5-3
Risk of Dust Impacts

Potential Impact	Earthworks	Construction	Trackout
Dust Soiling Impacts	High Risk	Medium Risk	High Risk
Human Health Impacts	Low Risk	Low Risk	Low Risk
Ecological	Low Risk	Low Risk	Low Risk

5.2 Construction Phase Plant Emissions

As per LAQM.TG(16), with the application of suitable control measures and site management, exhaust emissions from on-site NRMM are "*unlikely to make a significant impact on local air quality. In the vast majority of cases they will not need to be quantitatively assessed*".

5.3 Construction Phase – Vehicular Pollutants

Road traffic emissions associated with vehicle movements, particularly HDV movements, during the construction phase of the development have the potential to result in increased concentrations of combustion related pollutants, including NO_2 and PM_{10} in the vicinity of the development site.

The development quantum is not anticipated to result in a significant increase in movements or be above the EPUK and IAQM criterion (for sites adjacent to or within an AQMA). The duration of movements will be short-term in nature and are not considered further within the context of this assessment. Therefore, in accordance with the criterion presented within EPUK and IAQM guidance, additional road vehicle trips during the construction phase of the scheme *'can be considered to have insignificant effects*' on air quality.

6.0 BASELINE SITE SUITABILITY REVIEW

This section presents a review of KC's monitoring data and the *West Yorkshire Air Quality and Emissions Technical Planning Guidance* in consideration with the Proposed Development, for the purposes of identifying requirements for mitigation to be embedded into the scheme design.

6.1 West Yorkshire Air Quality and Emissions Technical Planning Guidance – Exposure Assessment

Stage 2 / Section 5.2 of the *West Yorkshire Air Quality and Emissions Technical Planning Guidance* requires 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 adjacent to 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 (http://uk-air.defra.gov.uk/data/gismapping);
- the proposal is one of the Land Use types:
    - C1 to C3;
    - C4 (Homes of Multiple Occupation); or
    - D1 in table1.
    - and (in conjunction with the above) within 20m of roads with >10,000 AADT.

In consideration of the above criterion:

- the Application Site is not located within or adjacent (i.e. within 200m) to an AQMA, as discussed within Section 4.3.1;
- the Application Site is not located within 20m of a road above the annual mean roadside NO_2 AQAL as presented within Section 4.4; and
- the Application Site is a C3 use-class Proposed Development. Traffic data provided by the Transport Consultants, Optima Highways indicates that the 2019 24-hour AADT along Rowley Lane is <5,000 AADT.

Therefore, based upon the above there is no requirement to quantify air pollutant concentrations at the Application Site and no requirement for mitigation measures to make the scheme acceptable.

6.2 Significance of Air Quality Impacts

The EPUK and IAQM guidance[27] considers a number of factors for the determination of significance of predicted air quality impacts.

To determine the significance of predicted air quality impacts based upon a site-suitability assessment, such as that undertaken as part of this assessment, the EPUK & IAQM guidance states:

> *"Where the air quality is such that an air quality objective at the building façade is not met, the effect on residents or occupants will be judged as significant, unless provision is made to reduce their exposure by some means."*

[27] EPUK and IAQM, 'Land-Use Planning and Development Control: Planning for Air Quality', v1.2 2017.

As the ‘exposure assessment’ indicates no requirement to quantify air pollutant concentrations at the Application Site and no requirement for mitigation measures to make the scheme acceptable, the overall effect is considered ‘not significant’.

7.0 OPERATIONAL PHASE ASSESSMENT

This section presents the potential air quality impacts associated with traffic associated with the operational phase of the development.

In summary, this assessment has utilised the following inputs:

- 2025 emission factors from v10.1 of the EFT; and
- 2025 mapped background concentrations the DEFRA mapping study (2018 base year, August 2020 update).

7.1 Modelling Outputs

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 B for the details of the verification process.

7.2 Operational Phase Impact Assessment

7.2.1 Nitrogen Dioxide Annual Mean Modelling Results

Predicted annual mean NO_2 concentrations were assessed against the AQAL of 40µg/m^3, based upon the existing receptor locations outlined in Table 4-1, are presented within Table 7-1.

Table 7-1
Summary of Predicted Annual Mean NO_2 Concentrations: Road Vehicle Emissions

Receptor	Predicted 2025 NO_2 Concentration (µg/m^3) (A)		Change (µg/m^3)	Change as a Percentage of the AQAL (%)
	'Do-minimum'	'Do-something'		
R1	14.8	14.9	+0.08	0.20
R2	11.8	11.9	+0.08	0.20
R3	9.37	9.42	+0.05	0.13
R4	9.36	9.41	+0.05	0.13
R5	7.76	7.77	+0.01	0.02
R6	8.84	8.89	+0.05	0.13
R7	9.92	10.0	+0.07	0.18
R8	9.27	9.31	+0.04	0.10
R9	11.6	11.7	+0.10	0.25
R10	11.1	11.2	+0.04	0.10
R11	10.4	10.5	+0.03	0.08

Note:
(A) Scenario modelled as an assumed 2025 development opening year, with 2025 emission factors and 2025 mapped background pollutant concentrations.

As shown in Table 7-1, there are no predicted exceedences of the annual mean NO_2 AQAL at any receptor in either the 'do-minimum' and 'do-something' scenarios. The maximum predicted change in annual mean NO_2 concentrations associated with additional development trips is +0.10µg/m^3, representing 0.25% of the AQAL, as predicted at receptor R9 (Residential property on Rowley Lane).

Predicted impacts on annual mean NO_2 concentrations are summarised in Table 7-2, based upon the descriptors presented within EPUK and IAQM guidance[28].

Table 7-2
Summary of Predicted Annual Mean NO_2 Impacts: Road Vehicle Emissions

Receptor	Concentration with the Development	Percentage Change Relative to AQAL (%)	Impact
R1	<75% of the AQAL	<0.5% of the AQAL	Negligible
R2	<75% of the AQAL	<0.5% of the AQAL	Negligible
R3	<75% of the AQAL	<0.5% of the AQAL	Negligible
R4	<75% of the AQAL	<0.5% of the AQAL	Negligible
R5	<75% of the AQAL	<0.5% of the AQAL	Negligible
R6	<75% of the AQAL	<0.5% of the AQAL	Negligible
R7	<75% of the AQAL	<0.5% of the AQAL	Negligible
R8	<75% of the AQAL	<0.5% of the AQAL	Negligible
R9	<75% of the AQAL	<0.5% of the AQAL	Negligible
R10	<75% of the AQAL	<0.5% of the AQAL	Negligible
R11	<75% of the AQAL	<0.5% of the AQAL	Negligible

As indicated in Table 7-2, the predicted percentage change of annual mean NO_2 concentrations is '<0.5% of the AQAL' at all considered receptor locations.

The predicted concentration with the development is '<75% of the AQAL' at all receptors. An unmitigated 'negligible' impact is predicted at all receptors in accordance with the EPUK & IAQM assessment methodology.

7.2.2 Nitrogen Dioxide 1-hour Mean Modelling Results

The maximum annual mean NO_2 'do-something' concentration is 14.9µg/m^3 (receptor location R1). 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 receptors as a result of proposed development trips.

7.2.3 Particulate Matter Annual Mean Modelling Results

Predicted annual mean ground level PM_{10} concentrations were assessed against the PM_{10} AQAL of 40µg/m^3, in accordance with EPUK & IAQM guidance.

[28] EPUK and IAQM, 'Land-Use Planning and Development Control: Planning for Air Quality', v1.2 2017.

Table 7-3
Summary of Predicted Annual Mean PM_{10} Concentrations: Road Vehicle Emissions

Receptor	Predicted 2025 PM_{10} Concentration (µg/m^3) (A)		Change (µg/m^3)	Change as a Percentage of the PM_{10} AQAL (%)
	'Do-minimum'	'Do-something'		
R1	11.9	11.9	+0.03	0.07
R2	10.6	10.6	+0.02	0.05
R3	9.93	9.94	+0.02	0.04
R4	9.93	9.95	+0.02	0.04
R5	9.67	9.67	+<0.01	0.01
R6	10.1	10.1	+0.02	0.04
R7	10.2	10.3	+0.02	0.05
R8	11.0	11.0	+0.01	0.04
R9	11.6	11.7	+0.03	0.07
R10	11.7	11.7	+0.01	0.04
R11	11.5	11.5	+0.01	0.03

Note:
(A) Scenario modelled as an assumed 2025 development opening year, with 2025 emission factors and 2025 mapped background pollutant concentrations.

As shown in Table 7-3, there are not predicted to be any exceedences of the annual mean PM_{10} AQAL at any identified receptor in either scenario. The maximum predicted change in annual mean PM_{10} concentrations associated with additional development trips is +0.03µg/m^3, representing 0.07% of the PM_{10} AQAL, as predicted at receptor R1 (Residential property 65 Penistone Lane) and receptor R9 (Residential property on Rowley Lane).

Predicted impacts assessed against the annual mean PM_{10} AQAL are summarised in Table 7-4, based upon the descriptors presented within EPUK & IAQM guidance[29].

Table 7-4
Summary of Predicted Annual Mean PM_{10} Impacts: Road Vehicle Emissions

Receptor	Concentration with Development	Percentage Change Relative to the PM_{10} AQAL (%)	Impact
R1	<75% of the AQAL	<0.5% of the AQAL	Negligible
R2	<75% of the AQAL	<0.5% of the AQAL	Negligible
R3	<75% of the AQAL	<0.5% of the AQAL	Negligible
R4	<75% of the AQAL	<0.5% of the AQAL	Negligible
R5	<75% of the AQAL	<0.5% of the AQAL	Negligible

[29] EPUK and IAQM, 'Land-Use Planning and Development Control: Planning for Air Quality', v1.2 2017.

Receptor	Concentration with Development	Percentage Change Relative to the PM_{10} AQAL (%)	Impact
R6	<75% of the AQAL	<0.5% of the AQAL	Negligible
R7	<75% of the AQAL	<0.5% of the AQAL	Negligible
R8	<75% of the AQAL	<0.5% of the AQAL	Negligible
R9	<75% of the AQAL	<0.5% of the AQAL	Negligible
R10	<75% of the AQAL	<0.5% of the AQAL	Negligible
R11	<75% of the AQAL	<0.5% of the AQAL	Negligible

As indicated in Table 7-4, the predicted percentage change of annual mean PM_{10} concentrations at sensitive receptor is '<0.5% of the AQAL' at all sensitive receptors. The predicted concentration with the development is '<75% of the AQAL' at all sensitive receptors. The unmitigated impact is predicted to be 'negligible' at all sensitive receptors in accordance with the stated assessment methodology.

7.2.4 Particulate Matter 24-hour Mean Modelling Results

Based upon the maximum predicted 'do-something' annual mean PM_{10} concentration of 11.9µg/m^3 (receptor location R1) this equates to 0 days 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.

7.2.5 Modelling Sensitivity

Assessment sensitivity to the dispersion modelling inputs is considered and presented within Appendix C.

7.2.6 Significance of Air Quality Impacts

The EPUK & IAQM guidance[30] considers a number of factors for the determination of significance of predicted air quality impacts. Such factors include:

- 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 development has adopted best practice to eliminate and minimise emissions.

The unmitigated impact associated with the scheme has been predicted in accordance with the stated assessment methodology. The following factors have been taken into account:

- there are no predicted exceedences of the annual mean NO_2 or PM_{10} AQALs as a result of the development;
- a negligible impact on annual mean NO_2 and PM_{10} concentrations has been predicted at all considered sensitive receptor locations;
- exceedences of the 1-hour mean NO_2 and 24-hour mean PM_{10} AQALs are considered unlikely, based upon the marginal change in concentrations and absolute concentrations predicted through the dispersion modelling study; and

[30] EPUK and IAQM, 'Land-Use Planning and Development Control: Planning for Air Quality', v1.2 2017.

- all modelled concentrations have been verified against KC monitoring data.

A sensitivity assessment of the model input variables (emission factors and background concentrations) has been considered and is presented in Appendix C. However, the overall conclusion over the significance of the effect has been based upon the main body of the assessment, utilising 2025 as the development opening year. Notwithstanding, it is noted that the sensitivity assessment presented within Appendix C does not predict any exceedences of the considered AQALs.

Therefore, on the basis of the above, the overall effect on air quality as a result of the additional development trips on sensitive receptors is considered to be 'not significant'.

8.0 MITIGATION MEASURES

This section presents any mitigation measures required during the construction and operational phases of the development in order to reduce the potential impact of the predicted effect.

8.1 Construction Phase Dust

Potential dust effects during the construction phase are considered to be temporary in nature. The impacts are determined to be temporary as they will only potentially occur throughout the construction phase and short-term because these will only arise at particular times when certain activities and meteorological conditions for creating the level of magnitude predicted combine.

In order to control potential impacts, Table 8-1 presents a potential range of mitigation measures which will be considered in keeping with the stated IAQM guidance. These measures can be secured by planning condition.

With the effective application of the dust mitigation measures it is considered that the overall effect at all receptors will be 'not significant'.

Table 8-1
Construction Dust Mitigation Measures

Site Application	Mitigation Measures
Communications	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary
	Display the head or regional office contact information
	Develop and implement a dust management strategy
Site Management	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken
	Make the complaints log available to the local authority when asked
	Record any exceptional incidents that cause dust and / or air quality emissions, either on- or off-site, and the action taken to resolve the situation in the logbook
Monitoring	Undertake daily on-site and off-site inspection where receptors are nearby
	Carry out regular site inspections to monitor compliance with the Dust Management Plan, record inspection results, and make the logbook available to the local authority when asked
	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out
Preparing and Maintaining the Site	Plan site layout so machinery is located away from receptors as far as possible
	When necessary erect solid barriers around dusty activities or the site boundary
	Fully enclose site or specific operations where there is a high potential for dust production
	Avoid site runoff of water or mud

Site Application	Mitigation Measures
	Keep site fencing, barriers and scaffolding clean using wet methods
	Cover, seed or fence stockpiles to prevent wind whipping
Operating Vehicle / machinery and sustainable travel	Ensure all vehicles switch off engines when stationary – no idling vehicles
	Impose and signpost a maximum-speed-limit of 15mph on surfaced and 10mph on unsurfaced haul roads and work areas
	Implement a Travel Plan that supports and encourages sustainable travel
Operations	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction
	Ensure an adequate water supply on the site for effective dust / particulate matter suppression / mitigation
	Use enclosed chutes and conveyors and covered skips
	Minimise drop heights
	Ensure equipment is readily available on site to clean any dry spillages
Waste Management	Avoid bonfires and burning of waste materials
Earthworks & Construction	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable
	Use Hessian, mulches or tackifiers where it is not possible to revegetate
	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out
Trackout	Use water-assisted dust sweepers on the access and local roads
	Avoid dry sweeping of large areas
	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport
	Inspect onsite haul routes for integrity and instigate any necessary repairs to the surface as soon as reasonably practicable
	When necessary install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems
	Implement a wheel washing system
	Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the exit, wherever site size and layout permits
	Access gates to be located at least 10m from receptors where possible

8.2 Construction Phase Plant Emissions

During the construction phase Non-road Mobile Machinery (NRMM) and plant shall be well maintained; if any emissions of dark smoke occur then the relevant machinery should stop immediately and any problem rectified. In addition, the following controls should apply to NRMM:

- all NRMM should use fuel equivalent to ultralow sulphur diesel;
- all NRMM should comply with either the current or previous EU Directive Staged Emission Standards;
- all NRMM should be fitted with Diesel Particulate Filters (DPF) conforming to defined and demonstrated filtration efficiency (load/duty cycle permitting);
- the on-going conformity of plant retrofitted with DPF, to a defined performance standard; and
- implementation of fuel conservation measures including instructions to throttle down or switch off idle construction equipment; switch off the engines of trucks while they are waiting to access the site and while they are being loaded or unloaded, ensure equipment is properly maintained to ensure efficient fuel consumption.

Successful implementation of the above relevant mitigation measures would ensure that emissions from the construction phase and NRMM used during construction phase result in a 'not significant' effect on air quality.

8.3 Construction Phase – Vehicular Pollutants

Information on traffic movements anticipated during construction works was unavailable for the completion of the Air Quality Assessment. However, the development quantum is not anticipated to result in a significant increase in movements above the EPUK & IAQM criterion and the duration of movements will be short-term in nature. Therefore, in accordance with the criterion presented within EPUK & IAQM guidance, additional road vehicle trips during the construction phase '*can be considered to have insignificant effects*' on air quality.

8.4 Operational Phase Road Traffic Emissions

An assessment of vehicle emissions associated with the operation of the scheme predicted the unmitigated impact on annual mean NO_2 and PM_{10} concentrations to be 'negligible' at all considered receptors resulting in an overall 'not significant' effect on air quality.

It is noted that in line with the WY AQ guidance[31] for 'medium' developments Type 1 and Type 2 mitigation measures should be included as part of the development. Table 8-2 displays these mitigation measures.

Table 8-2
WYLES Guidance Major Development Mitigation Measures

Mitigation Measure	
Type 1	Charging Infrastructure to facilitate 1 charging point per unit (dwelling with dedicated parking) or 1 charging point per 10 spaces (unallocated parking)
Type 2	Travel Plan
	Support for free or reduced membership of the West Yorkshire car club and travel network
	Improved Pedestrian links to public transport stops.

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

	Provision of bus infrastructure including stands, shelters, bus gates, information displays
	Provision of free ticketing with time limited uptake targets
	Provision of resident Low Emissions Vehicle (LEV) purchase support as an alternative to Metrocard with time limited uptake
	Supporting the extended provision of sustainable school travel into the development
	Site layout to include improved pedestrian pathways to encourage walking
	Improved convenient and segregated cycle paths to link to local cycle networks
	Provision of storage and support for cycle purchase or hire

EV charging will be provided for the scheme, with a 100% provision rate for units with dedicated parking.

The transport consultants for the proposals have created a Travel Plan32 for the development which includes a number of mitigation measures would help to improve air quality in the locale by reducing reliance upon car movements to and from site. These measures include:

- appointment of a Travel Plan Coordinator;
- promoting walking, cycling and public transport as the primary modes of travel. To encourage walking and cycling, the Proposed Development will provide internal pedestrian and cycle routes, and improve the Public Right of Way (PRoW) KIR/85/10. The Proposed Development will also provide for cycle storage; and
- promote car-sharing and car-clubs to reduce single occupancy trips and encourage sustainable travel.

Reference should be made to the Travel Plan for further information.

[32] Optima Highways and Transportation Consultancy Ltd (2022) Land off Hermitage Park, Lepton Proposed Residential Development Travel Plan January 2022 (Rev3).

9.0 CONCLUSIONS

SLR Consulting has undertaken an assessment of potential air quality impacts associated with a proposed residential development on land off Rowley Lane, Lepton.

A qualitative assessment of the potential dust impacts during the construction of the development has been undertaken. Through good practice and implementation of appropriate mitigation measures outlined, it is expected that the release of dust would be effectively controlled and mitigated, with resulting impacts considered to be 'not significant'. All dust impacts are considered to be temporary and short-term in nature.

Due to the low additional number of HDV trips anticipated during the construction phase of the development, there is predicted to result in an 'insignificant' effect on air quality from road vehicle emissions. Furthermore, emissions from plant / NRMM on-site is predicted to result in a 'not significant' impact on air quality.

Potential air quality impacts associated with change in development trips were quantified using the ADMS Roads v5.0 dispersion model. It is noted the impacts presented herein relate to a previous design iteration of the scheme comprising of 110 dwellings with an anticipated opening year of 2025. The revised scheme seeks the development of 80 dwellings with an anticipated complete opening year of 2027. Therefore, the results are considered to be precautionary in comparison to the revised proposals.

Additional development trips arising during the operational phase of the development in 2025 are predicted to result in a negligible impact on annual mean NO_2 and PM_{10} concentrations at all considered sensitive receptors, with a maximum absolute predicted change in annual mean NO_2 and PM_{10} concentrations of +0.10µg/m^3 and +0.03µg/m^3, respectively. There is no predicted risk of exceedence of the 1-hour mean NO_2 or 24-hour mean PM_{10} AQALs as a result of the development proposals. As such, the overall effect arising from change in operational phase trips is considered to be 'not significant'.

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 the Kirklees Local Plan

DRAWINGS

418800 419000 419200 419400 419600 419800

415000 414800 414600

10429.00003.0001.0 Site Setting and Construction Phase Receptors

LEGEND

- Site Boundary
- Site Boundary Buffer (20/50/100/350m)
- Trackout
- Trackout 50m Buffer

20m 50m 100m 350m

0 100 200 Metres

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ROWLEY LANE, LEPTON

AIR QUALITY ASSESSMENT

SITE SETTING AND CONSTRUCTION PHASE RECEPTORS

AQ1

Scale 1:4,000 @ A3

Date JANUARY 2022

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418500 419000 419500 420000 420500

415500 415000 414500

N

R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11

L1 L2 L3 L4

Fenay Bridge

Lepton

0 250 500

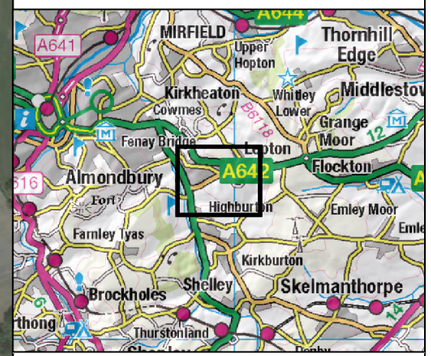
Metres

LEGEND

Site Boundary

Human Receptor

Modelled Road Link



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ROWLEY LANE, LEPTON

AIR QUALITY ASSESSMENT

MODELLED ROAD LINKS AND SENSITIVE RECEPTORS

AQ2

Scale 1:7,500 @ A3

Date JANUARY 2022

10429.00003.0002.0 Modelled Road Links and Sensitive Receptors

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Appendix A – Construction Dust Assessment Methodology

Predicting Risk

The assessment of risk is determined by considering the predicted change in conditions as a result of the development. The risk category for potential dust effects arising from site works is defined into 4No. potential activities:

- demolition;
- earthworks;
- construction; and
- trackout.

The determination of risk categories presented above are based upon the descriptors presented within IAQM: Guidance on the assessment of dust from demolition and construction.

Sensitivity of Receptor

To determine the significance of dust effects associated with the construction phase of the development, an evaluation of the sensitivity of the surrounding area is required. Receptors can demonstrate different sensitivities to changes in their environment, and are classified as detailed within Table A-1.

Quoted distances to the nearest receptor are from the dust emission sources. Where this is not known, receptor distances are determined from the site boundary. The risk category is based upon the distance of site works to the nearest receptor.

Table A-1
Methodology for Defining Sensitivity to Dust Effects

Sensitivity of Area	Examples		
	Human Receptors		Ecological Receptors [A]
	Dust Soiling Effects	Health Effects of PM_{10}	
High	• users can reasonably expect an enjoyment of a high level of amenity; or • the appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. Indicative examples include dwellings, museums and other culturally important collections, medium and long term car parks and car showrooms.	• locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). Indicative examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.	• locations with an international or national designation and the designated features may be affected by dust soiling; or • locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain. Indicative examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.
Medium	• users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to	• locations where the people exposed are workers, and exposure is over a time period	• locations where there is a particularly important plant species, where its

Sensitivity of Area	Examples		
	Human Receptors		Ecological Receptors [A]
	Dust Soiling Effects	Health Effects of PM_{10}	
	enjoy the same level of amenity as in their home; or • the appearance, aesthetics or value of their property could be diminished by soiling; or the people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. Indicative examples include parks and places of work.	relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). Indicative examples include office and shop workers, but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.	dust sensitivity is uncertain or unknown; or • locations with a national designation where the features may be affected by dust deposition. Indicative example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.
Low	• the enjoyment of amenity would not reasonably be expected; or • property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or	• locations where human exposure is transient. Indicative examples include public footpaths, playing fields, parks and shopping streets.	• locations with a local designation where the features may be affected by dust deposition. Indicative example is a local Nature Reserve with dust sensitive features.

Sensitivity of Area	Examples		
	Human Receptors		Ecological Receptors (A)
	Dust Soiling Effects	Health Effects of PM_{10}	
	• there is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. Indicative examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.		
Notes: (A) Only applicable if ecological habitats are present which may be sensitive to dust effects.			

Assessment of Impact Significance – Dust Effects

Table A-2 to Table A-4 illustrate how the sensitivity of the area may be determined for dust soiling, human health and ecosystem impacts, respectively. The highest level of sensitivity from each table should be recorded.

Table A-2
Sensitivity of Area to Dust Soiling Effects on People and Property

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

Table A-3
Sensitivity of Area to Human Health Impacts

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

		1 – 10	Low	Low	Low	Low	Low
	<24µg/m^3	>10	Low	Low	Low	Low	Low
		1 – 10	Low	Low	Low	Low	Low
Low	-	1	Low	Low	Low	Low	Low

Table A-4
Sensitivity of Area to Ecological Impacts

Receptor Sensitivity	Distance from the Source (m) (A)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low
Note: (A) For trackout, the stand-offs should be measured from the side of the roads used by construction traffic.		

Defining the Risk of Impact

Table A-5 to Table A-8 illustrates how the dust emission magnitude should be combined with the sensitivity of the area to determine the risk of impacts with no mitigation measures applied.

Table A-5
Risk of Dust Impacts – Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table A-6
Risk of Dust Impacts – Earthworks

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table A-7
Risk of Dust Impacts – Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table A-8
Risk of Dust Impacts – Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

APPENDIX B – Model Input and Verification

Model Input Summary

The modelling parameters are summarised in Table B-1.

Table B-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 0.5m was used within the assessment area of this dispersion modelling study. This value is for 'open suburbia' and therefore considered appropriate for the surface roughness of the dispersion modelling assessment area.
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 2025 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	Leeds Bradford Airport 2019
Background	Background pollutant concentration considered during the modelling	DEFRA supplied backgrounds maps (2018 base year) projected to 2025 for the development opening year. A further sensitivity scenario was assessed which considered 2018 DEFRA mapped 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}.

Traffic Data

The traffic flow data was provided by Optima Highways & Transportation and applied in the assessment as detailed in Table B-2 and Table B-3.

Both scenarios include committed developments. These are detailed further within the Transport Assessment supporting the planning application.

Table B-2
Traffic Flow (AADT)

Ref	Description	2025 Opening Year				Speed (A) (km/h)
		AADT 'Do-minimum'	HDV % 'Do-minimum'	AADT 'Do-something'	HDV % 'Do-something'	
L1	Penistone Road	19,856	6.4	20,087	6.3	48
L2	Rowley Lane (East of Hermitage Park)	4,344	9.8	4,492	9.5	48
L3	Rowley lane (West of Hermitage Park)	3.981	8.4	4,129	8.1	48
L4	Wakefield Road	10,693	2.8	10,817	2.8	48

Note:
(A) Traffic speeds have been adjusted to take into account queues and congestion in accordance with LAQM.TG(16).

Model Verification

Table B-3 presents the 2019 data for use within the 2019 verification assessment.

The 2019 verification traffic flow data was sourced from Department for Transport (DfT)[33], 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 for the following count points based upon 2019 traffic surveys:

- A629 Penistone Road – count point ID: 77648; and
- A629 Wakefield Road – count point ID: 37467.

Table B-3
2019 Traffic Flow (AADT)

Ref	Description	2019 Verification Year		Speed (A) (km/h)
		AADT	HDV %	
V1	Penistone Road	21,022	3.21	48
V2	Wakefield Road	36,067	3.38	48

Note:

[33] http://www.dft.gov.uk/matrix/, accessed October 2020.

Ref	Description	2019 Verification Year		Speed (A) (km/h)
		AADT	HDV %	
(A) Traffic speeds have been adjusted to take into account queues and congestion in accordance with LAQM.TG(16).				

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 location 52 'Penistone Road Waterloo' from the KC monitoring network; and
- 2019 DEFRA mapped background concentrations (2019 base year) for the grid square containing the above diffusion tube.

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 B-4 below with the derived adjustment factor based on a linear regression forced through zero.

Table B-4
Verification Data 2019, Final Comparison

Monitoring Location	Modelled NO_X Road Contribution ($\mu g/m^3$)	Calculated NO_X Road Contribution ($\mu g/m^3$)	Monitored NO_2 Concentration ($\mu g/m^3$)
DT52 Penistone Road Waterloo	10.9	33.8	30.7
		m-regression factor	3.1091

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 a 1:3.1091.

As presented in in Table B-4, modelled NOx concentrations have therefore been verified using a factor of 3.1091.

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 3.1091 following the recommendations within LAQM.TG(16).

APPENDIX C – Sensitivity Assessment Results

In order to provide further assessment and sensitivities on the assessment inputs, an additional scenario has been considered based as described above which considers:

- 2019 emission factors from v10.1 of the EFT (to represent the base year); and
- 2019 mapped background concentrations from the DEFRA mapping study (2018 base year).

The results of this sensitivity modelling are presented in the following subsections. No sensitivity analysis has been undertaken with respect to modelled annual mean PM_{10} concentrations.

Table C-1
Summary of Predicted Annual Mean NO_2 Concentrations: Road Vehicle Emissions: 2019 Assessment Sensitivity

Receptor	Predicted 2019 NO_2 Concentration (µg/m^3) [(A)]		Change (µg/m^3)	Change as a Percentage of the AQAL (%)
	'Do-minimum'	'Do-something'		
R1	23.4	23.6	+0.14	0.35
R2	17.9	18.0	+0.13	0.32
R3	13.1	13.1	+0.08	0.20
R4	13.1	13.1	+0.09	0.23
R5	10.0	10.0	+0.02	0.05
R6	12.2	12.2	+0.08	0.20
R7	14.4	14.5	+0.13	0.32
R8	12.6	12.7	+0.08	0.20
R9	17.5	17.7	+0.16	0.40
R10	16.0	16.1	+0.07	0.18
R11	14.7	14.8	+0.06	0.15

Note:
(A) Scenario modelled as an assumed 2025 development opening year, with 2019 emission factors and 2019 mapped background pollutant concentrations.

As shown in Table C-1, there remain to be no predicted exceedences of the annual mean NO_2 AQAL at any receptor in either the 'do-minimum' and 'do-something' scenarios as part of the 2019 sensitivity assessment.

The maximum predicted change in annual mean NO_2 concentrations associated with additional development trips is +0.16µg/m^3, representing 0.40% of the AQAL, as predicted at receptor R9.

Predicted impacts on annual mean NO_2 concentrations as part of the 2019 assessment sensitivity scenario are summarised in Table C-2, based upon the descriptors presented within EPUK and IAQM guidance[34].

[34] EPUK and IAQM, 'Land-Use Planning and Development Control: Planning for Air Quality', v1.2 2017.

Table C-2
Summary of Predicted Annual Mean NO_2 Impacts: Road Vehicle Emissions – 2019 Sensitivity

Receptor	Concentration with the Development	Percentage Change Relative to AQAL (%)	Impact
R1	<75% of the AQAL	<0.5% of the AQAL	Negligible
R2	<75% of the AQAL	<0.5% of the AQAL	Negligible
R3	<75% of the AQAL	<0.5% of the AQAL	Negligible
R4	<75% of the AQAL	<0.5% of the AQAL	Negligible
R5	<75% of the AQAL	<0.5% of the AQAL	Negligible
R6	<75% of the AQAL	<0.5% of the AQAL	Negligible
R7	<75% of the AQAL	<0.5% of the AQAL	Negligible
R8	<75% of the AQAL	<0.5% of the AQAL	Negligible
R9	<75% of the AQAL	<0.5% of the AQAL	Negligible
R10	<75% of the AQAL	<0.5% of the AQAL	Negligible
R11	<75% of the AQAL	<0.5% of the AQAL	Negligible

As indicated in Table C-2, the predicted percentage change of annual mean NO_2 concentrations as part of the 2019 assessment sensitivity scenario is '<0.5% of the AQAL'.

The predicted concentration with the development is '<75% of the AQAL'. An unmitigated 'negligible' impact is predicted at all receptors in accordance with the stated EPUK & IAQM assessment methodology.

Analysis of Assessment Sensitivities

Sensitivity modelling has been undertaken which utilises 2019 emission factors (EFT v10.1) and 2019 mapped background concentrations the DEFRA mapping study. This scenario does not predict any exceedences of the annual mean AQAL.

It is noted that this precautionary assessment assumes that road traffic emission factors and background concentrations in the 2025 development opening year will remain at the 2019 base year level. Furthermore, the precautionary assessment assumes that road traffic flows predicted in the 2025 development opening year will occur in 2019. The Proposed Development is now anticipated to be fully completed and operational by 2027, adding further confidence to the assessment given the forecasted reductions in vehicle emission factors and background pollutant concentrations.

DEFRA projections and the basis for future year road traffic emission factor reductions embedded within the EFT v10.1 are based upon a number of assumptions, including the following:

- Updated basic fleet assumptions for 2017-2030 in line with DfT, National Atmospheric Emissions Inventory (NAEI) and Transport for London (TfL) projections; and
- Updated Euro class compositions for 2017-2030 in line with DfT, NAEI, and TfL data (inclusive of Euro 6 subcategories).

These assumptions and forecasts are in accordance with the release of new car sales data, which represents a stronger empirical dataset than previous forecasts.

It is considered that the 2019 modelling predictions presented within this sensitivity assessment are worst-case reflections to provide confidence in the modelling predictions, and do not reflect likely impacts from additional development trips in the development opening year. Actual impacts in the development opening year are likely to

be lower than those predicted given the projected road traffic exhaust emission factor improvements, as indicated by the impact assessment scenario and modelled concentrations in the main body of the reporting text.

DEFRA mapped background concentrations (2018 base year) and their future year projections are based on a number of assumptions which include the following:

- all assumptions underlying the latest (2018) NOx emission projections for road transport, as detailed above;
- updated road transport forecasts for Great Britain from the DfT;
- updated assumptions on diesel car penetration rates provided by the DfT; and
- updated vehicle sales projections for cars and Light Goods Vehicles (LGV) based on information provided by the DfT.

In relation to trends in air pollutant concentrations within KC's area, including those of NO_2, a review of the KC 2020 Air Quality Annual Status Report (the most recent Air Quality Annual Status Report made available by KC) highlights a downward trend in monitored annual mean NO_2 concentrations within Kirklees over a considered 2014 – 2019 period. The report states, *'current trends indicate that the levels of these pollutants have fallen over the last 5 years […] The falling trends are also reflected year on year, with reductions between 2018 to 2019 of 8% in the AQMA's and districtwide fall of 6%.'* On this basis, the precautionary approach of using 2019 mapped background concentrations and verifying the assessment based upon 2019 monitoring data (with all future year scenarios built around this data) to reflect the 2025 development opening year is considered likely to overestimate background concentrations in 2025. On this basis, as the development is predicted to only result in small incremental concentrations (as predicted in the main body of the reporting text) this is not considered to effect compliance with the annual mean AQAL.

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