Shaw Lane, Carlton, Barnsley, S71 3HJ

Air Quality Assessment

784-B029129
28th January 2022

PRESENTED TO

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EXECUTIVE SUMMARY

This report presents the findings of an air quality assessment undertaken to assess road traffic emissions in support of an outline planning application for the construction of up to 215 dwellings at Shaw Lane, Carlton, Barnsley, S71 3HJ.

Construction Phase

The potential effects during the demolition and construction phases include fugitive dust emissions from site activities, such as earthworks, construction and trackout.

During the construction phase, site specific mitigation measures detailed within this assessment will be implemented. With these mitigation measures in place, the effects from the construction phase are not predicted to be significant.

Operational Phase

Detailed dispersion modelling of traffic pollutants has been undertaken for the proposed development. An operational year assessment for 2023 traffic emissions has been undertaken to assess the effects of the Proposed Development. The impacts during the operational phase take into account exhaust emissions from additional road traffic generated due to the proposed development.

The long-term (annual) assessment of the effects associated with the proposed development with respect to Nitrogen Dioxide (NO_2) is determined to be 'negligible'. With respect to PM_{10} and $PM_{2.5}$ exposure, the effect is determined to be 'negligible' at all identified existing sensitive receptor locations.

All proposed receptor locations are expected to be exposed to air quality below the Air Quality Objectives for NO_2, PM_{10} and $PM_{2.5}$. No further mitigation is required to protect future occupants.

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ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
AADT	Annual Average Daily Traffic
ADMS	Atmospheric Dispersion Modelling Software
AQAL	the Air Quality Assessment Level
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQO	Air Quality Objectives
AQS	Air Quality Standards
CHP	Combined Heat and Power
CL	Critical Level
CO	Carbon Monoxide
DEFRA	Department for Environment Food & Rural Affairs
EAL	Environmental Assessment Limits
EC	European Commission
EFT	The Emissions Factors Toolkit
EPUK	Environmental Protection UK
EU	European Union
EPAQS	The Expert Panel on Air Quality Standards
IAQM	The Institute of Air Quality Management
LA	Local Authority
LAQM	Local Air Quality Management
NGR	The United Kingdom National Grid Reference
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
PC	Process Contribution
MHCLG	the Ministry for Housing, Communities and Local Government
NPPF	The National Planning Policy Framework
OS	the UK Ordnance Survey
PEC	Predicted Environment Concentration
PPG	Planning Policy Guidance
PPS	Planning Policy Statements
SAC	Special Areas of Conservation
SPA	Special Protection Area
SSSI	Sites of Special Scientific Interest
VOC	Volatile organic compounds
WHO	World Health Organization
UK	The United Kingdom

1.0 INTRODUCTION

This report presents the findings of an air quality assessment undertaken to assess road traffic emissions in support of an outline planning application for the construction of up to 215 dwellings at Shaw Lane, Carlton, Barnsley, S71 3HJ.

1.1 SITE LOCATION

The central Grid Reference is approximately 437381, 410334. The application site is bounded to the north by open fields, bounded to the east by a railway line and industrial properties, the south by residential properties on Shaw Lane and to the west by open fields and Barnsley Canal.

Reference should be made to **Figure 1-1** for a map of the application site and surrounding area.

Figure 1-1. Satellite Image of Site and Surrounding Area

Google Imagery (2021)

1.2 CONTEXT

The primary source of the air quality associated with the proposed scheme is from vehicle movements, arriving and departing the proposed development. The traffic data generated by the development (provided by Pell Frischmann) has been assessed at the surrounding sensitive receptors and proposed sensitive receptors.

The following assessment stages have been undertaken as part of this assessment:

- Baseline evaluation;

- Assessment of potential air quality impacts during the construction phase;
- Assessment of potential air quality impacts during the operational phase; and,
- Identification of mitigation measures (as required).

The results of the assessment are detailed in the following sections of this report.

The construction phase assessment considers the potential effects of dust and particulate emissions from site activities and materials movement using a qualitative risk assessment method based on the Institute of Air Quality Management's (IAQM) 'Guidance on the Assessment of Dust from Demolition and Construction' document, published in 2014.

The assessment of the potential air quality impacts that are associated with the operational phase has focused on the predicted impact of changes in ambient nitrogen dioxide (NO_2) and particulate matter with an aerodynamic diameter of less than 10 µm (PM_{10}) and less than 2.5 µm ($PM_{2.5}$) as a result of the development at key local receptor locations. The changes have been referenced to EU air quality limits and UK air quality objectives and the magnitude and impact description of the changes have been referenced to non-statutory guidance issued by the IAQM and Environmental Protection UK (EPUK).

1.3 REPORT STRUCTURE

Following this introductory section, the remainder of this report is structured as follows:

- Section 2: Policy and Legislative Context
- Section 3: Assessment Methodology
- Section 4: Baseline Conditions
- Section 5: Assessment of Air Quality Impacts – Construction Phase
- Section 6: Assessment of Air Quality Impacts – Operational Phase
- Section 7: Mitigation
- Section 8: Conclusions

All technical Appendices are included at the end of this report for information.

2.0 POLICY AND LEGISLATIVE CONTEXT

2.1 DOCUMENTS CONSULTED

The following documents were consulted during the undertaking of this assessment:

Legislation and Best Practice Guidance

- National Planning Policy Framework, Ministry for Housing, Communities and Local Government, Revised July 2021;
- Planning Practice Guidance: Air Quality, Ministry for Housing, Communities and Local Government, November 2019;
- The Air Quality Standards Regulations (Amendments), 2016;
- The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Defra, 2007;
- The Environment Act, 1995;
- The Environment Act, 2021;
- Local Air Quality Management Technical Guidance LAQM.TG16, Defra, 2021;
- Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1, LA 105 Air quality, Highways England, November 2019;
- Land-Use Planning & Development Control: Planning for Air Quality, EPUK & IAQM, 2017;
- Guidance on the Assessment of Dust from Demolition and Construction, IAQM, 2014;
- A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites (Version 1.1), IAQM, May 2020; and,
- Ecological Assessment of Air Quality Impacts, CIEEM, January 2021.

Websites Consulted

- Google maps (maps.google.co.uk);
- The UK National Air Quality Archive (www.airquality.co.uk);
- Department for Transport Matrix (www.dft.go.uk/matrix);
- emapsite.com;
- Multi-Agency Geographic Information for the Countryside (http://magic.defra.gov.uk/);
- Planning Practice Guidance (http://planningguidance.planningportal.gov.uk/); and,
- Barnsley Metropolitan Borough Council (https://www.barnsley.gov.uk/).

Site Specific Reference Documents

- Barnsley Metropolitan Borough Council, Air Quality Annual Status Report 2020; and,
- Barnsley Metropolitan Borough Council Local Plan (Adopted January 2019).

2.2 AIR QUALITY LEGISLATIVE FRAMEWORK

European Legislation

European air quality legislation is consolidated under Directive 2008/50/EC, which came into force on 11th June 2008. This Directive consolidates previous legislation which was designed to deal with specific pollutants in a consistent manner and provides new air quality objectives for fine particulates. The consolidated Directives include:

- **Directive 1999/30/EC** – the First Air Quality "Daughter" Directive – sets ambient air limit values for NO_2 and oxides of nitrogen, sulphur dioxide, lead and PM_{10};
- **Directive 2000/69/EC** – the Second Air Quality "Daughter" Directive – sets ambient air limit values for benzene and carbon monoxide; and,
- **Directive 2002/3/EC** – the Third Air Quality "Daughter" Directive – seeks to establish long-term objectives, target values, an alert threshold and an information threshold for concentrations of ozone in ambient air.

The fourth daughter Directive was not included within the consolidation and is described as:

- **Directive 2004/107/EC** – sets health-based limits on polycyclic aromatic hydrocarbons, cadmium, arsenic, nickel and mercury, for which there is a requirement to reduce exposure to as low as reasonably achievable.

The European Commission (EC) Directive Limits, outlined above, have been transposed in the UK through the Air Quality Standards Regulations. In the UK responsibility for meeting ambient air quality limit values is devolved to the national administrations in Scotland, Wales and Northern Ireland.

The European Union (Withdrawal) Act 2018 (EUWA) provides a new framework for the continuity of 'retained EU law' in the UK. EU Directives no longer have to be implemented by the UK except to any extent agreed or decided by the UK unilaterally.

EUWA retains the domestic effect of EU Directives to the extent already implemented in UK law, by preserving the relevant domestic implementing legislation enacted in UK law before ‘Implementation Period’ completion day. Though the EU Directives are not retained, following the UK’s departure from the EU, the EUWA converts the current framework of Air Quality targets, however the role that the EU instructions were party to are lost.

UK Legislation

The Air Quality Standards Regulations (Amendments 2016) seek to simplify air quality regulation and provide a new transposition of the Air Quality Framework Directive, First, Second and Third Daughter Directives and also transpose the Fourth Daughter Directive within the UK. The Air Quality Limit Values are transposed into the updated Regulations as Air Quality Standards, with attainment dates in line with the European Directives. SI 2010 No. 1001, Part 7 Regulation 31 extends powers, under Section 85(5) of the Environment Act (1995), for the Secretary of State to give directions to Local Authorities (LAs) for the implementation of these Directives.

The UK Air Quality Strategy is the method for implementation of the air quality limit values in England, Scotland, Wales and Northern Ireland and provides a framework for improving air quality and protecting human health from the effects of pollution.

For each nominated pollutant, the Air Quality Strategy sets clear, measurable, outdoor air quality standards and target dates by which these must be achieved; the combined standard and target date is referred to as the Air Quality Objective (AQO) for that pollutant. Adopted national standards are based on the recommendations of the Expert Panel on Air Quality Standards (EPAQS) and have been translated into a set of Statutory Objectives within the Air Quality (England) Regulations (2000) SI 928, and subsequent amendments.

The AQOs for pollutants included within the Air Quality Strategy and assessed as part of the scope of this report are presented in **Table 2-1** and **Table 2-2** along with European Commission (EC) Directive Limits and World Health Organisation (WHO) Guidelines. The ecological levels are based on WHO and CLRTAP (Convention on Long-range Transboundary Air Pollution) guidance.

Table 2-1. Air Quality Standards, Objectives, Limits and Target Values

Pollutant	Applies	Objective	Concentration Measured as[10]	Date to be achieved and maintained thereafter	European Obligations	Date to be achieved and maintained thereafter	New or existing
PM_{10}	UK	50µg/m^3 by end of 2004 (max 35 exceedances a year)	24-hour Mean	1st January 2005	50µg/m^3 by end of 2004 (max 35 exceedances a year)	1st January 2005	Retain Existing
	UK	40µg/m^3 by end of 2004	Annual Mean	1st January 2005	40µg/m^3	1st January 2005	
$PM_{2.5}$	UK	25µg/m^3	Annual Mean	31st December 2010	25µg/m^3	1st January 2010	Retain Existing
NO_2	UK	200µg/m^3 not to be exceeded more than 18 times a year	1-Hour Mean	31st December 2005	200µg/m^3 not to be exceeded more than 18 times a year	1st January 2010	Retain Existing
	UK	40µg/m^3	Annual Mean	31st December 2005	40µg/m^3	1st January 2010	

Table 2-2. Ecological Air Quality Standards, Objectives, Limit and Target Values

Pollutant	Applies	Objective	Concentration Measured as
NO_X	UK	30µg/m^3	Annual Mean

Within the context of this assessment, the annual mean objectives are those against which facades of residential receptors will be assessed and the short-term objectives apply to all other receptor locations, where people may be exposed over a short duration, both residential and non-residential such as using gardens, balconies, walking along streets, using playgrounds, footpaths or external areas of employment uses.

Local Air Quality Management

Under Section 82 of the Environment Act (1995) (Part IV) Local Authorities (LAs) are required to periodically review and assess air quality within their area of jurisdiction under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves assessing present and likely future air quality against the AQOs. If it is predicted that levels at the façade of buildings where members of the public are regularly present (normally residential properties) are likely to be exceeded, the LA is required to declare an Air Quality Management Area (AQMA).

Environment Act 2021

The Environment Act (2021) introduces a commitment to create a legally binding duty on government to reduce the concentrations of fine particulate matter ($PM_{2.5}$) in ambient air, and to set a long-term target expected to be 10 µg/m^3, a reduction from the current Air Quality objective of 20 µg/m^3 set out within the Air Quality Standards Regulations (Amendment 2016). A draft of a statutory instrument (or drafts of statutory instruments) containing regulations setting the $PM_{2.5}$ air quality target must be laid before Parliament on or before 31st October 2022 and is expected to come into force thereafter.

2.3 PLANNING AND POLICY GUIDANCE

National Policy

The National Planning Policy Framework (NPPF), revised July 2021, principally brings together and summarises the suite of Planning Policy Statements (PPS) and Planning Policy Guidance (PPG) which previously guided planning policy making. The NPPF (para. 186) states that:

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

The Planning Practice Guidance (PPG) web-based resource was updated by the Ministry for Housing, Communities and Local Government (MHCLG) on 1st November 2019 to support the National Planning Policy Framework and make it more accessible. A review of PPG: Air Quality identified the following guidance (Paragraph: 001 Reference ID: 32-001-20191101):

> *"The 2008 Ambient Air Quality Directive sets legally binding limits for concentrations in outdoor air of major air pollutants that affect public health such as particulate matter (PM10 and PM2.5) and nitrogen dioxide (NO_2).*
>
> *The UK also has national emission reduction commitments for overall UK emissions of 5 damaging air pollutants:*

- *fine particulate matter ($PM_{2.5}$);*
- *ammonia (NH_3);*
- *nitrogen oxides (NO_x);*
- *sulphur dioxide (SO_2); and*
- *non-methane volatile organic compounds (NMVOCs).*

As well as having direct effects on public health, habitats and biodiversity, these pollutants can combine in the atmosphere to form ozone, a harmful air pollutant (and potent greenhouse gas) which can be transported great distances by weather systems. Odour and dust can also be a planning concern, for example, because of the effect on local amenity. "

Local Policy

Following a review of the Barnsley Metropolitan Borough Council Local Plan (Adopted January 2019), the following policy concerning air quality was identified.

"Policy AQ1: Development in Air Quality Management Areas

Development which impacts on areas sensitive to air pollution in air quality management areas will be expected to demonstrate that it will not have a harmful effect on the health or living conditions of any future users of the development in terms of air quality (including residents, employees, visitors and customers), taking into account any suitable and proportionate mitigation required for the development.

We will only allow residential development which impacts on areas sensitive to air pollution, where the developer provides an assessment that shows living conditions will be acceptable for future residents, subject to any required mitigation.

We will only allow development which impacts on areas sensitive to air pollution which could cause more air pollution, where the developer provides an assessment that shows there will not be a significantly harmful effect on air quality, subject to any required mitigation.

Furthermore, development which impacts on areas sensitive to air pollution due to traffic emissions will be expected to demonstrate suitable and proportionate mitigation relative to the increased traffic emissions generated by the development."

3.0 ASSESSMENT METHODOLOGY

The potential environmental effects of the operational phase of the proposed development have been identified as proposed vehicle movements. The significance of potential environmental effects is assessed according to the latest guidance produced by EPUK and IAQM in January 2017 '*Land-Use Planning & Development Control: Planning for Air Quality*' and May 2020 '*A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites*'.

The methodology used to determine the potential air quality effects of the construction phase of the proposed development has been derived from the IAQM '*Guidance on the Assessment of the Impacts of Dust from Demolition and Construction'* document and is summarised in Section 5.

3.1 DETERMINING IMPACT DESCRIPTION OF THE AIR QUALITY EFFECTS

The impact description of the effects during the operational phase of the development is based on the latest guidance produced by EPUK and IAQM in January 2017. The guidance provides a basis for a consistent approach that could be used by all parties associated with the planning process to professionally judge the overall impact description of the air quality effects based on severity of air quality impacts.

The following rationale is used in determining the severity of the air quality effects at individual receptors:

1. The change in concentration of air pollutants, air quality effects, are quantified and evaluated in the context of AQOs. The effects are provided as a percentage of the Air Quality Objective (AQO), which may be an AQO, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)';
2. The absolute concentrations are also considered in terms of the AQO and are divided into categories for long term concentration. The categories are based on the sensitivity of the individual receptor in terms of harm potential. The degree of harm potential to change increases as absolute concentrations are close to or above the AQO;
3. Severity of the effect is described as qualitative descriptors; negligible, slight, moderate or substantial, by taking into account in combination the harm potential and air quality effect. This means that a small increase at a receptor which is already close to or above the AQO will have higher severity compared to a relatively large change at a receptor which is significantly below the AQO;
4. The effects can be adverse when pollutant concentrations increase or beneficial when concentrations decrease as a result of development;
5. The judgement of overall impact description of the effects is then based on severity of effects on all the individual receptors considered; and,
6. Where a development is not resulting in any change in emissions itself, the impact description of effect is based on the effect of surrounding sources on new residents or users of the development, i.e., will they be exposed to levels above the AQO.

Table 3-1. Impact Descriptors for Individual Receptors

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

In accordance with explanation note 2 of Table 6.3 of the EPUK & IAQM guidance, the Table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The user is encouraged to treat the numbers with recognition of their likely accuracy and not assume a false level of precision. Changes of 0%, i.e. less than 0.5%, will be described as Negligible.

4.0 BASELINE CONDITIONS

4.1 AIR QUALITY REVIEW

This section provides a review of the existing air quality in the vicinity of the application site in order to provide a benchmark against which to assess potential air quality impacts of the proposed development. Baseline air quality in the vicinity of the application site has been defined from several sources, as described in the following sections.

Local Air Quality Management (LAQM)

As required under section 82 of the Environment Act 1995, Barnsley Metropolitan Borough Council (BMBC) has undertaken an ongoing exercise to review and assess air quality within its area of jurisdiction.

The assessments have indicated that concentrations of NO_2 are above the relevant AQOs at six locations of relevant public exposure within BMBC that is shown below.

Table 4-1. Local Authority AQMA Details

AQMA	Description	Date Declared	Date Amended	Pollutants Declared
Barnsley AQMA No.1	An area along the M1 between Junction 35a and Junction 38, including Haigh, Darton, Cawthorne Dike, Higham, Dodworth, Gilroyd, Rockley, Birdwell, and Tankersley. The area extends 100m either side of the central reservation.	03/10/2001	N/A	Nitrogen Dioxide NO_2
Barnsley AQMA No.2A	An area encompassing the A628 from junction 37 of the M1 to Town End roundabout, including part of Summer Lane from Town End roundabout to Wharncliffe Street.	16/06/2005	N/A	Nitrogen Dioxide NO_2
Barnsley AQMA No.4	An area encompassing the southbound carriageway of the A61 Harborough Hill Road from the PC World gyratory to the southbound slip road of the A61 near to its junction with Queens Road.	07/07/2008	N/A	Nitrogen Dioxide NO_2
Barnsley AQMA No.5	An area encompassing the junction of Rotherham Road and Burton Road.	07/07/2008	N/A	Nitrogen Dioxide NO_2
Barnsley AQMA No.6	Incorporating the A616 road through Langsett	30/08/2012	27/10/2016	Nitrogen Dioxide NO_2
Barnsley AQMA No.7	Incorporating the southbound carriageway of the A61 Sheffield Road adjacent to the junction with the A6133 Cemetery Road	30/08/2012	N/A	Nitrogen Dioxide NO_2

Due to the distance of the closest/AQMA to the proposed development site, no sensitive receptors have been assessed within an AQMA.

However, it should be noted that the extent of these AQMAs are based on work undertaken in 2000, 2005, 2008 and 2012 and therefore are potentially out of date. Similarly, it should be noted that the Barnsley AQMA No.6 was amended in 2016.

As such, the modelling work in this assessment, which is verified to local monitoring, should be considered to be a more precise and up to date assessment of pollutant levels at the site. The assessment considers potential exposure to pollutants by future occupiers rather than simply considering the extent of the AQMA represents a

theoretical delineation of harm. It should be also noted that the AQMA is a management area, where pollutant levels should be "managed" by the local authority air quality action plan and should not be considered to be a planning constraint in itself.

Air Quality Monitoring

Monitoring of air quality within BMBC has been undertaken through both continuous and non-continuous monitoring methods in 2019. These have been reviewed in order to provide an indication of existing air quality in the area surrounding the application site. The most recent monitoring data within BMBC was undertaken during 2019.

Continuous Monitoring

BMBC undertook automatic pollution monitoring during 2019 at 3 different locations. The closest monitoring location is CM3, which is located at Woodview Lane, approximately 5.5 km south west of the application site. The most recently available data is from 2019 which is presented in **Table 4-2**.

Table 4-2. Monitored Annual Mean NO_2 Concentrations at Automatic Monitoring Locations

Site ID	Location	Site Type	Distance from Kerb of Nearest Road (m)	Inlet Height (m)	2019 NO_2 Annual Mean Concentration ($\mu g/m^3$)	2019 PM_{10} Annual Mean Concentration ($\mu g/m^3$)
CM1	Barnsley A635 Roadside	Roadside	5.0	1.45	N/A	11.0
CM2*	Barnsley A628 Roadside	Roadside	3.5	1.7	32.0	N/A
CM3	Barnsley Gawber	Urban Background	N/A	4.0	17.0	N/A
*Located within AQMA						

As outlined in **Table 4-2**, monitoring locations CM2 and CM3 monitored annual average NO_2 concentrations below the AQO for NO_2 (40 $\mu g/m^3$ annual mean) during 2019. Monitoring location CM1 also monitored annual average PM_{10} concentrations below the AQO for PM_{10} (40 $\mu g/m^3$ annual mean) during 2019.

Non - Continuous Monitoring

BMBC operates a network of 64 passive diffusion tubes. The closest diffusion tube is diffusion tube DT50, which is located on Carlton Road, approximately 3 km south west of the application site. The most recently available diffusion tube data is from 2019 which is presented in

Table 4-3.

Table 4-3. Monitored Annual Mean NO_2 Concentrations at Diffusion Tubes

Site ID	Location	Site Type	Distance from Kerb (m)	Inlet Height (m)	Monitored 2019 Annual Mean NO_2 Concentration ($\mu g/m^3$)
DT34	Wakefield Road / Carlton Road	Roadside	2.0	3.50	32.2
DT35	Wakefield Road / Carlton Road	Roadside	2.0	2.80	35.9
DT36	Wakefield Road / Smithies Lane (North)	Roadside	2.0	2.70	40.3
DT50	Carlton Road (W'fd Road junction) uphill	Roadside	1.5	2.75	37.4

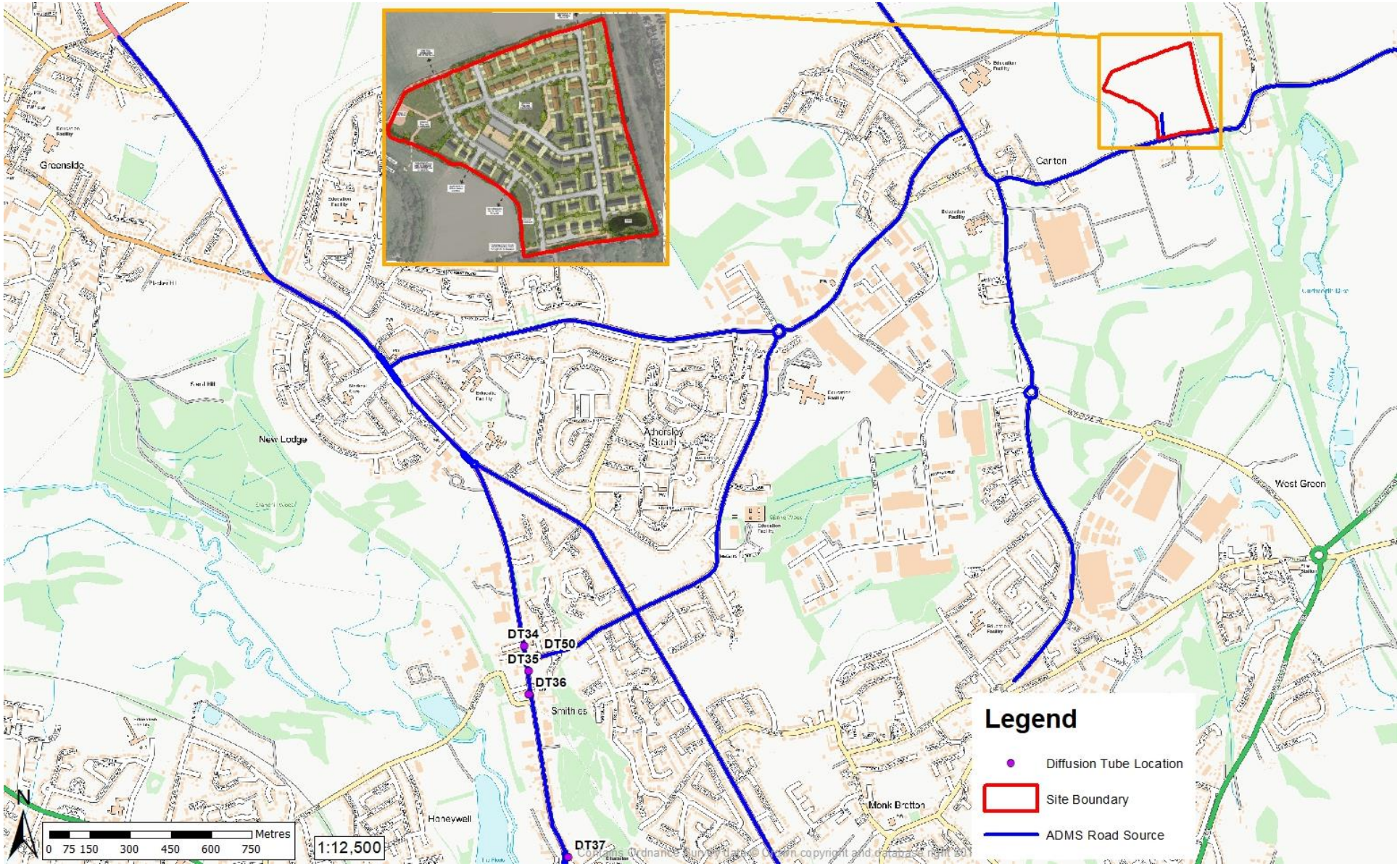
*Located within AQMA

As indicated in

Table 4-3, all diffusion tubes located within the Air Quality Assessment area monitored annual average NO_2 concentrations below the AQO for NO_2 (40 µg/m^3 annual mean) during 2019 excluding DT36 which monitored 40.3 µg/m^3 during 2019.

It should be noted that as part of the model verification a review of diffusion tubes locations and monitoring heights was undertaken. As part of this process, the locations and monitoring heights were adjusted following desk-based review using Google Maps.

Figure 4-1. Local Authority Monitoring Locations

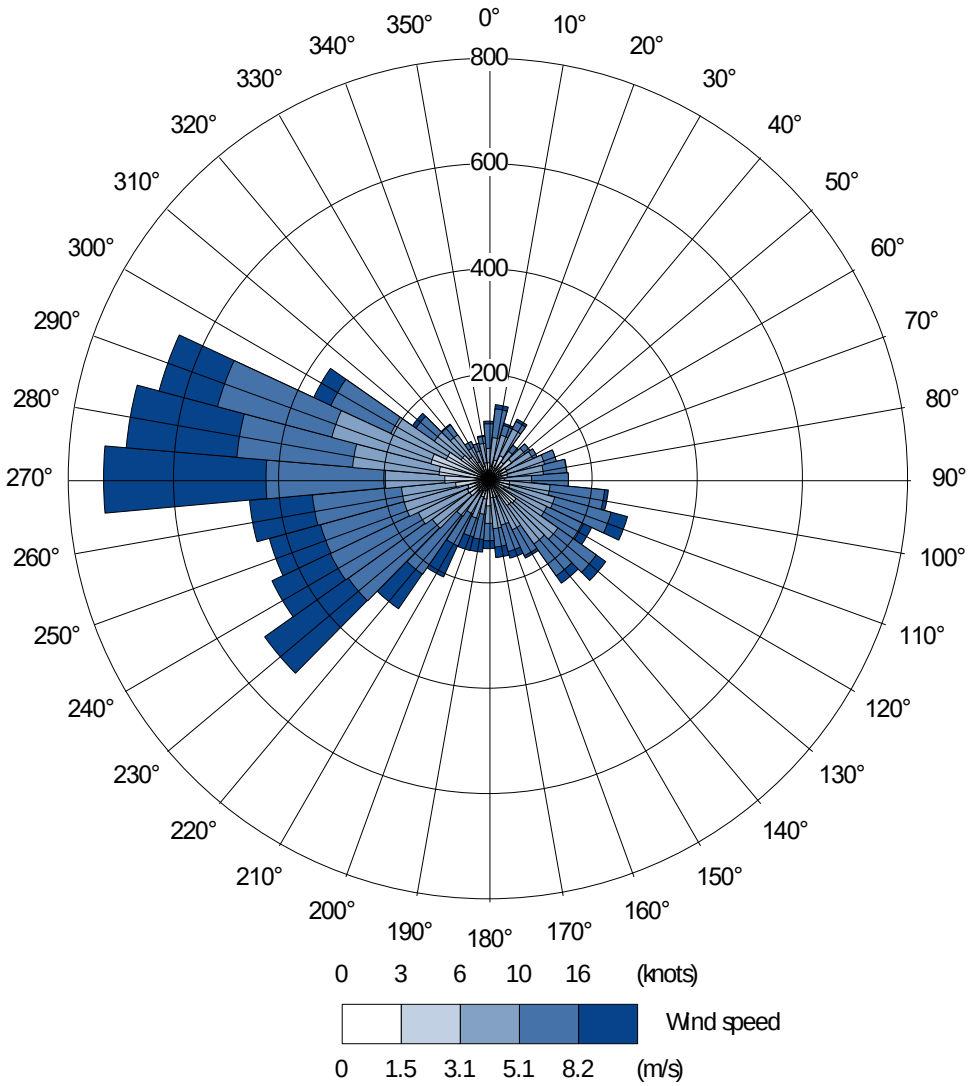


4.2 METEOROLOGY

Meteorological conditions have significant influence over air pollutant concentrations and dispersion. Pollutant levels can vary significantly from hour to hour as well as day to day, thus any air quality predictions need to be based on detailed meteorological data. The ADMS (Atmospheric Dispersion Modelling System) model calculates the dispersion of pollutants on an hourly basis using a year of local meteorological data.

The 2019 meteorological data used in the assessment is derived from Emley Moor Meteorological Station. This is the nearest meteorological station, which is considered representative of the application site, with all the complete parameters necessary for the ADMS model. Reference should be made to **Figure 4-2** for an illustration of the prevalent wind conditions at Emley Moor Meteorological Station site.

Figure 4-2. Emley Moor 2019 Wind Rose



4.3 EMISSION SOURCES

A desktop assessment has identified that traffic movements are likely to be the most significant local source of pollutants affecting the site and its surroundings. The principal traffic derived pollutants likely to impact local receptors are NO_2, PM_{10} and $PM_{2.5}$.

The assessment has therefore modelled all roads within the immediate vicinity of the application site which are considered likely to experience significant changes in traffic flow as a result of the proposed development. Reference should be made to **Figure A-1** for a graphical representation of the traffic data utilised within the ADMS Roads 5.0.0.1 model.

It should be noted that the pollutant contribution of minor roads and rail sources that are not included within the dispersion model is considered to be accounted for via the use of background air quality levels.

4.4 SENSITIVE RECEPTORS

Receptors that are considered as part of the air quality assessment are primarily those existing receptors that are situated along routes predicted to experience significant changes in traffic flow as a result of the proposed development.

The existing receptor locations are summarised in **Table 4-4** and the spatial locations of all of the receptors are illustrated in **Figure 4-3**.

Table 4-4. Modelled Sensitive Receptor Locations

Existing Sensitive Receptor		X	Y	Receptor Height (m)
R1	59 Shaw Lane	437009	410003	1.5
R2	1 Ivy Farm Close	436794	410024	1.5
R3	Carlton Primary School	436725	409848	1.5
R4	6 Far Lawns	436670	410149	1.5
R5	4 Lynwood Drive	436409	410491	1.5
R6	236 Fish Dam Lane	436781	409655	1.5
R7	224 Fish Dam Lane	436798	409532	1.5
R8	11 Baycliff Close	436858	408987	1.5
R9	436 Carlton Road	436242	409744	1.5
R10	Outwood Academy	436627	410336	1.5
R11	Springwell Learning Community	435779	408763	1.5
R12	Athersley South Primary School	434873	409001	1.5
R13	169 Wakefield Road	435023	408240	1.5
R14	1 Albury Close	435782	408890	1.5
R15	1 Lindhurst Road	435316	409476	1.5
R16	455 Rotherham Road	435275	408705	1.5
Proposed Sensitive Receptor		**X**	**Y**	**Receptor Height (m)**
PR1	Proposed Receptor	391273	347285	1.5
PR2	Proposed Receptor	391284	347301	1.5
PR3	Proposed Receptor	391696	347221	1.5
PR4	Proposed Receptor	391699	347186	1.5
PR5	Proposed Receptor	391186	347158	1.5

PR6	Proposed Receptor	391325	347355	1.5
PR7	Proposed Receptor	391199	347124	1.5
PR8	Proposed Receptor	391224	347204	1.5

Sixteen existing sensitive receptors and eight proposed sensitive receptors have been assessed to determine the effect of air quality, associated with the proposed development. The locations of the receptor are identified on **Figure 4-3**.

4.5 ECOLOGICAL RECEPTORS

Air quality impacts associated with the proposed re-development have the potential to impact on receptors of ecological sensitivity within the vicinity of the site. The IAQM guidance on 'Air Quality Impacts on Designated Nature Conservation Sites' (2020) outlines the types of designated nature sites within 2 km of the proposed development which require air quality assessment. These are inclusive of;

- Sites of Special Scientific Interest (SSSIs);
- Special Areas of Conservation (SACs);
- Special Protection Areas (SPAs);
- Ramsar Sites;
- Areas of Special Scientific Interest (ASSIs);
- National Nature Reserves (NNRs);
- Local Nature Reserves (LNRs);
- Local Wildlife Sites (LWSs); and,
- Areas of Ancient Woodland (AW).

The Conservation of Habitats and Species Regulations (2019) additionally requires competent authorities to review planning applications and consents that have the potential to impact on European designated sites (e.g. Special Protection Areas).

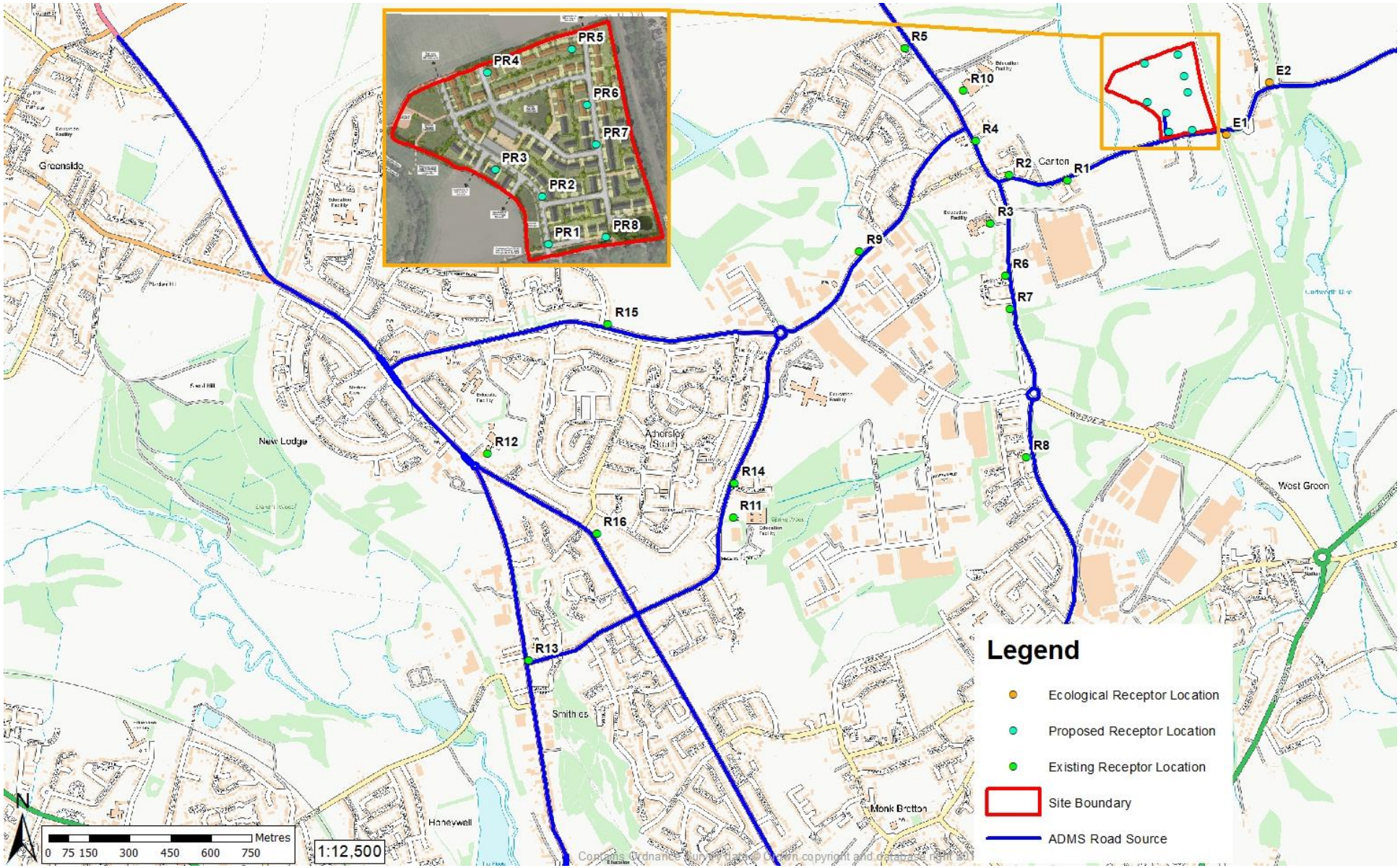
A study was undertaken to identify any statutory designated sites of ecological or nature conservation importance within the extents of the dispersion modelling assessment. This was completed using the Multi-Agency Geographic Information for the Countryside (MAGIC) web-based interactive mapping service, which draws together information on key environmental schemes and designations. Following a search within a 2 km radius of the site boundary the following ecological receptors were identified:

Table 4-5. Ecological Sensitive Receptor Locations

Site ID	Site	Designation	UK NGR (m)		Distance from Site (km)	Distance from Nearest Affected Road (m)
			X	Y		
E1	Dearne Valley Wetlands	SSSI	437594	410173	0.06	17
E2	Carlton Marsh	LNR	437753	410364	0.23	16

It should be noted that the IAQM Guidance only requires the assessment of ecological receptors which are located within 200 m of the affected road network. Therefore, both ecological receptors have been included within this assessment

Figure 4-3. Sensitive Receptor Locations



5.0 ASSESSMENT OF AIR QUALITY IMPACTS - CONSTRUCTION PHASE

5.1 POLLUTANT SOURCES

The main emissions during construction are likely to be dust and particulate matter generated during earth moving (particularly during dry months) or from construction materials. The main potential effects of dust and particulate matter are:

- Visual - dust plume, reduced visibility, coating and soiling of surfaces leading to annoyance, loss of amenity, the need to clean surfaces;
- Physical and/or chemical contamination and corrosion of artefacts;
- Coating of vegetation and soil contamination; and,
- Health effects due to inhalation e.g. asthma or irritation of the eyes.

A number of other factors such as the amount of precipitation and other meteorological conditions will also greatly influence the amount of particulate matter generated.

Construction activities can give rise to short-term elevated dust/PM_{10} concentrations in neighbouring areas. This may arise from vehicle movements, soiling of the public highway, demolition or windblown stockpiles.

5.2 PARTICULATE MATTER (PM_{10})

The UK Air Quality Standards seek to control the health implications of respirable PM_{10}. However, the majority of particles released from construction will be greater than this in size.

Construction works on site have the potential to elevate localised PM_{10} concentrations in the area. On this basis, mitigation measures should still be taken to minimise these emissions as part of good site practice.

5.3 DUST

Particles greater than 10µm are likely to settle out relatively quickly and may cause annoyance due to their soiling capability. Although there are no formal standards or criteria for nuisance caused by deposited particles, the IAQM 'Guidance on Monitoring in the Vicinity of Demolition and Construction Sites' (October 2018) and the Environment Agency Technical Guidance Note (TGN) M17 states that dust is usually compared with a 'complaints likely' guideline of 200mg/m^2/day. Therefore, a deposition rate of 200mg/m^2/day is often presented as a threshold for serious nuisance though this is usually only applied to long term exposure as people are generally more tolerant of dust for a short or defined period. Significant nuisance is likely when the dust coverage of surfaces is visible in contrast with adjacent clean areas, especially when it happens regularly. Severe dust nuisance occurs when the dust is perceptible without a clean reference surface.

Construction activities have the potential to suspend dust, which could result in annoyance of residents surrounding the site. Measures will be taken to minimise the emissions of dust as part of good site practice.

Recommended mitigation measures proportionate to the risk associated with the development and based on best practice guidance are discussed in the following sections.

5.4 METHODOLOGY

The construction phase assessment utilises the IAQM Guidance on the Assessment of Dust from Demolition and Construction document published in February 2014.

Four construction processes are considered; these are demolition, earthworks, construction and trackout. For each of these phases, the impact description of the potential dust impacts is derived following the determination of a dust emission magnitude and the distance of activities to the nearest sensitive receptor, therefore assessing worst case impacts. A full explanation of the methodology is contained in Appendix A.

5.5 ASSESSMENT RESULTS

Based on the methodology detailed in Appendix A, the scale of the anticipated works has determined the potential dust emission magnitude for each process, as presented in the **Table 5-1** below.

Table 5-1. Dust Emission Magnitude

Construction Process	Site Criteria	Dust Emission Magnitude
Demolition	No demolition required	N/A
Earthworks	Total Site Area: >10,000 m^2	Large
Construction	Total Building Volume >100,000 m^3	Large
Trackout	Assumed 10 - 50 HDV outward movements in any one day	Medium

The sensitivity of the surrounding area to each construction process has been determined following stage 2B of the IAQM guidance. The assessment has determined the area sensitivities as shown in the **Table 5-2**.

The sensitivity of the ecological receptors is considered not applicable within the construction phase assessment due to the distance from the application site which is greater than 500m. This is in accordance with Table 4 of the IAQM Guidance.

Table 5-2. Sensitivity of the Area

Source	Area Sensitivity					
	Dust Soiling	Site Sensitivity Criteria	Health Effects of PM_{10}	Site Sensitivity Criteria	Ecological	Site Sensitivity Criteria
Demolition	N/A	No demolition required	N/A	No demolition required	N/A	No demolition required
Earthworks	Medium	10-100 Highly Sensitive Receptors within 50m	Low	Annual Mean of <24 ug/m^3 for PM_{10} 10-100 Highly Sensitive Receptors within 50m	N/A	>50 m from site boundary
Construction	Medium		Low		N/A	
Trackout	Medium	10-100 Highly Sensitive Receptors within 50m of roads within 500m of site	Low	Annual Mean of <24 ug/m^3 for PM_{10} 10-100 Highly Sensitive Receptors within 50m of roads within 500m of site	N/A	>50 m from roads within 500 m from site boundary

The dust emission magnitude determined in **Table 5-1** has been combined with the sensitivity of the area determined in **Table 5-2**, to determine the risk of impacts prior to the implementation of appropriate mitigation measures. The potential impact significance of dust emissions associated with the development, without mitigation, is presented in **Table 5-3**.

Table 5-3. Impact Description of Construction Activities without Mitigation

Source	Summary Risk of Impacts Prior to Mitigation		
	Dust Soiling	Health Effects of PM_{10}	Ecological
Demolition	N/A	N/A	N/A
Earthworks	Medium	Low	N/A
Construction	Medium	Low	N/A
Trackout	Low	Low	N/A

Appropriate mitigation measures are detailed and presented in Section 7. Following the adoption of these measures, the subsequent impact significance of the construction phase is not predicted to be significant.

6.0 ASSESSMENT OF AIR QUALITY IMPACTS - OPERATIONAL PHASE

In the context of the proposed development, road traffic is identified as the dominant emission source that is likely to cause potential risk of exposure of air pollutants at receptors.

The operational phase assessment therefore consists of the quantified predictions of the change in NO_2, PM_{10} and $PM_{2.5}$ for the operational phase of the development due to changes in traffic movement. Predictions of air quality at the site have been undertaken for the operational phase of the development using ADMS Roads.

In accordance with the provided traffic data, the operational phase assessment has been undertaken with an assumed operational opening year of 2023. The assessment scenarios are therefore:

- 2019 Baseline = Existing Baseline Conditions (2019);
- 2023 "Do Minimum" = Baseline Conditions + Committed Development Flows (through local growth factor); and,
- 2023 "Do Something" = Baseline Conditions + Committed Development (through local growth factor) + Proposed Development.

6.1 EXISTING AND PREDICTED TRAFFIC FLOWS

Baseline 2019 traffic data, projected 2023 'Do Minimum' and 'Do Something' traffic data, and average vehicle speeds have been obtained for the operational phase assessment in the form of Annual Average Daily Traffic figures (AADT). Development traffic flows have been provided by Pell Frischmann.

Traffic data for all scenarios, inclusive of HGV numbers has been provided by Pell Frischmann Transport Consultants for most links. Baseline 2019 data for links where no data was provided was downloaded from the Department for Transport (DfT) road statistic database.

The proposed development opening year is assumed to be a worst-case year of 2023. To determine the traffic flows for the 2023 'Do Minimum' traffic flows for links where no data was provided, a TEMPro factor of 1.0468 has been applied to the 2019 Baseline traffic data.

To calculate the 2023 'Do Something' operational year traffic flows for link where no data was provided, the proposed development traffic flows have been distributed across the model area and have been added onto the 2023 'Do Minimum' scenario flows.

Emission factors for the 2019 baseline and 2023 projected 'Do Minimum' and 'Do Something' scenarios have been calculated using the Emission Factor Toolkit (EFT) Version 10.1 (August 2020).

It is assumed the average vehicle speeds on the local road network in an opening year of 2023 will be broadly the same as the ones in 2019. A 50 m 20 km/hr slow down phase is included on each link at every junction and roundabout within the assessment. All of the roads within the dispersion model are illustrated in **Figure A-1**. Detailed traffic figures are provided in the **Table 6-1**.

Table 6-1. Traffic Data

Link	Speed (km/h)	2019 Baseline		2023 Do Minimum		2023 Do Something	
		AADT	HGV %	AADT	%HGV	AADT	%HGV
Shaw Lane	48	6,599	3.61	7,226	3.61	8,588	3.61
Church Street	48	15,918	3.18	16,913	3.18	17,614	3.18
Fish Dam Lane North of Woodmoor Street	48	10,676	8.66	11,343	8.66	11,766	8.66
Fish Dam Lane South of Woodmoor Street	64	10,676	8.66	11,343	8.66	11,766	8.66
Site Access	20	0	0	0	0	1,238	0
Carlton Road	48	15,918	3.18	16,913	3.18	17,264	3.18
Carlton Road South of Laithes Lane	48	15,918	3.18	16,913	3.18	17,088	3.18
Wakefield Road North of Carlton Road	64	11,816	2.87	12,306	2.87	12,394	2.87
Wakefield Road South of Carlton Road	64	16,596	2.57	17,285	2.57	17,372	2.57
Laithes Lane	48	15,918	3.18	16,913	3.18	17,088	3.18
Rotherham Road	48	8,550	3.52	8,905	3.52	8,992	3.52

6.2 BACKGROUND CONCENTRATIONS

The use of background concentrations within the modelling process ensures that pollutant sources other than traffic are represented appropriately. Background sources of pollutants include industrial, domestic and rail emissions within the vicinity of the study site. Several sources have been used to obtain representative background levels as discussed below.

The background concentrations used within the assessment have been determined with reference to the IAQM Guidance and Technical Guidance (TG) (16).

The IAQM Guidance states:

> "*A matter of judgement should take into account the background and future background air quality and whether it is likely to approach or exceed the value of the AQO.*"

Additionally, TG (16) states:

> "*Typically, only the process contributions from local sources are represented within an output by the dispersion model. In these circumstances, it is necessary to add an appropriate background concentration(s) to the modelled source contributions to derive the total pollutant concentrations.*"

Defra Published Background Concentrations for 2019

The background concentrations shown in **Table 6-2** were referenced from the UK National Air Quality Information Archive database based on the National Grid Co-ordinates of 1 x 1 km grid squares nearest to the application site. In August 2020, Defra issued revised 2018 based background maps for nitrogen oxide (NO_X), NO_2, PM_{10} and $PM_{2.5}$.

Table 6-2. Published Background Air Quality Levels (µg/m^3)

Receptor Location		2019			
		NO_X	NO_2	PM_{10}	$PM_{2.5}$
Proposed Site					
437381	410334	12.74	9.71	11.94	7.34
Local Authority Monitoring					
DT34		15.60	11.72	11.18	7.39
DT35		15.60	11.72	11.18	7.39
DT36		15.60	11.72	11.18	7.39
DT50		15.60	11.72	11.18	7.39
Existing Sensitive Receptors					
R1		16.54	23.04	13.04	8.94
R2		16.54	23.04	13.04	8.94
R3		12.85	17.28	11.49	7.80
R4		11.33	15.03	10.94	7.37
R5		11.33	15.03	10.94	7.37
R6		11.33	15.03	10.94	7.37
R7		11.33	15.03	10.94	7.37
R8		11.33	15.03	10.94	7.37
R9		12.61	16.92	11.29	7.62
R10		12.61	16.92	11.29	7.62
R11		11.68	15.53	11.14	7.50
R12		11.68	15.53	11.14	7.50
R13		12.61	16.92	11.29	7.62
R14		12.61	16.92	11.29	7.62
R15		12.85	17.28	11.49	7.80
R16		11.33	15.03	10.94	7.37
Proposed Sensitive Receptors					
PR1 – PR9		12.74	9.71	11.94	7.34
Ecological Sensitive Receptors					
E1 – E2		12.74	9.71	11.94	7.34

All the Defra background concentrations detailed in **Table 6-2** for 2019, show that the background levels are predicted to be below the relevant AQO within the study area.

A breakdown of the background source apportionment of NO_X concentrations at each monitoring location and receptor is shown in **Table 6-3**.

Table 6-3. Pollutant Source Apportionment of NO_X (µg/m^3)

Receptor Location	2019						
	Total NO_x	% of NO_X from Road Sources	% of NO_X from Industrial Sources	% of NO_X from Domestic Sources	% of NO_X from Aircraft Sources	% of NO_X from Rail Sources	% of NO_X from Other Sources
Local Authority Monitoring							
DT34	0.22	7.38	32.96	7.13	11.20	<0.01	1.41
DT35	0.22	7.38	32.96	7.13	11.20	<0.01	1.41
DT36	0.22	7.38	32.96	7.13	11.20	<0.01	1.41

DT50	0.22	7.38	32.96	7.13	11.20	<0.01	1.41
Existing Sensitive Receptors							
R1	12.74	22.35	9.29	7.02	<0.01	1.47	59.88
R2	13.26	25.93	8.69	8.94	<0.01	1.38	55.05
R3	16.56	22.81	7.19	7.31	<0.01	1.13	61.57
R4	13.26	25.93	8.69	8.94	<0.01	1.38	55.05
R5	13.26	25.93	8.69	8.94	<0.01	1.38	55.05
R6	16.56	22.81	7.19	7.31	<0.01	1.13	61.57
R7	16.56	22.81	7.19	7.31	<0.01	1.13	61.57
R8	16.60	25.26	14.42	9.45	<0.01	1.18	49.69
R9	16.56	22.81	7.19	7.31	<0.01	1.13	61.57
R10	13.26	25.93	8.69	8.94	<0.01	1.38	55.05
R11	15.60	32.96	7.13	11.20	<0.01	1.41	47.30
R12	14.56	32.34	7.60	11.65	<0.01	1.40	47.01
R13	15.60	32.96	7.13	11.20	<0.01	1.41	47.30
R14	15.60	32.96	7.13	11.20	<0.01	1.41	47.30
R15	14.08	28.73	7.84	10.78	<0.01	1.35	51.30
R16	15.60	32.96	7.13	11.20	<0.01	1.41	47.30
Proposed Sensitive Receptors							
PR1 – PR8	12.74	22.35	9.29	7.02	<0.01	1.47	59.88
Ecological Sensitive Receptors							
E1 – E2	12.74	22.35	9.29	7.02	<0.01	1.47	59.88

Table 6-3 shows that the major background source of NO_X at the monitoring, sensitive receptor locations where sources have been identified are mainly comprised of road sources.

A review of the Defra background site has determined that they are in line with the Local Authority monitoring within BMBC.

Table 6-4 shows the background concentrations utilised within the assessment.

Table 6-4. Utilised Background Concentrations (µg/m^3)

Receptor Location	2019		Source
	NO_x	NO_2	
Local Authority Monitoring			
DT34	15.60	11.72	Defra Background Maps
DT35	15.60	11.72	
DT36	15.60	11.72	
DT50	15.60	11.72	
Existing Sensitive Receptors			
R1	12.74	9.71	Defra Background Maps
R2	13.26	10.09	
R3	16.56	12.30	
R4	13.26	10.09	
R5	13.26	10.09	
R6	16.56	12.30	
R7	16.56	12.30	
R8	16.60	12.34	

R9	16.56	12.30	
R10	13.26	10.09	
R11	15.60	11.72	
R12	14.56	11.01	
R13	15.60	11.72	
R14	15.60	11.72	
R15	14.08	10.67	
R16	15.60	11.72	
Proposed Sensitive Receptors			
PR1 – PR8	12.74	9.71	Defra Background Maps
Ecological Sensitive Receptors			
E1 – E2	13.97	-	APIS

6.3 MODEL VERIFICATION

Model verification involves the comparison of modelled data to monitored data in order to gain the best possible representation of current pollutant concentrations for the assessment years. The verification process is in general accordance with that contained in Section 7 of the TG16 guidance note and uses the most recently available diffusion tube monitoring data to best represent this.

The verification process consists of using the monitoring data and the published background air quality data in the UK National Air Quality Information Archive to calculate the road traffic contribution of NO_X at the monitoring locations. Outputs from the ADMS Roads model are provided as predicted road traffic contribution NO_X emissions. These are converted into predicted roadside contribution NO_2 exposure at the relevant receptor locations based on the updated approach to deriving NO_2 from NO_X for road traffic sources published in Local Air Quality Management TG16. The calculation was derived using the NO_X to NO_2 worksheet in the online LAQM tools website hosted by Defra. **Table 6-5** summarises the final model/monitored data correlation following the application of the model correction factor.

Table 6-5. Comparison of Roadside Modelling & Monitoring Results for NO_2

Monitoring Site	NO_2 µg/m^3		
	Monitored NO_2	**Modelled NO_2**	**Difference (%)**
DT34	32.20	29.59	-8.12
DT35	35.90	39.81	10.88
DT36	40.30	40.93	1.57
DT50	37.40	33.69	-9.91

The final model produced data at the monitoring locations to within 25% of the monitoring results at all of the verification points, as required by TG16 guidance.

The final verification model correlation coefficient (representing the model uncertainty) is 1.00. This was achieved by applying a model correction factor of 6.18 to roadside predicted NO_X concentrations before converting to NO_2. This figure demonstrates that the model predictions were in line with the road traffic emissions at the monitoring locations.

6.4 ADMS-ROADS MODEL INPUTS

Table 6-6. Summary of ADMS Roads Model Inputs

Parameter	Description	Input Value
Chemistry	A facility within ADMS-Roads to calculate the chemical reactions in the atmosphere between Nitric Oxide (NO), NO_2, Ozone (O_3) and Volatile organic compounds (VOCs).	No atmospheric chemistry parameters included
Meteorology	Representative meteorological data from a local source	**Emley Moor 2019 Meteorological Station**, hourly sequential data
Surface Roughness	A setting to define the surface roughness of the model area based upon its location.	**1.5m** representing a typical surface roughness for **Parklands and open suburbia** was used for the Site **0.3m** representing a typical surface roughness for **Agricultural Areas** for the met. Measurement site.
Latitude	Allows the location of the model area to be set	United Kingdom = **53.35**
Monin-Obukhov Length	This allows a measure of the stability of the atmosphere within the model area to be specified depending upon its character.	Cities and Large Towns= **30m** was used for the Site Small Towns = 1**0m** was used for the met. Measurement site.
Elevation of Road	Allows the height of the road link above ground level to be specified.	All other road links were set at ground level = **0m**.
Road Width	Allows the width of the road link to be specified.	Road width used depended on data obtained from OS map data for the specific road link
Topography	This enables complex terrain data to be included within the model in order to account for turbulence and plume spread effects of topography	No topographical information used
Time Varied Emissions	This enables daily, weekly or monthly variations in emissions to be applied to road sources	No time varied emissions used
Road Type	Allows the effect of different types of roads to be assessed.	**Urban (Not London)** settings were used for the relevant links
Road Speeds	Enables individual road speeds to be added for each road link	Based on national speed limits
Canyon Height	Allows the model to take account turbulent flow patterns occurring inside a street with relatively tall buildings on both sides, known as a “street canyon”.	No canyons used within the model
Road Source Emissions	Road source emission rates are calculated from traffic flow data using the in-built EFT database of traffic emission factors.	The **EFT** Version **10.1 (2020)** dataset was used.
Year	Predicted EFT emissions rates depend on the year of emission.	**2019** data for verification and baseline Operational Phase Assessment. **2023** data for the Operational Phase Traffic Assessment.

6.5 ADMS MODELLING RESULTS

6.5.1 Traffic Assessment

The ADMS Model has predicted concentrations of NO_2, PM_{10} and $PM_{2.5}$ at relevant receptor locations adjacent to roads likely to be affected by the development, as summarised in the following tables. Only receptors close to roads where there is predicted to be a change in emissions have been assessed.

6.5.2 Assessment Scenarios

For the operational year of 2023, assessment of the effects of emissions from the proposed traffic associated with the scheme, has been undertaken using the Emissions Factor Toolkit (EFT) 2023 emissions rates which take into account of the rate of reduction in emission from road vehicles into the future with the following factors:

- 2019 Baseline = Existing Baseline conditions;
- 2023 "Do Minimum" = 2023 Baseline + Committed Development Flows (through local growth factor); and,
- 2023 "Do Something" = 2023 Baseline + Committed Development Flows (through local growth factor) + Development Traffic Flows.

6.5.3 Operational Traffic Assessment

Nitrogen Dioxide

Table 6-7 presents a summary of the predicted change in NO_2 concentrations at relevant receptor locations, due to changes in traffic flow associated with the proposed development, based on modelled 'Do Minimum' and 'Do Something' scenarios.

Table 6-7. Predicted Annual Average Concentrations of NO_2 at Receptor Locations

Receptor		NO_2 (µg/m^3)			
		2019 Baseline	2023 Do Minimum	2023 Do Something	Development Contribution
R1	59 Shaw Lane	18.72	16.18	17.17	0.99
R2	1 Ivy Farm Close	23.83	19.85	20.98	1.13
R3	Carlton Primary School	16.22	14.95	15.06	0.11
R4	6 Far Lawns	33.66	27.07	27.68	0.61
R5	4 Lynwood Drive	16.22	14.41	14.51	0.10
R6	236 Fish Dam Lane	21.24	18.27	18.49	0.22
R7	224 Fish Dam Lane	21.44	18.42	18.64	0.22
R8	11 Baycliff Close	18.22	16.27	16.40	0.13
R9	436 Carlton Road	22.63	19.61	19.76	0.15
R10	Outwood Academy	15.64	14.01	14.11	0.10
R11	Springwell Learning Community	18.76	16.67	16.73	0.06
R12	Athersley South Primary School	17.41	15.42	15.46	0.04
R13	169 Wakefield Road	45.43	35.77	35.95	0.18
R14	1 Albury Close	30.28	24.99	25.13	0.14
R15	1 Lindhurst Road	26.82	22.18	22.30	0.12
R16	455 Rotherham Road	21.48	18.44	18.51	0.07
PR1	Proposed Receptor	-	-	14.47	-
PR2	Proposed Receptor	-	-	11.77	-
PR3	Proposed Receptor	-	-	10.81	-
PR4	Proposed Receptor	-	-	10.43	-
PR5	Proposed Receptor	-	-	10.37	-
PR6	Proposed Receptor	-	-	10.52	-
PR7	Proposed Receptor	-	-	10.72	-
PR8	Proposed Receptor	-	-	14.69	-
Annual Mean AQO		**40 µg/m^3**			

All modelled existing receptors are predicted to be below the AQO for NO_2 in both the 'Do Minimum' and 'Do Something' scenarios.

As indicated in **Table 6-7**, the maximum predicted increase in annual average exposure to NO_2 at any existing receptor, due to changes in traffic movements associated with the proposed development is likely to be 1.13 µg/m^3 at 1 Ivy Farm Close (R2).

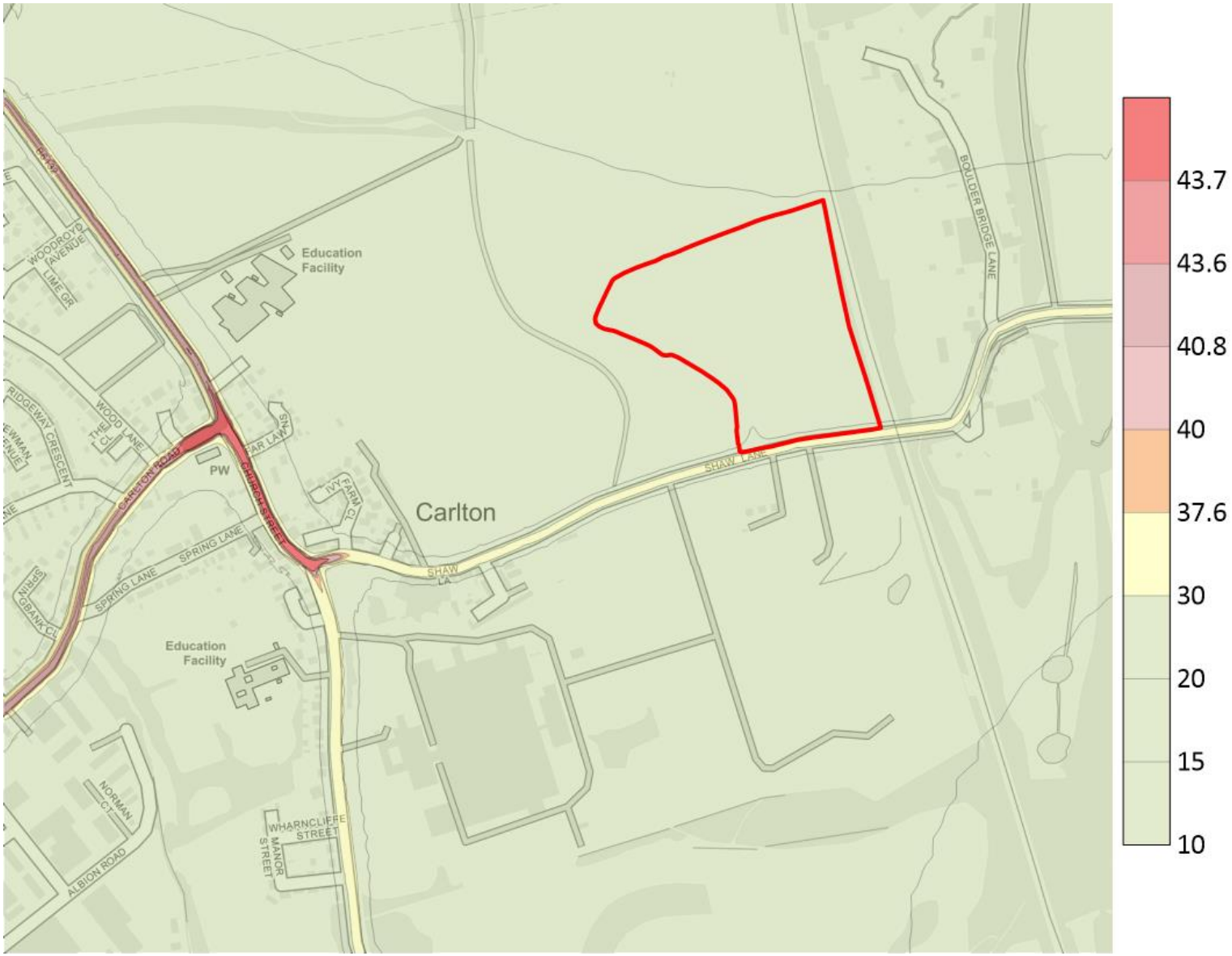
The maximum predicted annual average exposure to NO_2 at any proposed receptor at the ground floor is 14.69 µg/m^3. All modelled proposed residential receptors are predicted to be below the annual average AQO for NO_2.

The predicted long-term NO_2 concentrations at all proposed and existing receptors are well below 60 µg/m^3 in all scenarios. Therefore, it is unlikely there will be any exceedances for the short-term NO_2 AQO at all modelled receptors as outlined in LAQM TG16 technical guidance.

Figure 6-1 and **Figure 6-2** below, illustrate the Total Long Term Annual Average Nitrogen Dioxide (NO_2) Contribution and Concentration at the Proposed Development (µg/m^3).

Figure 6-1. Annual Average Long-Term Nitrogen Dioxide (NO_2) Contribution from Proposed Development ($\mu g/m^3$)

Figure 6-2. Total Long Term Annual Average Nitrogen Dioxide (NO_2) Concentration at Proposed Development ($\mu g/m^3$)



The impact description of changes in traffic flow associated with the proposed development with respect to annual mean NO_2 exposure has been assessed with reference to the criteria in Section 3. The outcomes of the assessment are summarised in **Table 6-8**.

Table 6-8. Impact Description of Effects at Key Receptors (NO_2)

Impact Description of NO_2 Effects at Key Receptors					
Receptor	**Change Due to Development (DS-DM) (µg/m³)**	**Change due to Development (% of AQO)**	**% Change in Concentration Relative to AQO**	**% Annual Mean Concentration in Assessment Year**	**Impact Description**
R1	0.99	2.48	2-5%	≤75% of AQO	Negligible
R2	1.13	2.84	2-5%	≤75% of AQO	Negligible
R3	0.11	0.28	0%	≤75% of AQO	Negligible
R4	0.61	1.53	2-5%	≤75% of AQO	Negligible
R5	0.10	0.25	0%	≤75% of AQO	Negligible
R6	0.22	0.55	1%	≤75% of AQO	Negligible
R7	0.22	0.55	1%	≤75% of AQO	Negligible
R8	0.13	0.33	0%	≤75% of AQO	Negligible
R9	0.15	0.38	0%	≤75% of AQO	Negligible
R10	0.10	0.25	0%	≤75% of AQO	Negligible
R11	0.06	0.15	0%	≤75% of AQO	Negligible
R12	0.04	0.10	0%	≤75% of AQO	Negligible
R13	0.18	0.45	0%	76-94% of AQO	Negligible
R14	0.14	0.35	0%	≤75% of AQO	Negligible
R15	0.12	0.30	0%	≤75% of AQO	Negligible
R16	0.07	0.18	0%	≤75% of AQO	Negligible
+0% means a change of <0.5% as per explanatory note 2 of table 6.3 of the EPUK IAQM Guidance.					
*Located in the AQMA					

The impact description of the effects of changes in traffic flow as a result of the proposed development, with respect to NO_2 exposure for existing receptors, is determined to be 'negligible' at all modelled receptors. This is based on the methodology outlined in section 3. Given the quantitative nature of the assessment and the verification of the air quality dispersion model, the level of accuracy of the assessment results is considered to be 'high'.

Particulate Matter (PM_{10})

Table 6-9 presents a summary of the predicted change in annual mean PM_{10} concentrations at relevant receptor locations, due to changes in traffic flow associated with the proposed development, based on modelled 'Do Minimum' and 'Do Something' scenarios.

Table 6-9. Predicted Annual Average Concentrations of PM_{10} at Receptor Locations

Receptor		**PM_{10} (µg/m³)**			
		2019 Baseline	**2023 Do Minimum**	**2023 Do Something**	**Development Contribution**
R1	59 Shaw Lane	13.71	13.79	14.08	0.29
R2	1 Ivy Farm Close	14.63	14.70	14.99	0.29
R3	Carlton Primary School	12.25	12.26	12.29	0.03
R4	6 Far Lawns	17.09	17.18	17.38	0.20

R5	4 Lynwood Drive	13.45	13.48	13.51	0.03
R6	236 Fish Dam Lane	13.25	13.27	13.34	0.07
R7	224 Fish Dam Lane	13.43	13.46	13.53	0.07
R8	11 Baycliff Close	13.18	13.20	13.24	0.04
R9	436 Carlton Road	13.58	13.61	13.66	0.05
R10	Outwood Academy	13.31	13.33	13.36	0.03
R11	Springwell Learning Community	12.57	12.59	12.61	0.02
R12	Athersley South Primary School	11.97	11.96	11.97	0.01
R13	169 Wakefield Road	16.76	16.71	16.76	0.05
R14	1 Albury Close	15.05	15.12	15.16	0.04
R15	1 Lindhurst Road	14.36	14.42	14.46	0.04
R16	455 Rotherham Road	12.95	12.94	12.95	0.02
PR1	Proposed Receptor	-	-	13.22	-
PR2	Proposed Receptor	-	-	12.47	-
PR3	Proposed Receptor	-	-	12.24	-
PR4	Proposed Receptor	-	-	12.14	-
PR5	Proposed Receptor	-	-	12.12	-
PR6	Proposed Receptor	-	-	12.16	-
PR7	Proposed Receptor	-	-	12.22	-
PR8	Proposed Receptor	-	-	13.35	-
Annual Mean AQO		**40 µg/m³**			

*Located in the AQMA

All modelled existing receptors are predicted to be below the AQO for PM_{10} in both the 'Do Minimum' and 'Do Something' scenarios.

As indicated in **Table 6-9**, the maximum predicted increase in annual average exposure to PM_{10} at any existing receptor, due to changes in traffic movements associated with the proposed development is 0.29 µg/m³ at 59 Shaw Lane (R1) and 1 Ivy Farm Close (R2).

The maximum predicted annual average exposure to PM_{10} at any proposed receptor at the ground floor is 13.35 µg/m³. All modelled proposed residential receptors are predicted to be below the annual average AQO for PM_{10}.

The impact description of changes in traffic flow associated with the proposed development with respect to annual mean PM_{10} exposure has been assessed with reference to the criteria in Section 3. The outcomes of the assessment are summarised in **Table 6-10**.

Table 6-10. Impact Description of Effects at Key Receptors (PM_{10})

Impact Description of PM_{10} Effects at Key Receptors					
Receptor	**Change Due to Development (DS-DM) (µg/m³)**	**Change due to Development (% of AQO)**	**% Change in Concentration Relative to AQO**	**% Annual Mean Concentration in Assessment Year**	**Impact Description**
R1	0.29	0.73	1%	≤75% of AQO	Negligible
R2	0.29	0.72	1%	≤75% of AQO	Negligible
R3	0.03	0.08	0%	≤75% of AQO	Negligible
R4	0.20	0.49	0%	≤75% of AQO	Negligible
R5	0.03	0.07	0%	≤75% of AQO	Negligible
R6	0.07	0.16	0%	≤75% of AQO	Negligible
R7	0.07	0.18	0%	≤75% of AQO	Negligible

R8	0.04	0.11	0%	≤75% of AQO	Negligible
R9	0.05	0.11	0%	≤75% of AQO	Negligible
R10	0.03	0.08	0%	≤75% of AQO	Negligible
R11	0.02	0.04	0%	≤75% of AQO	Negligible
R12	0.01	0.02	0%	≤75% of AQO	Negligible
R13	0.05	0.12	0%	≤75% of AQO	Negligible
R14	0.04	0.10	0%	≤75% of AQO	Negligible
R15	0.04	0.09	0%	≤75% of AQO	Negligible
R16	0.02	0.04	0%	≤75% of AQO	Negligible
+0% means a change of <0.5% as per explanatory note 2 of table 6.3 of the EPUK IAQM Guidance.					
*Located in the AQMA					

The impact description of the effects of changes in traffic as a result of the proposed development, with respect to annual mean PM_{10} exposure for existing receptors is determined to be 'negligible' based on the methodology outlined in section 3. Given the quantitative nature of the assessment and the verification of the air quality dispersion model, the level of accuracy of the assessment results is considered to be 'high'.

Particulate Matter ($PM_{2.5}$)

Table 6-11 presents a summary of the predicted change in annual mean $PM_{2.5}$ concentrations at relevant receptor locations, due to changes in traffic flow associated with the proposed development, based on modelled 'Do Minimum' and 'Do Something' scenarios.

Table 6-11. Predicted Annual Average Concentrations of $PM_{2.5}$ at Receptor Locations

Receptor		$PM_{2.5}$ (µg/m^3)			
		2019 Baseline	2023 Do Minimum	2023 Do Something	Development Contribution
R1	59 Shaw Lane	8.37	8.38	8.54	0.16
R2	1 Ivy Farm Close	8.90	8.88	9.04	0.16
R3	Carlton Primary School	7.90	7.90	7.91	0.02
R4	6 Far Lawns	10.31	10.27	10.38	0.11
R5	4 Lynwood Drive	8.20	8.19	8.20	0.02
R6	236 Fish Dam Lane	8.48	8.46	8.49	0.04
R7	224 Fish Dam Lane	8.58	8.56	8.60	0.04
R8	11 Baycliff Close	8.95	8.93	8.96	0.02
R9	436 Carlton Road	8.67	8.65	8.68	0.03
R10	Outwood Academy	8.11	8.10	8.12	0.02
R11	Springwell Learning Community	8.19	8.18	8.18	0.01
R12	Athersley South Primary School	7.80	7.77	7.78	0.01
R13	169 Wakefield Road	10.72	10.55	10.57	0.03
R14	1 Albury Close	9.62	9.59	9.61	0.02
R15	1 Lindhurst Road	9.14	9.11	9.13	0.02
R16	455 Rotherham Road	8.42	8.37	8.38	0.01
PR1	Proposed Receptor	-	-	8.06	-
PR2	Proposed Receptor	-	-	7.64	-
PR3	Proposed Receptor	-	-	7.51	-
PR4	Proposed Receptor	-	-	7.45	-
PR5	Proposed Receptor	-	-	7.44	-
PR6	Proposed Receptor	-	-	7.47	-

PR7	Proposed Receptor	-	-	7.50	-
PR8	Proposed Receptor	-	-	8.13	-
Annual Mean AQO		**25 µg/m³**			
*Located in the AQMA					

All modelled existing receptors are predicted to be below the AQO for $PM_{2.5}$ in both the 'Do Minimum' and 'Do Something' scenarios.

As indicated in **Table 6-11**, the maximum predicted increase in annual average exposure to $PM_{2.5}$ at any existing receptor, due to changes in traffic movements associated with the proposed development is 0.16 µg/m³ 59 Shaw Lane (R1) and 1 Ivy Farm Close (R2).

The maximum predicted annual average exposure to NO_2 at any proposed receptor at the ground floor is 8.13 µg/m³. All modelled proposed residential receptors are predicted to be below the annual average AQO for $PM_{2.5}$.

The impact description of changes in traffic flow associated with the proposed development with respect to annual mean $PM_{2.5}$ exposure has been assessed with reference to the criteria in Section 3. The outcomes of the assessment are summarised in **Table 6-12**.

Table 6-12. Impact Description of Effects at Key Receptors ($PM_{2.5}$)

Impact Description of $PM_{2.5}$ Effects at Key Receptors					
Receptor	**Change Due to Development (DS-DM) (µg/m³)**	**Change due to Development (% of AQO)**	**% Change in Concentration Relative to AQO**	**% Annual Mean Concentration in Assessment Year**	**Impact Description**
R1	0.16	0.65	1%	≤75% of AQO	Negligible
R2	0.16	0.65	1%	≤75% of AQO	Negligible
R3	0.02	0.07	0%	≤75% of AQO	Negligible
R4	0.11	0.44	0%	≤75% of AQO	Negligible
R5	0.02	0.07	0%	≤75% of AQO	Negligible
R6	0.04	0.15	0%	≤75% of AQO	Negligible
R7	0.04	0.16	0%	≤75% of AQO	Negligible
R8	0.02	0.10	0%	≤75% of AQO	Negligible
R9	0.03	0.10	0%	≤75% of AQO	Negligible
R10	0.02	0.07	0%	≤75% of AQO	Negligible
R11	0.01	0.03	0%	≤75% of AQO	Negligible
R12	0.01	0.02	0%	≤75% of AQO	Negligible
R13	0.03	0.11	0%	≤75% of AQO	Negligible
R14	0.02	0.09	0%	≤75% of AQO	Negligible
R15	0.02	0.08	0%	≤75% of AQO	Negligible
R16	0.01	0.04	0%	≤75% of AQO	Negligible
+0% means a change of <0.5% as per explanatory note 2 of table 6.3 of the EPUK IAQM Guidance.					
*Located in the AQMA					

The impact description of the effects of changes in traffic as a result of the proposed development, with respect to annual mean PM_{10} exposure for existing receptors is determined to be 'negligible' based on the methodology outlined in section 3. Given the quantitative nature of the assessment and the verification of the air quality dispersion model, the level of accuracy of the assessment results is considered to be 'high'.

6.5.4 Ecological Sensitive Receptor Locations

Background concentrations at each of the ecologically sensitive sites were determined through a review of the NO_X pollutants published on the APIS website.

The below assessment has been undertaken in accordance with A Guide to the Assessment of Air Quality Impacts in Designated Nature Conservation Sites (IAQM, 2020).

Nitrogen Oxide

Table 6-13 presents a summary of the predicted change in NO_X concentrations at relevant receptor locations, due to changes in traffic flow associated with the development, based on modelled 'Do Minimum' and 'Do Something' scenarios.

Table 6-13. Predicted Annual Average Concentrations of NO_X at Ecological Receptor Locations

Ecological Receptor		Predicted Maximum Annual Mean Concentration (µg/m³)				
		Do Minimum 2023 NO_X	Do Something 2023 NO_X	Process Contribution (PC)	PC as %age of AQO	Background
E1	Dearne Valley Wetlands (SSSI)	21.65	23.02	1.37	4.55	13.97
E2	Carlton Marsh (LNR)	20.78	21.98	1.21	4.02	13.97
Annual Mean AQO/Critical Level (CL)		**30 µg/m³**				

As indicated in **Table 6-13**, the maximum predicted increase in the annual average exposure to NO_X at any ecological receptor, due to changes in traffic movements associated with the development, is 1.37 µg/m³ at Dearne Valley Wetlands (SSSI) (E1).

Section 5.5.4.1 of *A Guide to the Assessment of Air Quality Impacts in Designated Nature Conservation Sites*', IAQM 2020 states:

Where the assessment indicates that changes in annual mean NO_x concentrations within a designated site cannot be dismissed as imperceptible (i.e. an increase of over 0.4 µg/m³) and the NO_x critical level is exceeded, then changes in nutrient nitrogen deposition should be calculated as supporting information to further assist in the evaluation of significance.

The maximum predicted increase in the annual average exposure to NO_X at the identified ecological receptor, due to changes in traffic movements associated with the development, is 1.37 µg/m³ at Dearne Valley Wetlands (SSSI) (E1) which is above the 0.40 µg/m³ development contribution stated within the guidance of '*A Guide to the Assessment of Air Quality Impacts in Designated Nature Conservation Sites*', IAQM 2020.

As the NO_x contribution at E1 (Dearne Valley Wetlands, SSSI) and E2 (Carlton Marsh, LNR) is above 0.40 µg/m³, a full nitrogen deposition assessment has been undertaken below.

6.5.5 Nitrogen Deposition

The dry deposition calculation has used the spreadsheet provided by the Air Quality Modelling and Assessment Unit (AQMAU). These calculations take the predicted maximum annual concentration (µg/m³) and use an assumed deposition velocity to estimate deposition concentration in kgN/ha/year or keq/ha/year. The available deposition velocity is 0.14 for grasslands or similar habitats, in accordance with in LA 105 (published November

2019). The calculated total nitrogen depositions at the ecological receptors are presented in **Table 6-14**. The calculated nitrogen deposition was compared to the available critical load of nitrogen deposition.

Table 6-14. The Predicted Total PC Nitrogen Deposition

Ecological Receptor	Long-Term PC of NO_x ($\mu g/m^3$)	Dry PC Nitrogen Deposition (kgN/ha/year)	Background	Total PC Nitrogen Deposition (kgN/ha/year)	Critical load (CL) (kgN/ha/year)	PC as %age of CL
E1	1.37	0.39	13.97	4.11	5 - 15	27.4– 82.2
E2	1.21	0.35	13.97	3.63	5 - 15	24.2 - 72.6

Critical Load Function Tool

Calculating exceedance of an acidity critical load function, or the impact description of a contribution from a source is complex. Critical Load Function Tool has been used to calculate the exceedance (http://www.apis.ac.uk/critical-load-function-tool). It enables the comparison of acid deposition to the critical load function to help make a decision on the impact description of a process contribution.

Dearne Valley Wetlands (SSSI) (E1)

The results of exceedance and deposition as a proportion of the critical level (CL) function for E1, are presented both in **Figure 6-3** and in **Table 6-15**. The following data has been used in the calculations.

Background deposition: 2.71 (N: 2.62 | S: 0.28) (keq/ha/yr).

CLmaxS: 1.128 **CLminN**: 0.142 **CLmaxN**: 1.27 (keq/ha/yr)

Nitrogen PC deposition: = 4.11 / 14 = 0.29 kqN/ha/yr

Figure 6-3 Critical Load Function for Ecological receptor E1

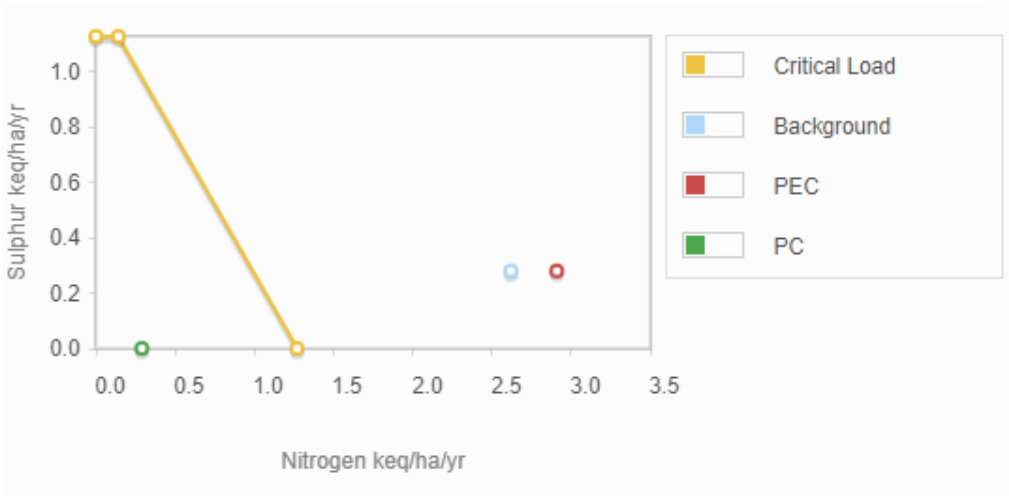


Table 6-15. Exceedance and deposition as a proportion of the CL Function at E1

Source	Exceedance (keq/ha/year)	% of CL function
Process Contribution (PC)	No exceedance of CL function	22.8
Background	1.63	228.3
Predicted Environmental Concentration (PEC)	1.92	251.2

The maximum predicted total acid deposition PC at receptor E1 is 0.29 keqN/ha/yr, which is “no exceedance of CL function” and 22.8 % of CL function. It can be concluded that the impact of nitrogen depositions from the road at E1 are negligible.

Carlton Marsh (LNR) (E2)

The results of exceedance and deposition as a proportion of the critical level (CL) function for E2, are presented both in Figure 2 and in **Table 6-15**. The following data has been used in the calculations.

Background deposition: 2.71 (N: 2.62 | S: 0.28) (keq/ha/yr).

CLmaxS: 1.128 **CLminN**: 0.142 **CLmaxN**: 1.27 (keq/ha/yr)

Nitrogen PC deposition: = 3.63 / 14 = 0.26 kqN/ha/yr

Figure 6-4 Critical Load Function for Ecological receptor E2

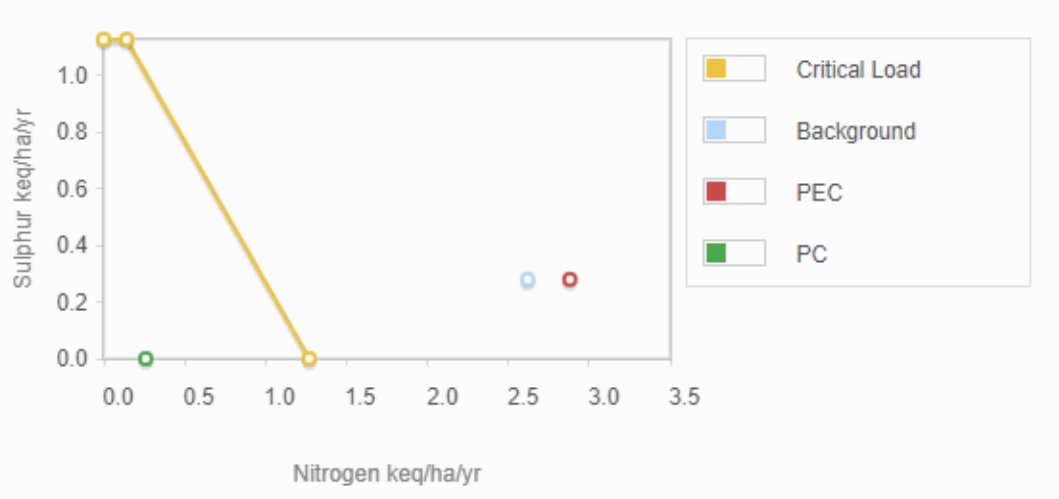


Table 6-16. Exceedance and deposition as a proportion of the CL Function at E2

Source	Exceedance (keq/ha/year)	% of CL function
Process Contribution (PC)	No exceedance of CL function	20.5
Background	1.63	228.3
Predicted Environmental Concentration (PEC)	1.89	248.8

The maximum predicted total acid deposition PC at receptor E42 is **0.**06 keqN/ha/yr, which is “no exceedance of CL function” and 20.5 % of CL function. It can be concluded that the impact of nitrogen depositions from the road at E2 are negligible.

7.0 MITIGATION

7.1 CONSTRUCTION PHASE

The dust risk categories have been determined in Section 5 for each of the four construction activities. The assessment has determined that the potential impact description of dust emissions associated with the construction phase of the proposed development is 'medium risk' at the worst affected receptors.

Using the methodology described in Appendix A, appropriate site-specific mitigation measures associated with the determined level of risk can be found in Section 8.2 of the 'IAQM Guidance on the Assessment of Dust from Demolition and Construction'.

The mitigation measures have been divided into general measures applicable to all sites and measures applicable specifically to demolition, earthworks, construction and trackout. They are categorised into 'highly recommended' and 'desirable' measures.

The mitigation measures for the proposed development are detailed in **Table 7-1** and **Table 7-2**.

Table 7-1. IAQM Guidance on the Assessment of Dust from Demolition and Construction 'Highly Recommended' Mitigation Measures

Communications
Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
Display the head or regional office contact information.
Dust Management
Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust deposition, dust flux, real time PM_{10} continuous monitoring and/or visual inspections.
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 emissions, either on- or offsite, and the action taken to resolve the situation in the log book.
Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log 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 and during prolonged dry or windy conditions.
Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period.
Avoid site runoff of water or mud.
Keep site fencing, barriers and scaffolding clean using wet methods.
Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
Cover, seed or fence stockpiles to prevent wind whipping.
Ensure all vehicles switch off engines when stationary - no idling vehicles.
Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable.
Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.

Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
Use enclosed chutes and conveyors and covered skips.
Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Avoid bonfires and burning of waste materials.
Earthworks
No Action Required.
Construction
Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
Trackout
Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
Avoid dry sweeping of large areas.
Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
Record all inspections of haul routes and any subsequent action in a site log book.
Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
Access gates to be located at least 10m from receptors where possible.

Table 7-2. IAQM Guidance on the Assessment of Dust from Demolition and Construction 'Desirable' Mitigation Measures

Communications
No Action Required.
Dust Management
Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.
Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on un-surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).
Earthworks
Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
Only remove the cover in small areas during work and not all at once.
Construction
Avoid scabbling (roughening of concrete surfaces) if possible.
Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.
Trackout
No Action Required.

Following the implementation of the mitigation measures detailed in the tables above, the impact description of the construction phase is not considered to be significant.

8.0 CONCLUSIONS

This report presents the findings of an air quality assessment undertaken to assess road traffic emissions in support of an outline planning application for the construction of up to 215 dwellings at Shaw Lane, Carlton, Barnsley, S71 3HJ.

Construction Phase

Prior to the implementation of appropriate mitigation measures, the potential impact description of dust emissions associated with the construction phase of the proposed development is 'medium risk' at the worst affected receptors without mitigation. However, appropriate site-specific mitigation measures have been proposed based on Section 8.2 of the IAQM Guidance on the Assessment of Dust from Demolition, Earthworks, Construction and Trackout. It is anticipated that with these appropriate mitigation measures in place, the risk of adverse effects due to dust emissions from the construction phase will not be significant.

Operational Assessment

The 2023 assessment of the effect of emissions from traffic associated with the scheme, has determined that the maximum predicted increase in the annual average exposure to NO_2 at any existing receptor is likely to be 1.13 µg/m^3 at 1 Ivy Farm Close (R2).

The maximum predicted annual average exposure to NO_2 at any proposed receptor at the ground floor is 14.69 µg/m^3. All modelled proposed residential receptors are predicted to be below the annual average AQO for NO_2.

The predicted long-term NO_2 concentrations at all proposed receptors are well below 60 µg/m^3 in all scenarios. Therefore, it is unlikely there will be any exceedances for the short-term NO_2 AQO at all proposed receptors as outlined in LAQM TG16 technical guidance.

For PM_{10}, the maximum predicted increase in the annual average exposure is likely to be 0.29 µg/m^3 at 59 Shaw Lane (R1) and 1 Ivy Farm Close (R2). For $PM_{2.5}$, the maximum predicted increase in the annual average exposure is likely to 0.16 µg/m^3 59 Shaw Lane (R1) and 1 Ivy Farm Close (R2).

The impact description of the effects of changes in traffic flow as a result of the proposed development, with respect to NO_2, PM_{10} and $PM_{2.5}$ exposure, is determined to be 'negligible' at all existing receptors.

There are not predicted to be exceedances of the NO_2, PM_{10} or $PM_{2.5}$ pollutant concentrations at any proposed sensitive receptors and therefore, mitigation is not required at the proposed development.

Operational Assessment – Ecology

The maximum predicted increase in the annual average exposure to NO_X at the identified ecological receptor, due to changes in traffic movements associated with the development, is 1.37 µg/m^3 at Dearne Valley Wetlands (SSSI) (E1). This is above the 0.40 µg/m^3 development contribution stated within the guidance of '*A Guide to the Assessment of Air Quality Impacts in Designated Nature Conservation Sites*', IAQM 2020.

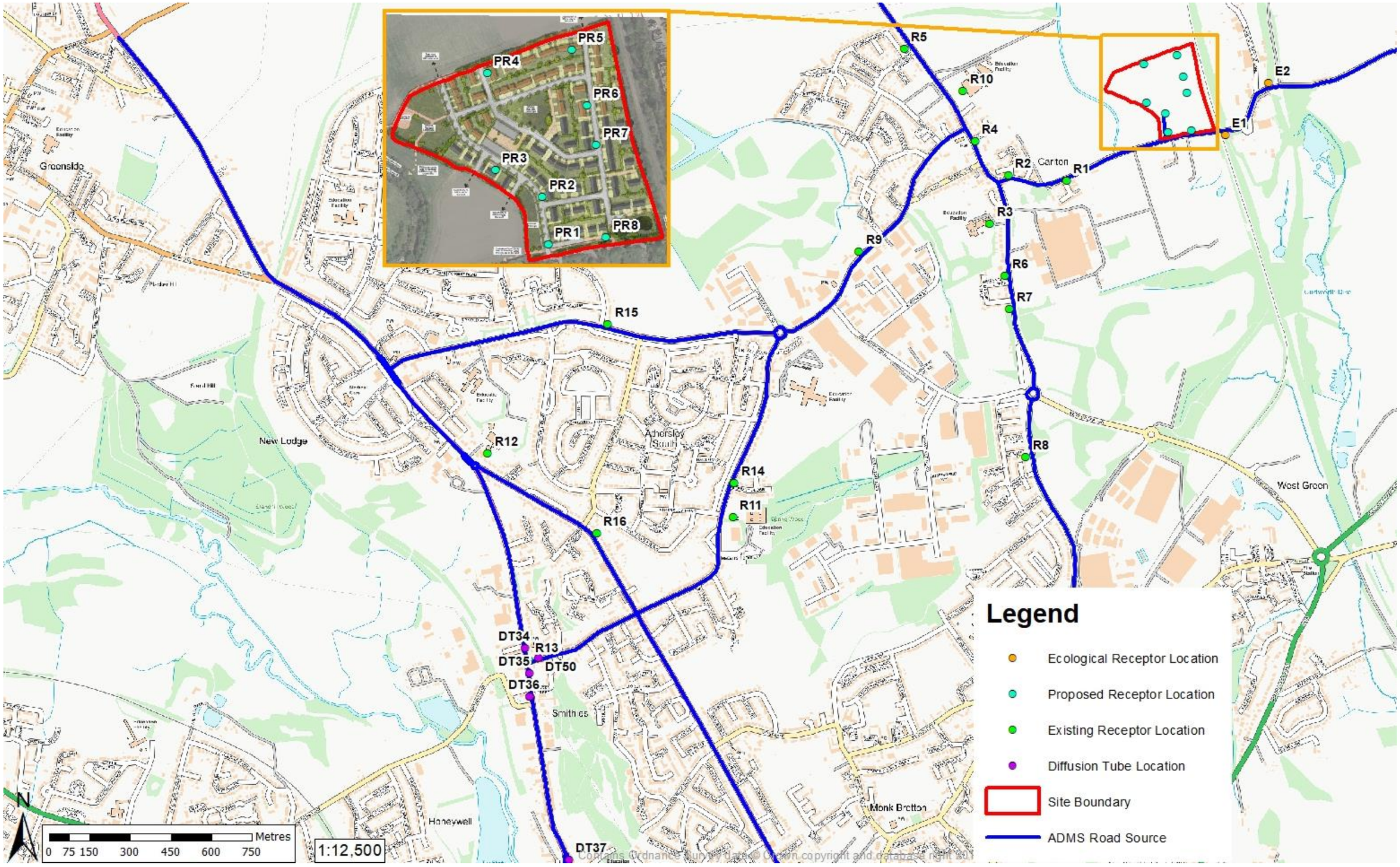
A full nitrogen deposition assessment was undertaken for ecological receptor E1 and E2 due to a development NO_x contribution of 0.40 µg/m^3. There were no predicted significant impacts on nitrogen deposition at E1 and E2 as a result of the proposed development.

Given the quantitative nature of the assessment and the verification of the air quality dispersion model, the level of accuracy of the assessment results is considered to be ‘high’.

In conclusion, the development is not considered to be contrary to any of the national and local planning policies regarding air quality.

APPENDIX A - FIGURES

Figure A-1 Air Quality Assessment Area



APPENDIX B - CONSTRUCTION PHASE ASSESSMENT METHODOLOGY

The following information sets out the adopted approach to the construction phase impact assessment in accordance with the aforementioned IAQM guidance[1].

Step 1 – Screen the Requirement for a more Detailed Assessment

An assessment is required if there are sensitive receptors within 350m of the site boundary, within 50m of the route(s) used by construction vehicles on the surrounding road network, or within 500m from the site entrance. A detailed assessment is also required if there is an ecological receptor within 50m of the site boundary.

Step 2A – Define the Potential Dust Emission Magnitude

Demolition

The dust emission magnitude for the demolition phase has been determined based on the below criteria:

- *Large*: Total building volume >50 000m^3, potentially dusty construction (e.g. concrete), on-site crushing and screening, demolition activities >20m above ground level;
- *Medium*: Total building volume 20 000m^3 – 50 000m^3, potentially dusty construction material, demolition activities 10-20m above ground level; and,
- *Small*: Total building volume <20 000m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10m above ground, demolition during wetter months.

Earthworks

The dust emission magnitude for the planned earthworks has been determined based on the below criteria:

- *Large:* Total site area >10 000m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), > 10 heavy earth moving vehicles active at any one time, formation of bunds >8m in height, total material moved >100 000 tonnes;
- *Medium*: Total site area 2 500m^2 – 10 000m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4m-8m in height, total material moved 20 000 tonnes – 100 000 tonnes; and
- *Small:* Total site area <2 500 m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <10 000 tonnes, earthworks during wetter months.

Construction

The dust emission magnitude for the construction phase has been determined based on the below criteria:

- *Large:* Total building volume >100 000m^3, on site concrete batching; sandblasting
- *Medium:* Total building volume 25 000m^3 – 100 000m^3, potentially dusty construction material (e.g. concrete), on site concrete batching; and,
- *Small:* Total building volume <25 000m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

Trackout

The dust emission magnitude for trackout has been determined based on the below criteria:

- *Large:* >50 HGV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m;
- *Medium:* 10-50 HGV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50m – 100m; and,
- *Small:* <10 HGV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50m.

Step 2B - Defining the Sensitivity of the Area

Sensitivities of People to Dust Soiling Effects

- *High:*
  - Users can reasonably expect an enjoyment of a high level of amenity;
  - The appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably expect to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land; and,
  - Indicative examples include dwellings, museums and other culturally important collections, medium- and long-term car parks

[1] Institute of Air Quality Management 2014. *Guidance on the Assessment of dust from demolition and construction.*

and car showrooms.

- *Medium:*
  - Users can reasonably expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home;
  - The appearance, aesthetics or value of their property could be diminished by soiling;
  - 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; and,
  - Indicative examples include parks and places of work.
- *Low:*
  - The enjoyment of amenity would not reasonably be expected;
  - Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling;
  - 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; and,
  - Indicative examples include playing fields, farmland (unless commercially sensitive horticultural), footpaths, short term car parks and roads.

The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout, using the following table:

Table B-1. Sensitivity of the Area to Dust Soiling Effects on People and Property

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

Note - The likely routes the construction traffic will use should also be included to enable the presence of trackout receptors to be included in the assessment. As a general guidance, without site-specific mitigation, trackout may occur along the public highway up to 500 m from large sites (as defined in step 2A), 200 m from medium sites and 50 m from small sites, as measured from the site exit.

Sensitivities of People to the Health Effects of PM_{10}

- *High:*
  - 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.
- *Medium:*
  - Locations where the people exposed are workers, and exposure is 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); and,
  - 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.
- *Low:*
  - Locations where human exposure is transient; and,
  - Indicative examples include public footpaths, playing fields, parks and shopping streets.

The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout, using the following table:

Table B-2. Sensitivity of the 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	>32 µg/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28 - 32 µg/m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24 – 28 µg/m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	-	>10	High	Medium	Low	Low	Low
	-	1-10	Medium	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Note - The likely routes the construction traffic will use should also be included to enable the presence of trackout receptors to be included in the assessment. As a general guidance, without site-specific mitigation, trackout may occur along the public highway up to 500 m from large sites (as defined in step 2A), 200 m from medium sites and 50 m from small sites, as measured from the site exit.

Sensitivities of Receptors to Ecological Effects

- *High:*
  - Locations with an international or national designation and the designated features may be affected by dust soiling;
  - 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; and,
  - 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:*
  - Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown;
  - Locations with a national designation where the features may be affected by dust deposition; and,
  - Indicative example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.
- *Low:*
  - Locations with a local designation where the features may be affected by dust deposition; and,
  - Indicative example is a local Nature Reserve with dust sensitive features.

The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout, using the following table:

Table B-3. Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Note - The likely routes the construction traffic will use should also be included to enable the presence of trackout receptors to be included in the assessment. As a general guidance, without site-specific mitigation, trackout may occur along the public highway up to 500 m from large sites (as defined in step 2A), 200 m from medium sites and 50 m from small sites, as measured from the site exit.

Step 2C - Defining the Risk of Impacts

The risk of impacts with no mitigation is determined by combining the dust emission magnitude determined in Step 2A and the sensitivity of the area determined in Step 2B.

The following tables provide a method of assigning the level of risk for each activity.

Demolition

Table B-4. 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

Earthworks

Table B-5. 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

Construction

Table B-6. 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

Trackout

Table B-7. 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

Step 3 – Site Specific Mitigation

The dust risk categories for each of the four activities determined in Step 2C should be used to define the appropriate, site-specific mitigation measures to be adopted.

These mitigation measures are contained within section 8.2 of the IAQM Guidance on the Assessment of Dust from Demolition and Construction.

APPENDIX C - REPORT TERMS & CONDITIONS

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