



Air Quality Assessment

Land at Doncaster Road, Darfield, Barnsley

Saul Construction Limited and Keepmoat Homes

MAN.916.001.AQ.001.R.001



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Non-Technical Summary

- i. This report provides a consideration of potential development led impacts and pollutant exposure relating to a proposed residential development off Doncaster Road, Darfield, Barnsley.
- ii. The proposals include a planning application for 480 dwellings, including associated car parking, landscaping, and access.
- iii. The development has potential to cause impacts at nearby sensitive locations during the construction and operational phases. Impacts could arise due to fugitive dust emissions generated by construction phase activities and road traffic emissions generated during the operational phase. Emission sources also have potential to expose future site occupiers to poor air quality.
- iv. Construction phase impacts were assessed in accordance industry standard guidance to determine risk and identify necessary dust control measures. The implementation of good practice dust control measures during construction would ensure that residual impacts relating to fugitive dust emissions were not significant.
- v. On-site pollutant exposure impacts were assessed using dispersion modelling with results compared against national air quality standards to determine site suitability. The modelling results indicated that pollutant concentrations across the application site were compliant with the national air quality objectives at all modelled sensitive locations. Further mitigation to protect future occupiers is not required.
- vi. Operational road traffic impacts were modelled with and without the development in place in accordance with national and local authority technical air quality guidance. Results were assessed against industry standard significance criteria and determined that operational phase emission impacts were not significant at all sensitive locations in the vicinity of the site.
- vii. Notwithstanding this a best practice mitigation strategy, including a damage cost calculation, was prepared in accordance with the requirements of local authority air quality guidance. The implementation of such measures would ensure that the development is future proofed.
- viii. In summary and considering all the above, it is predicted with confidence that all pollutant concentrations at the proposed development site would be acceptable and associated impacts are deemed not significant.

1.0 Introduction

1.1 Background

- 1.1.1 Enzygo Limited (Ltd) was commissioned by Saul Construction Limited and Keepmoat Homesto produce an Air Quality Assessment in support of a planning application for a residential development off Doncaster Road, Darfield, Barnsley. Referred to as the 'Proposed Development'.
- 1.1.2 Enzygo understands that the Proposed Development seeks planning approval to provide 480 residential dwellings with associated car parking, landscaping, and access off the A365 and Barnsley Road.
- 1.1.3 Pollutant emissions associated with construction activities and traffic generated during operation have potential to cause impacts at sensitive locations within the vicinity of the site. Existing pollutant emissions in the area may also introduce future residential occupiers to an area of poor air quality.
- 1.1.4 The application site is located in Barnsley Metropolitan Borough Council's (BMBC) area of administration and an Air Quality Assessment is required in accordance with the 'Air Quality and Emission Good Practice Planning Guidance'¹. The assessment considers fugitive dust emissions generated by construction processes and road traffic emissions generated during the operation phase. It also determines site suitability with relation to pollutant concentrations from local emission sources and outlines best practice mitigation measures and mechanisms to offset development led impacts..
- 1.1.5 The assessment methodology, assessment inputs, results and conclusions are detailed within this report.

1.2 Site Location and Context

- 1.2.1 The application site is located at land off Doncaster Road, Darfield at the approximate National Grid Reference (NGR): 440255, 405130.
- 1.2.2 The site is set within a well-established residential area to the western extents of Darfield, Barnsley. The site is bounded to the north by the A635 (Doncaster Road) and Barnsley Road and to the east by existing residential use along Genoa Close and Belvedere Road. To the south and west of the application site are open fields.
- 1.2.3 The closest residential receptors are those situated directly adjacent to site access along Genoa Close and Belvedere Road, and a group of properties off Doncaster Road to the west of the site.
- 1.2.4 A desk top review did not identify any Air Quality Management Area (AQMA) across the study area, with the closest designated area approximately 5 km west of the site, at a section of the A61 (Sheffield Road). A review of ecological designations identified the Dearne Valley Wetlands Site of Scientific Importance (SSSI) within the study area.
- 1.2.5 Figure 1 shows a map of the site boundary.

¹ Air Quality and Emissions Good Practice Planning Guidance, BMBC, November 2021

2.0 Legislation, Guidance and Policy

The following legislation, guidance and policy will be considered during the preparation of the Air Quality Assessment:

- European Union (EU) Directive 2008/50/EC;
- The National Planning Policy Framework (NPPF), updated on 20th December 2023;
- The National Planning Practice Guidance (NPPG), relevant chapters produced on 1st November 2019;
- Section 82 of the Environment Act (1995) (Part IV);
- The Air Quality Strategy for England, DEFRA, August 2023²;
- The Air Quality Standards (Amendment) Regulations (2016), December 2016;
- Local Air Quality Management Technical Guidance 2022³, August 2022;
- Guidance on the Assessment of Dust from Demolition and Construction, Institute of Air Quality Management (IAQM), January 2024⁴;
- Land-Use Planning and Development Control: Planning for Air Quality Guidance, Environmental Protection UK and IAQM⁵, January 2017;
- Air Quality and Emissions Good Practice Planning Guidance, BMBC, November 2021¹; and
- Barnsley Local Plan, BMBC, January 2019.

2.1 UK Legislation and National Strategy

2.1.1 Government policy requires the Secretary of State to publish a national Air Quality Strategy (AQS). The national AQS produced by DEFRA sets out the framework to reducing adverse impacts of air pollution upon human health, vegetation, and ecosystems. To achieve this the AQS defines air quality objectives (AQOs) for 10 key pollutant species, including nitrogen dioxide (NO₂), fine Particulate Matter (PM₁₀ and PM_{2.5}) which are relevant to this assessment.

2.1.2 In accordance with the Environment Act (1995), Local Authorities (LAs) have an obligation to periodically review and assess air quality within their administration to determine if specified pollutants are exceeding relevant objectives. This review involves the assessment of present and likely future air quality and is termed Local Air Quality Management (LAQM).

2.1.3 Should the LAQM process identify areas which are predicted to or currently exceed relevant AQOs the LA is required to designate an Air Quality Management Area (AQMA). The AQMA is then accompanied by an Air Quality Action Plan (AQAP) which sets various measures and polices to improve air quality with the goal of restoring compliance with the AQOs. The process of LAQM is informed by DEFRA's Technical Guidance LAQM.TG22³.

2.1.4 European Directive 2008/50/EC also sets out a similar approach to the AQS and defines limit values for the protection of human health and ecosystems. The Environmental Permitting

² The Air Quality Strategy for England, DEFRA, 2023

³ Local Air Quality Management Technical Guidance 2022 LAQM.TG22, DEFRA, August 2022.

⁴ Guidance on the Assessment of Dust from Demolition and Construction v2.2, Institute of Air Quality Management, January 2024.

⁵ Land-Use Planning and Development Control: Planning for Air Quality, EPUK and IAQM, January 2017.

(England and Wales) (Amendment) (EU Exit) Regulations 2019 ensures that the Environmental Permitting (EP) regime can continue following the UK's exit from the European Union (EU).

2.1.5 The regulations state also that exceedances of the objectives should be assessed in relation to air quality at locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present”.

2.1.6 AQOs applicable to this assessment are summarised in Table 1 with relation to human health receptors. It should be noted that site suitability will be determined using these objectives.

Table 1: National Air Quality Objectives

Pollutant	Air Quality Objectives	
	Concentration ($\mu\text{g}/\text{m}^3$)	Averaging Periods
NO ₂	40	Annual mean
	200	1-hour mean; not to be exceeded more than 18 times a year
PM ₁₀	40	Annual mean
	50	24-hour mean; not to be exceeded more than 35 times a year
PM _{2.5}	25	Annual mean

2.1.7 LAQM.TG22³ specifies locations where the AQOs should be applied as detailed in Table 2.

Table 2: Where Air Quality Objectives Apply

Averaging Period	Objectives Should Apply At	Objectives Should Not Apply At
Annual mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building facades of offices and places of work where members of the public do not have regular access Hotels, unless people live there as their permanent residence Gardens of residential properties Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
24-hour mean	As above together with hotels, and gardens of residential properties	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
1-hour mean	As above, and kerbside sites (for example, pavements of busy shopping streets) Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer	Kerbside sites where the public would not be expected to have regular access

2.1.8 Based on the proposed C3 land use the Proposed Development would be sensitive to all objectives detailed in Table 2.

2.2 Local Planning Policy

Barnsley Local Plan

2.2.1 The Barnsley Local Plan⁶ was adopted in 2019 and sets out the council's vision and strategy across the borough up to the year 2033. Policies contained within this document provide the current basis for planning determination of within BMBC's area of administration.

2.2.2 Policies relevant to the assessment are detailed below:

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."

Policy GD1 General Development

"Proposals for development will be approved if:

There will be no significant adverse effect on the living conditions and residential amenity of existing and future residents;

[...]

Any adverse impact on the environment, natural resources, waste and pollution is minimised and mitigated;"

Policy Poll1 Pollution Control and Protection

"Development will be expected to demonstrate that it is not likely to result, directly or indirectly, in an increase in air, surface water and groundwater, noise, smell, dust, vibration, light or other pollution which would unacceptably affect or cause a nuisance to the natural and built environment or to people.

We will not allow development of new housing or other environmentally sensitive development where existing air pollution, noise, smell, dust, vibration, light or other pollution levels are unacceptable and there is no reasonable prospect that these can be mitigated against.

⁶ Barnsley Local Plan, BMBC, January 2019

Developers will be expected to minimise the effects of any possible pollution and provide mitigation measures where appropriate.”

- 2.2.3 These policies were considered throughout the undertaking of this Air Quality Assessment, by assessing on-site exposure, construction phase, and operational impacts generated by the Proposed Development. It is understood that relevant policies set out in the Core Strategy are superseded by the 2019 Local Plan.

3.0 Methodology

3.1 Introduction

3.1.1 Emissions generated by the Proposed Development during construction and operation have potential to cause impacts at existing sensitive locations. Additionally, NO₂ and fine PM emissions associated with the local road network have potential to introduce future site occupiers to an area of existing poor air quality. These impacts were assessed in accordance with the following methodology. The methodology consists of three key steps:

- Construction Phase Dust Risk Assessment
- Onsite Pollutant Exposure Assessment;
- Offsite Operational Phase Impact Assessment; and
- Damage Cost and Emissions Mitigation Assessment.

3.1.2 BMBC was approached to discuss the proposed assessment methodology, no response was received.

3.2 Baseline Review

3.2.1 Baseline conditions within the assessment extents were determined by a review of the latest air quality monitoring data provided by BMBC and predicted background pollutant concentrations produced by DEFRA⁷. Local emission sources were identified along with AQMAs to identify potential emission sources in the study area.

3.3 Construction Phase Impacts

3.3.1 There is potential for fugitive dust impacts to occur at sensitive locations as a result of demolition, earthworks, construction and trackout activities during the construction phase of the Proposed Development. A qualitative assessment was undertaken in accordance with the methodology outlined within the IAQM document⁴.

3.3.2 The assessment has identified specific control measures to be implemented on site which aim to reduce residual fugitive dust impacts. Appendix C details the IAQM methodology.

3.4 Operational Phase Site Exposure

3.4.1 The suitability of the site with regards to future pollutant exposure was determined by modelling NO₂ and PM concentrations across the site and comparing results against appropriate AQOs detailed in Table 1. Any unmitigated exceedance of the AQOs at proposed sensitive receptor locations is determined a significant impact.

3.4.2 Dispersion modelling using the ADMS-Roads model (version 5.0), developed by Cambridge Environmental Research Consultants (CERC), was carried out to predicted future year concentrations during the anticipated completion year of 2026. The model requires various inputs including traffic flow data, emission factor inventories, and meteorological data which are detailed further in Appendix A. Table 3 provides a summary of which AQOs apply.

Table 3: Relevant Air Quality Objectives

Land Use	Applicable AQO
Residential (Class C3)	Annual mean

⁷ <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018>

Land Use	Applicable AQO
	1-hour mean
	24-hour mean

3.5 Operational Phase Impacts

EPUK and IAQM Guidance

3.5.1 The operational phase will generate additional traffic on the local road network which may cause increases in pollutant concentrations at sensitive receptors close to the Proposed Development. These will be assessed on a quantitative basis, as required by the BMBC guidance¹, by calculating NO₂ and PM concentrations at sensitive locations with and without the development in place using ADMS-Road model.

3.5.2 Potential road vehicle exhaust impacts with vehicles travelling to and from the site were initially screened against the criteria contained within the EPUK and IAQM guidance⁵ to determine the likely significance of impacts and if further detailed assessment work is necessary.

3.5.3 The EPUK and IAQM guidance document states the following with regards to construction and operation phase impacts:

- Proposals that will cause a change in Heavy Duty Vehicle (HDV) flows of more than 100 AADT; and
- Proposals that will cause a change in Light Duty Vehicle (LDV) flows of more than 500 AADT.

3.5.4 Based on the information provided the appointed transport consultant, anticipated LDV trips generated during the operational phase are expected to exceed the EPUK and IAQM criteria detailed above. Construction phase road traffic impacts were screened as not significant.

3.5.5 Pollutant concentrations were therefore predicted at sensitive discrete receptors along the roads likely to be used by development traffic. Impacts were then determined in accordance with the EPUK and IAQM significance criteria. This was undertaken in accordance with the following assessment scenarios:

- Opening year do-minimum (DM) - Predicted traffic flows for 2026 should the Proposed Development not be completed, plus local committed developments; and
- Opening year do-something (DS) - Predicted traffic flows for 2026 in combination with additional traffic flows generated by the Proposed Development.

3.5.6 Growth factors provided by TEMPRO v8.0 were applied to 2019 baseline traffic to take account of forecasted growth as a result of recently committed development in 2026.

Impact Significance Criteria

3.5.7 Receptors potentially sensitive to changes in pollutant concentrations will be identified within the assessment extents and defined using the guidance provide in LAQM.TG22². The significance of impact at each receptor will be defined in accordance with EPUK and IAQM guidance⁴ criteria shown in Table 4.

Table 4: EPUK and IAQM Assessment Impact Criteria

Long Term Average Concentration	% Change in Concentration Relative to AQO			
	1	2-5	6-10	>10
75% or less of AQO	Negligible	Negligible	Slight	Moderate

Long Term Average Concentration	% Change in Concentration Relative to AQO			
	1	2-5	6-10	>10
76 - 94% of AQO	Negligible	Slight	Moderate	Moderate
95 - 102% of AQO	Slight	Moderate	Moderate	Substantial
103 - 109% of AQO	Moderate	Moderate	Substantial	Substantial

3.5.8 The criteria shown in Table 4 is extracted from the EPUK and IAQM guidance⁵ with sensitivity descriptors included to allow comparisons of various air quality impacts. It should be noted that changes of 0%, i.e. less than 0.5%, will be described as negligible in accordance with the EPUK and IAQM guidance⁴.

3.5.9 Following the prediction of impacts at discrete receptor locations utilising the criteria in Table 3 the guidance states that this framework is to be used as a starting point to make a judgement on significance of effect. The guidance suggests that any judgement on the overall significance of effect of a development will need to take into account such factors as:

- the existing and future air quality in the absence of the development
- the extent of current and future population exposure to the impacts; and
- the influence and validity of any assumptions adopted when undertaking the prediction of impacts.

3.5.10 Full details of data used for the modelling assessment and results are presented in Appendix A and Appendix B, respectively.

3.6 BMBC Air Quality and Emission Planning Guidance

3.6.1 The BMBC guidance¹ outlines an assessment approach with the overall aim of sustaining and further promoting healthy and sustainable communities and encouraging emissions reductions associated with proposed developments.

3.6.2 The approach provides criteria for when a detailed impact or exposure assessment is necessary and compares the scale and location of the Proposed Development against specific screening criteria. The assessment process follows three key stages:

1. Development Type Classification;
2. Air Quality Impact Assessment; and
3. Mitigation and Compensation.

3.6.3 As detailed in Table 5 the Stage 1 assessment determined the scale of the Proposed Development as major. The Proposed Development also meets the exposure criteria detailed in Stage 2. In accordance with Section 5.2.3 of the BMBC guidance the air quality assessment therefore requires:

- A. The identification of the level of exposure through the change in pollutant concentrations including cumulative impacts arising from the proposal, during both demolition/construction operations and operational phases. Mitigation measures should be identified and modelled where practicable.
- B. The calculation of pollutant emissions costs from the development.

3.6.4 Table 5 provides a summary of the assessment process and relevant assessment criteria. Full details of the guidance are provided in Appendix D.

Table 5: Air Quality and Emissions Mitigation Assessment Process

Screening Checklist	Criteria
Stage 1 - Development Type Classification	<ul style="list-style-type: none"> The Proposed Development meets two criteria detailed in Table 3 of the guidance. These are: <ul style="list-style-type: none"> <i>Dwelling Houses (C3) > 50 units; and</i> <i>Any developments generating 100 or more two-way vehicle movements per day</i>”. The Proposed Development also meets the additional trigger criteria detailed in Table 4 of the guidance for major developments. These are: <ul style="list-style-type: none"> <i>Proposals that could increase the existing traffic flow on roads > 10,000 AADT by 5% or more.</i>
Stage 2 – Air Quality Impact Assessment	<ul style="list-style-type: none"> The Proposed Development proposes C3 land use, and is also located: <ul style="list-style-type: none"> <i>Within 20m of roads with >10,000 24-AADT.</i>
Stage 3 – Mitigation and Compensation	<ul style="list-style-type: none"> The pollution damage costs attributed to the Proposed Development will determine the level of mitigation compensation required to offset the impact of the development. Details of the recommended mitigation is detailed in Section 6.0.

3.6.5 The calculation of pollutant emissions costs associated with the Proposed Development provides a basis for defining the financial commitment required to offset development impacts and to reduce the potential effect on health and/or the local environment. The BMBC guidance¹ outlines a simple approach which corresponds with the DEFRA methodology⁸ as detailed below:

- Identify the additional trip rates (as trips/annum) generated by the proposed development (this information will normally be provided in the Transport Assessment);
- Assume an average distance travelled of 10km/trip;
- Calculate the additional emissions of Oxides of Nitrogen (NO_x) and particulate matter with an aerodynamic diameter of less than 10µm (PM_{2.5}) (kg/annum), based on emissions factors in the Emissions Factor Toolkit⁹, and an assumption of an average speed of 50 km/h;
- Calculate emissions using the Emissions Factor Toolkit over a 5-year time frame;
- Use the latest 2022 DEFRA Damage Cost approach to provide a valuation of the excess emissions, using the currently applicable values for each pollutant; and
- Sum the NO_x and PM_{2.5} costs.

3.6.6 The results of the assessment process are detailed in Section 5.0. Appendix A details the methodology, including relevant assessment stages and screening criteria.

⁸ <https://www.gov.uk/government/publications/assess-the-impact-of-air-quality/air-quality-appraisal-damage-cost-guidance>

⁹ <https://laqm.defra.gov.uk/air-quality/air-quality-assessment/emissions-factors-toolkit/>

4.0 Baseline Conditions

4.1 Introduction

4.1.1 Available air quality data and the surrounding context was reviewed to provide a baseline for assessment. The following sources were used in the assessment of baseline conditions:

- DEFRA's LAQM Background Mapping Data and AQMA Database¹⁰; and
- BMBC 2023 Air Quality Annual Status Report (ASR)¹¹.

4.1.2 A request was made to BMBC's Environmental Protection team to obtain the most recent local authority monitoring data, however no response was received. As such, the baseline review was informed by the 2023 ASR which is the most recent publicly available report.

4.2 Air Quality Management Areas

4.2.1 As required by the Environment Act (1995), BMBC have undertaken Review and Assessment of air quality within their area of administration. This process has indicated that annual mean concentrations of NO₂ are currently above the annual mean AQO for NO₂ concentrations at five locations across the borough. The closest AQMA to the Proposed Development is described as:

"Barnsley AQMA No.7 - Incorporating the southbound carriageway of the A61 Sheffield Road adjacent to the junction with the A6133 Cemetery Road"

4.2.2 The AQMA is located approximately 5 km west of the site and it is unlikely that significant traffic flows generated by the Proposed Development would impact the AQMA. As such, no assessment was undertaken at sensitive receptor locations with the AQMA.

4.2.3 BMBC has concluded that concentrations of all other pollutants considered within the AQS are currently below the relevant AQOs and as such no further AQMAs have been designated.

4.3 Air Quality Monitoring

4.3.1 The 2023 BMBC ASR was reviewed to identify representative monitoring locations which could inform on-site concentrations. The review indicated the closest automatic station is CM1 located adjacent to the A635 (Doncaster Road) approximately 4 km west of the Proposed Development at the NGR: 436298, 405691.

4.3.2 As the Proposed Development and analyser are located adjacent to the A635, albeit separated by 4 km, comparisons can be drawn between the two locations given similar traffic characteristics and urban settings. It is therefore considered the A635 analyser provides a reasonable representation of conditions across the application site. The analyser only provides monitoring of roadside PM₁₀ concentrations which are presented in Table 6.

Table 6: Automatic Analyser Monitoring Results

Site ID and Name	Type	Distance to Site (m)	Pollutant	Concentration (µg/m ³)			
				2019	2020	2021	2022
CM1 - Barnsley A635 Roadside*	Roadside	4,010	PM ₁₀	20	20	19	21
			PM ₁₀ (>50 µg/m ³)	11	3	1	7-

* Site ID renamed as BAR9 in 2021

¹⁰ https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=43

¹¹ 2023 Air Quality Annual Status Report, BMBC, October 2023

4.3.3 PM₁₀ result provided by CM1 do not indicate recent exceedances of either the annual mean or 24-hour mean AQO adjacent to the A635.

4.3.4 BMBC monitor annual mean NO₂ concentrations using passive diffusion tube techniques. A review of the 2023 ASR indicated several locations within 3.5 km of the Proposed Development. Monitoring data from 2019 to 2022 at these locations is presented in Table 7 with exceedances of the AQO highlighted in **bold**.

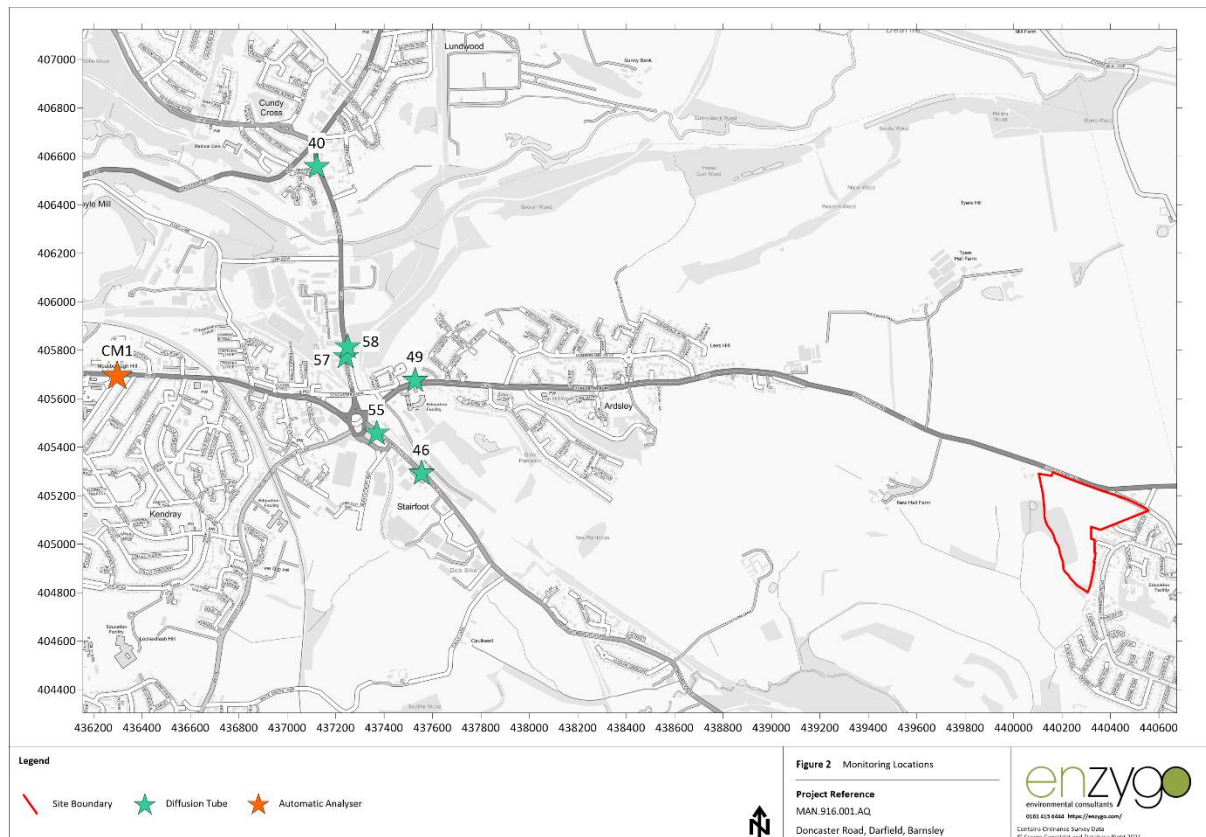
Table 7: Diffusion Tube Monitoring Results

Site ID	Type	Distance to Site (m)	IN AQMA?	Annual Mean Concentration (µg/m ³)			
				2019	2020	2021	2022
46 - Wombwell Lane	Kerbside	2,720	No	42.2	29.0	29.4	33.1
49 - Doncaster Road, Ardsley	Roadside	2,796	No	41.9	30.2	31.2	33.9
55 - Wombwell Lane	Roadside	2,919	No	42.6	27.0	30.2	30.1
57 - Grange Lane, Stairfoot	Roadside	3,095	No	38.9	29.1	27.9	31.7
58 - Grange Lane, Stairfoot	Roadside	3,096	No	37.4	26.1	26.6	27.3
40 - Grange Lane, Stairfoot	Roadside	3,458	No	42.2	30.0	35.4	33.1

4.3.5 NO₂ diffusion tube monitoring indicates recent exceedances of the annual mean AQO at sites adjacent to the A633 (Wombwell and Grange Lane) and A635 (Doncaster Road) within 4 km of the site.

4.3.6 It should be noted that 2020 monitoring data will be affected by the impact of restrictions during the national and local COVID lockdowns. Figure 2 provides a location map of the local authority monitoring locations within the study area.

Figure 2: Diffusion Tube Monitoring Locations



4.4 DEFRA Background Concentrations

4.4.1 To assist LAs in their air quality Review and Assessments, DEFRA produced background concentration maps for NO₂, PM₁₀ and PM_{2.5}. Predictions are based on a 1 km by 1 km grid basis across the entire UK with the Proposed Development located in NGR: 355500, 411500.

4.4.2 Data for the application site was downloaded for the baseline year of 2019 and the anticipated opening year of 2026 as presented in Table 8.

Table 8: DEFRA Background Pollutant Concentrations

Pollutant	2019 Concentration (µg/m ³)	2026 Concentration (µg/m ³)
NO ₂	9.77	7.65
PM ₁₀	13.05	12.25
PM _{2.5}	7.57	6.95

4.4.3 DEFRA background predictions concentrations of NO₂ and PM are not predicted to exceed the relevant AQOs.

4.5 Sensitive Receptors

4.5.1 A sensitive receptor is defined as any location which may be affected by changes in air quality as a result of a development. These were defined for construction dust and road vehicle exhaust emissions impacts in the following sections.

Construction Phase Sensitive Receptors

4.5.2 No national or European ecological designations are located within 50 m of the Site boundary, or 50 m from a route used by construction vehicles on the public highway (up to 500 m from the Site entrance). Therefore, potential dust impacts at the Dearne Valley Wetlands SSSI were not considered further in this assessment.

4.5.3 Human receptors sensitive to potential dust impacts during earthworks and construction were identified from a desk-top study of the area up to 250 m from the development boundary. These are summarised in Section 5.1.

Operational Phase Sensitive Receptors

4.5.4 A desk-top study was undertaken to identify worst case sensitive receptor locations adjacent to the affected road network. Human receptor locations were plotted where traffic changes exceed the EPUK and IAQM assessment thresholds (Section 3.5.3). No national or European ecological designations are located within 200 m of the affected road network.

4.5.5 The majority of receptor locations represent residential premises where members of the public might reasonably be expected to spend one hour or more. The identified receptor locations are summarised Table 9.

Table 9: Existing Sensitive Human Receptors

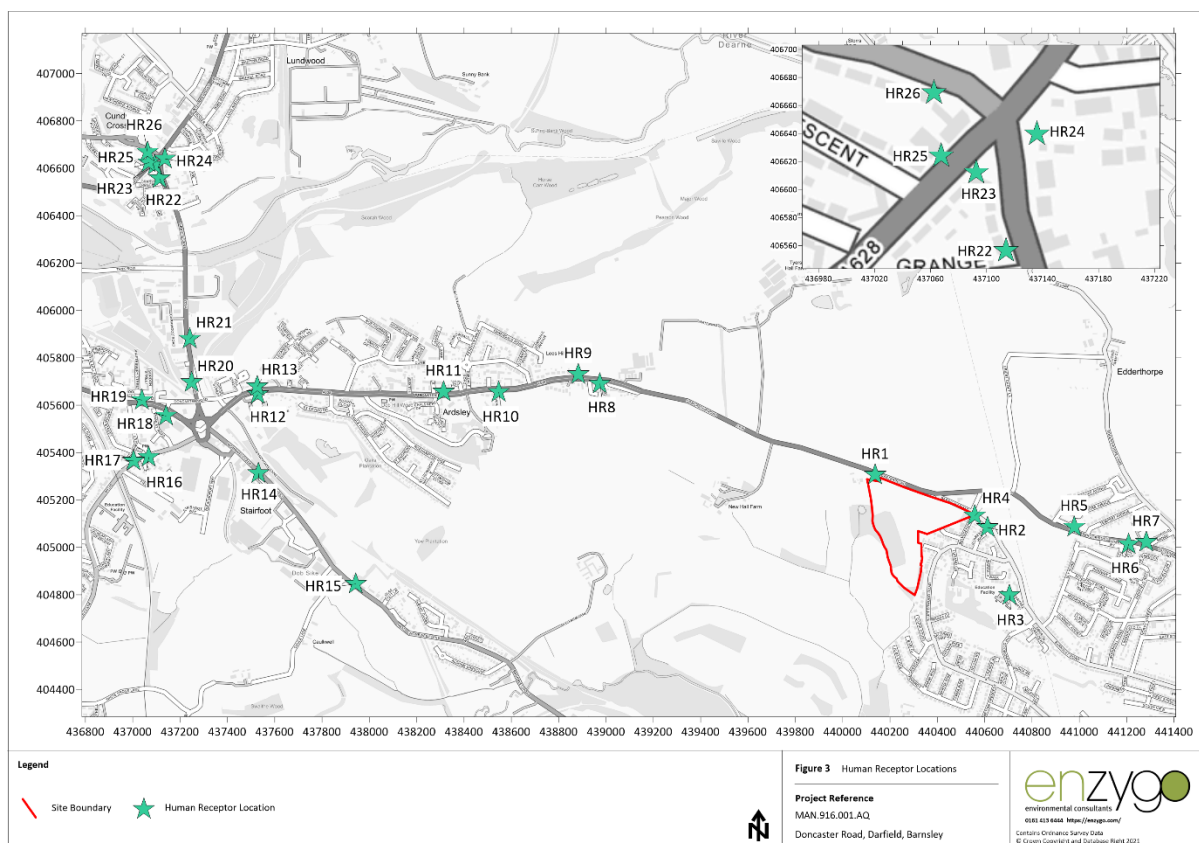
Receptor Name	NGR (m)		Height (m)	
	X	Y		
HR1	Brookfield Road	440138.1	405306.8	1.5
HR2	13 Sorrento Way	440613.8	405085.5	1.5
HR3	Darfield Primary School	440703.4	404797.6	1.5
HR4	16 Belvedere Drive	440555.4	405129.6	1.5

Receptor Name		NGR (m)		Height (m)
		X	Y	
HR5	Tempest Avenue	440978.2	405084.2	1.5
HR6	2 Quern Way	441208.5	405012.1	1.5
HR7	23 Highfield Road	441283.0	405022.3	1.5
HR8	553 Doncaster Road	438974.5	405690.7	1.5
HR9	774 Doncaster Road	438882.4	405732.0	1.5
HR10	439 Doncaster Road	438546.8	405654.5	1.5
HR11	714 Doncaster Road	438314.0	405657.8	1.5
HR12	Oakhill Primary School	437528.6	405644.6	1.5
HR13	584 Doncaster Road	437526.4	405678.5	1.5
HR14	88 Wombwell Lane	437529.0	405308.7	1.5
HR15	15 Wombwell Lane	437944.3	404847.8	1.5
HR16	1 Nursery Gardens	437068.4	405378.5	1.5
HR17	47 Hunningley Close	437001.6	405367.5	1.5
HR18	Highgrove Care Home	437142.4	405557.9	1.5
HR19	494 Doncaster Road	437038.7	405621.5	1.5
HR20	1 Grange Lane	437247.5	405695.7	1.5
HR21	1 Grange Lane	437241.3	405879.6	1.5
HR22	117 Grange Lane	437114.5	406556.7	1.5
HR23	119 Grange Lane	437097.3	406607.6	1.5
HR24	98 Grange Lane	437145.5	406641.7	1.5
HR25	206 Pontefract Rd	437065.6	406626.1	4.5
HR26	10 Rotherham road	437061.7	406667.2	1.5

4.5.6 Receptors modelled at 1.5 m to represent the average UK “breathing height” above ground level. Receptors modelled at heights above this level represent upper floors.

4.5.7 Figure 3 presents the modelled operational phase human receptor locations.

Figure 3 – Modelled Receptor Locations



5.0 Assessment

There is the potential for air quality impacts as a result of the construction and operation phases of the Proposed Development. Associated impacts are assessed in the following Sections.

5.1 Construction Phase Impact Assessment

5.1.1 A desk top screening assessment (Step 1) identified sensitive receptors within 250 m of the site boundary, and within 50m of the anticipated trackout. Construction impacts on human receptors are summarised in Table 10.

Table 10: Construction Phase Sensitive Receptor Counts

Distance from Site or Trackout Routes (m)	Approximate Number of Receptors
Earthworks and Construction	
Less than 20	1 - 10
20 – 50	10 - 100
50 – 100	10 - 100
100 – 250	More than 100
Trackout	
Less than 20	10 - 100
20 – 50	10 - 100

5.1.2 A detailed assessment of potential dust impacts was therefore required. This is described in the following sections. Figure 4 and Figure 5 provide maps of the construction and trackout buffer distances.

Figure 4 – Earthworks and Construction Buffer Distances

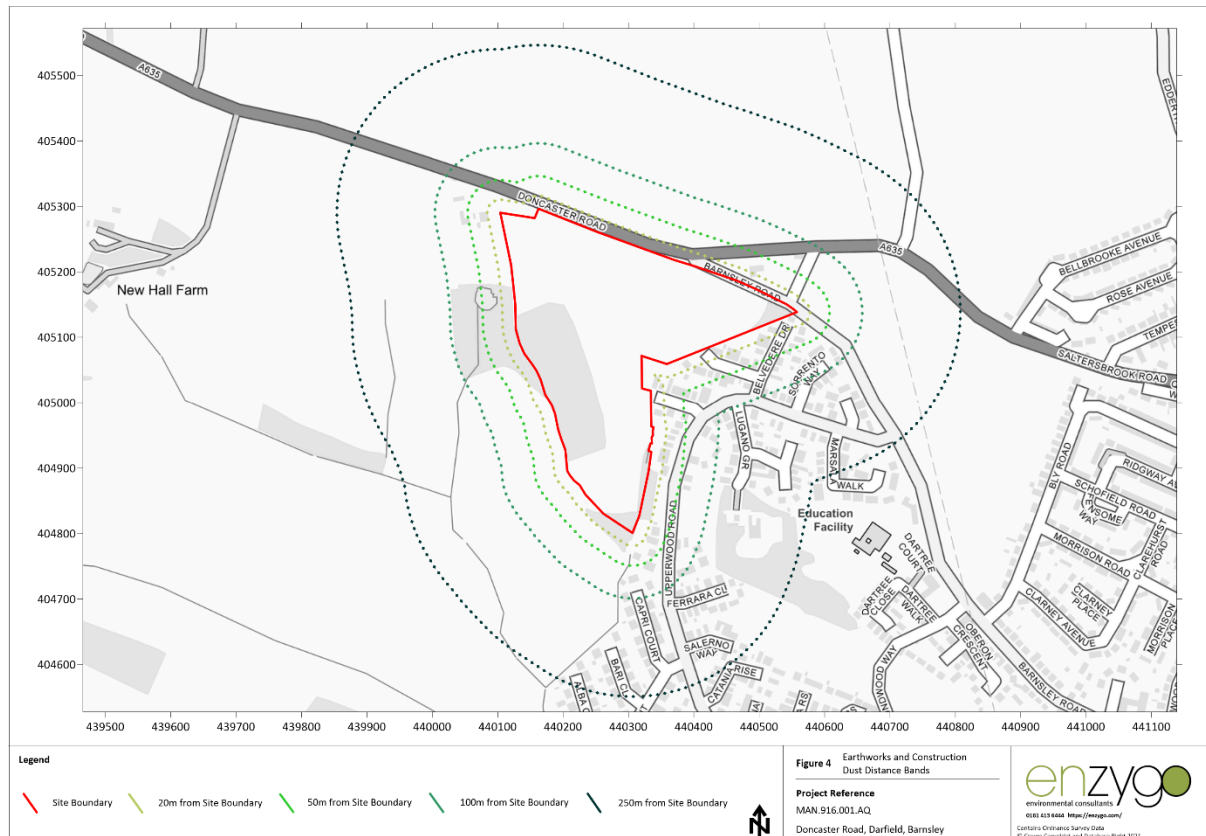
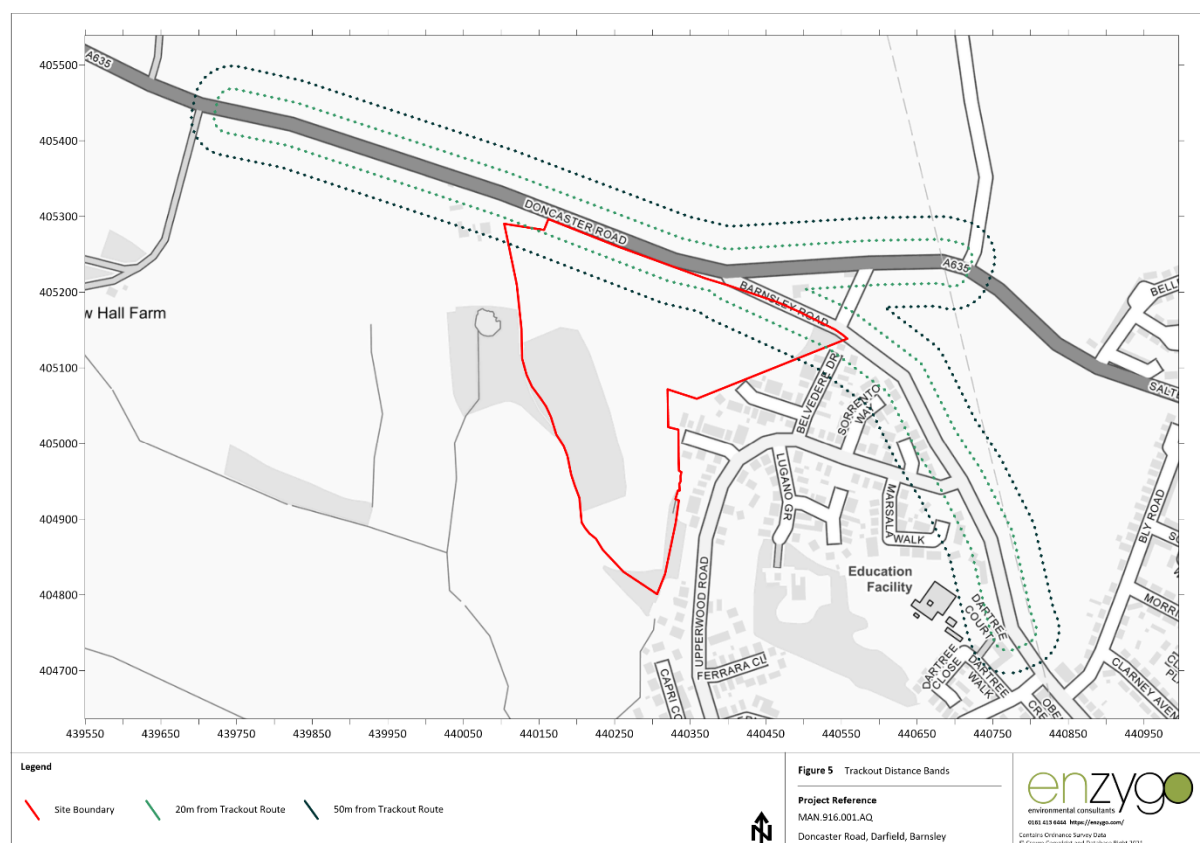


Figure 5 – Trackout Buffer Distances



Magnitude

5.1.3 The scale and nature of the works has been determined to assess the magnitude (Step 2A) of fugitive dust emissions arising from each construction phase activity. The determination of magnitude was based upon the criteria detailed in Appendix C.

Demolition

5.1.4 There is no requirement to remove existing building structures to prepare for construction. Subsequently, this aspect of the construction phase dust risk assessment has not been considered further.

Earthworks

5.1.5 The Proposed Development site is unlikely to require significant imports or exports of material to prepare for construction. However, based on the estimated site area and potential stockpiling the magnitude is considered *large*.

Construction

5.1.6 The Proposed Development comprises the construction of 480 residential dwellings. The total building volume is estimated to be >100,000 m³ and the magnitude is considered *large*.

Trackout

5.1.7 Information on the number of HDV trips generated during the construction phase was not available at the time of assessment. Similarly, the surface material and unpaved road length was not known. As the unpaved road length is likely to be >100 m the magnitude is considered *large*.

5.1.8 A summary of the construction phase magnitudes is detailed in Table 11.

Table 11: Dust Emission Magnitude

Demolition	Earthworks	Construction	Trackout
-	Large	Large	Large

Sensitivity

5.1.9 The next step (Step 2B) determined the sensitivity of the surrounding area, based on the number, proximity, and type of receptors. To ensure a worse case assessment all receptors were assumed to be highly sensitive (e.g. residential).

Dust Soiling

5.1.10 Residential premises are located adjacent to all boundaries of the site which presents a high receptor sensitivity. When combined with receptor counts provided in Table 10 the sensitivity of the surrounding area is medium for earthwork and construction activities and high for trackout activities.

Human Health

5.1.11 Predicted annual mean background concentrations of PM₁₀ within the vicinity of the proposed site, as predicted by DEFRA, are 13.05 µg/m³ (Table 8). Based on the receptor counts provided in Table 10, the sensitivity of the surrounding area is low for all construction phase activities.

Table 12: Summary of Area Sensitivity to Dust Impacts

Impact	Demolition	Earthworks	Construction	Trackout
Dust Soiling	-	Medium	Medium	High
Human Health	-	Low	Low	Low

Risk

5.1.12 The next stage of the assessment (Step 2C) combined the dust magnitude and receptor sensitivity defined above to determine the overall risk with no mitigation applied. This is summarised in Table 13.

Table 13: Summary of Unmitigated Dust Risk

Impact	Demolition	Earthworks	Construction	Trackout
Dust Soiling	-	Medium	Medium	High
Human Health	-	Low	Low	Low

5.1.13 Following the determination of risk for each activity, the final step (Step 3) detailed necessary mitigation measures to reduce impacts during the construction phase.

5.1.14 These measures were adapted for the Proposed Development based on a medium risk and summarised in Table 23 within Section 6.1.

5.2 On-site Exposure

Long Term Objectives

5.2.1 Opening year pollutant concentrations were modelled across the Proposed Development during the future opening year of 2026. Results are presented in Table 14, which reflect the maximum concentrations across the site.

Table 14: Predicted Maximum Annual Mean Concentrations Across the Site

Receptor Location	Maximum Concentration ($\mu\text{g}/\text{m}^3$)		
	NO_2 (AQO – $40\mu\text{g}/\text{m}^3$)	PM_{10} (AQO – $40\mu\text{g}/\text{m}^3$)	$\text{PM}_{2.5}$ (AQO – $25\mu\text{g}/\text{m}^3$)
Site	18.1	20.4	11.2

5.2.2 Predicted annual mean concentrations presented in Table 14 indicate compliance with national AQOs detailed in Table 1. Based on these results, on-site exposure to annual mean pollutant concentrations was considered not significant and the site is considered suitable for residential use without the requirement of protective mitigation measures.

5.2.3 Predictions at heights above first floor were not assessed further, as it is considered that pollutant concentrations would reduce with increased height from the local road network.

5.2.4 Pollutant contour plots in Figure 6, Figure 7 and Figure 8 provide a graphical representation of pollutant concentrations across the site.

Figure 6 – Annual Mean NO_2 Contours

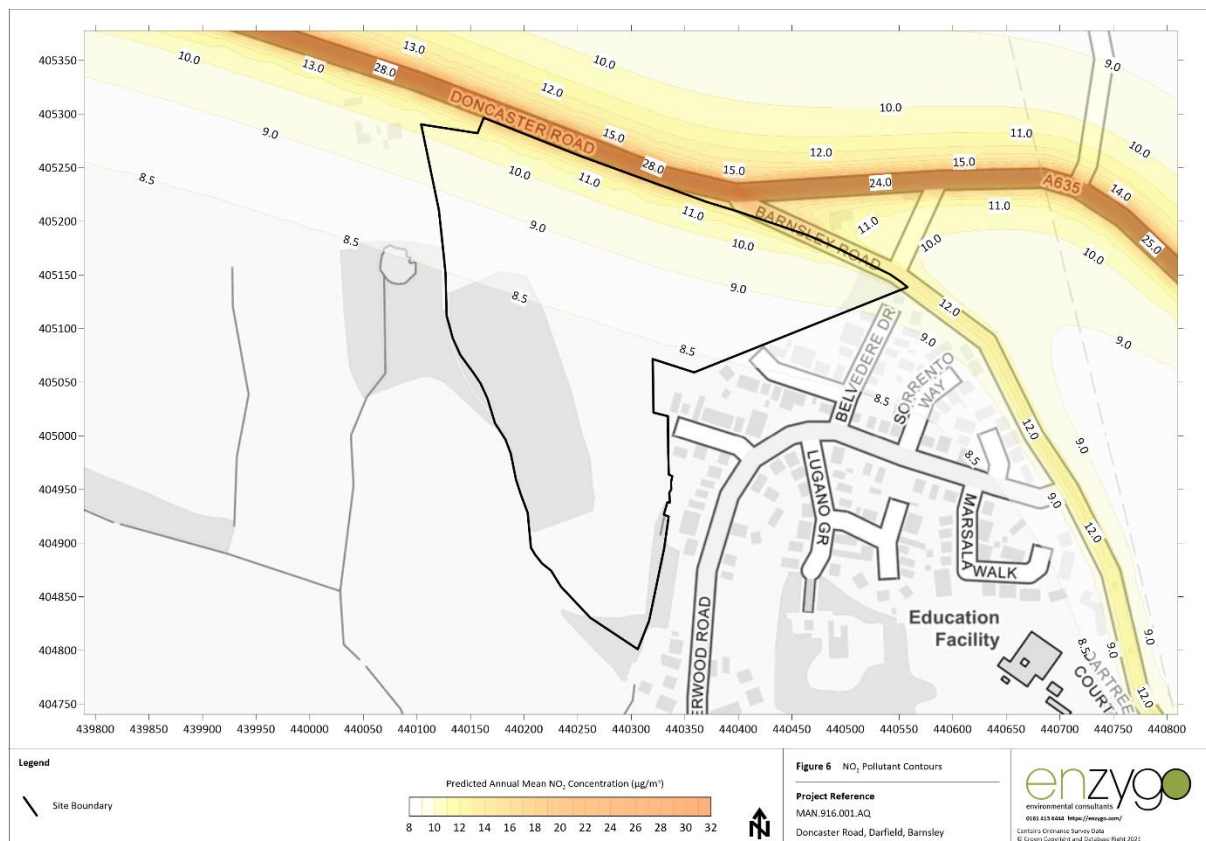


Figure 7 – Annual Mean PM₁₀ Contours

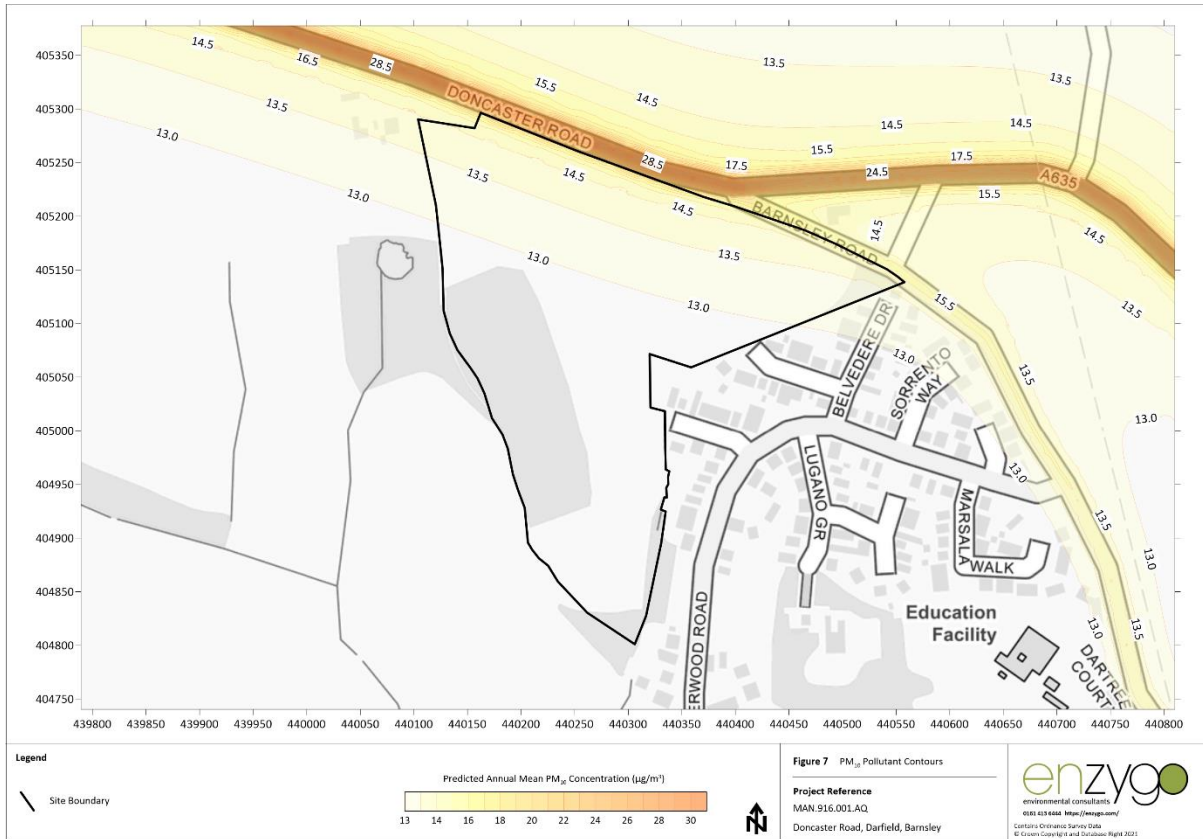
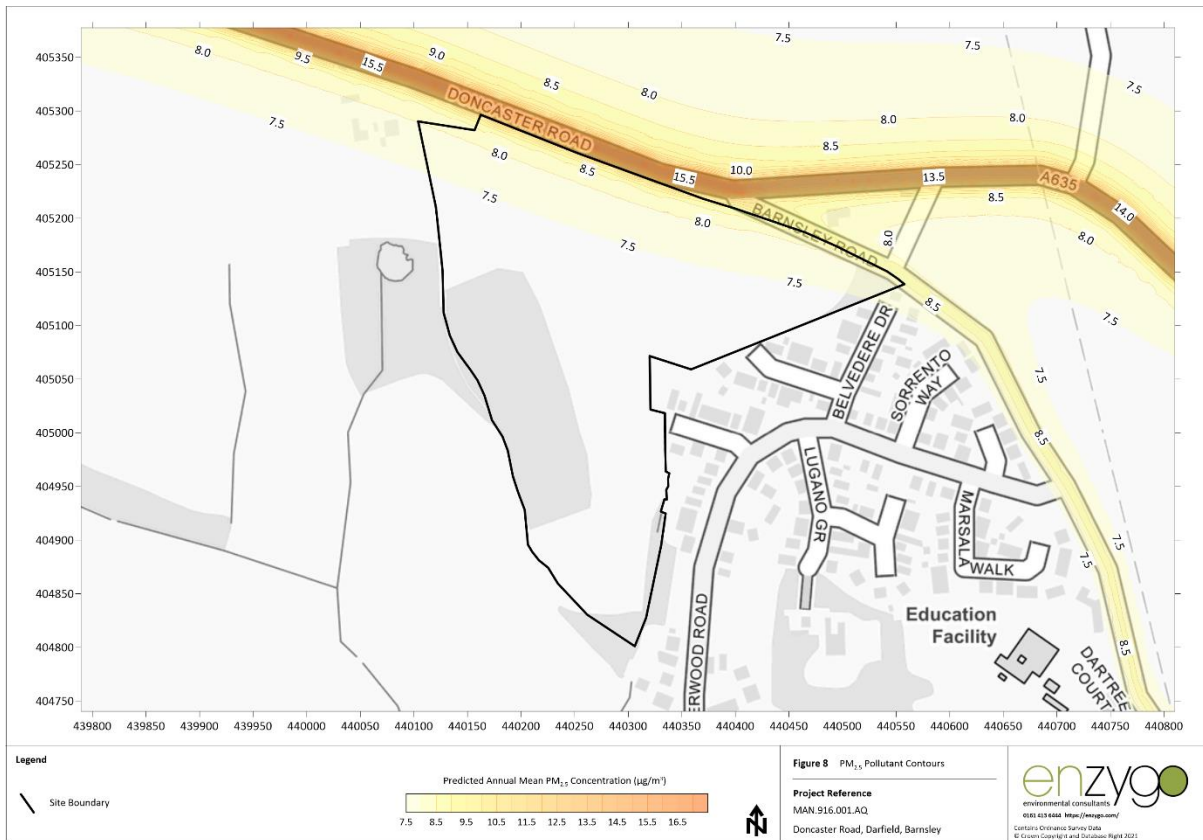


Figure 8 – Annual Mean PM_{2.5} Contours



Short Term Objectives

- 5.2.5 Exposure to 1-hour NO₂ or 24-hour PM₁₀ concentrations are relevant at the Proposed Development Site but contours were not produced as part of the dispersion modelling assessment. LAQM.TG22³ states if annual mean NO₂ concentrations are below 60 µg/m³ then it is unlikely that the 1-hour AQO will be exceeded. Similarly, if the annual PM₁₀ concentrations are below 32 µg/m³ then it is unlikely that the 24-hour AQO will be exceeded.
- 5.2.6 Annual mean NO₂ and PM₁₀ concentrations across the site are predicted as 18.1 µg/m³ and 20.4 µg/m³ and therefore both 1 hour and 24-hour AQOs are not predicted to exceed short term AQOs at any location across the site and the overall significance of potential exposure impacts is not significant.

5.3 Road Traffic Exhaust Impacts

- 5.3.1 The Proposed Development has the potential to cause impacts at nearby sensitive locations. This was assessed through dispersion modelling, with the results presented in the following Sections.
- 5.3.2 Based on data provided by the transport consultant, it is expected the Proposed Development will generate a 24-hour AADT flow of 1,934 (0% HGVs) during operation. Based on the anticipated AADT trip generation a dispersion modelling assessment was undertaken to quantify potential changes in pollutant concentrations at sensitive locations in the vicinity of the site. Predicted impact significance at individual receptors on annual mean NO₂, PM₁₀ and PM_{2.5} concentrations based on the criteria given in Table 4 are summarised in Table 15.

Table 15: Summary of Operational Phase Impacts

Pollutant and Period	Receptors	Significance of Impact
Annual Mean NO ₂	All Receptors	Negligible
Annual Mean PM ₁₀	All Receptors	Negligible
Annual Mean PM _{2.5}	All Receptors	Negligible

- 5.3.3 As shown in Table 15 the significance of impacts was predicted to be negligible at all sensitive receptors.
- 5.3.4 The overall significance of potential impacts was determined to be not significant in accordance with the EPUK and IAQM guidance⁵. Full assessment results and commentary are presented in Appendix B.

Impact Significance

- 5.3.5 The overall significance of operational phase road traffic emission impacts during 2026 was determined as not significant. This was based on the predicted impacts at discrete receptor locations and the considerations outlined in Section 5.2. Further justifications are provided in Table 16.

Table 16: Overall Road Emissions Impact Significance

Guidance	Comment
Number of properties affected by slight, moderate or substantial air quality impacts and a judgement on the overall balance	Impacts on NO ₂ , PM ₁₀ and PM _{2.5} concentrations were predicted to be negligible at all sensitive receptors. These represent worst-case locations and therefore it is unlikely that any other receptors would be significantly affected by the Proposed Development.

Guidance	Comment
Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective or limit value will be relevant	The Proposed Development will not result in any new sensitive exposure to pollutant concentrations above the AQOs at sensitive locations
The percentage change in concentration relative to the objective and the descriptions of the impacts at the receptors	The maximum changes in annual mean NO ₂ and PM ₁₀ concentrations relative to their respective AQOs were predicted to range from: <ul style="list-style-type: none"> • 0.08% to 2.12% for NO₂, • 0.05% to 1.20% for PM₁₀; and • 0.04% to 1.04% for PM_{2.5}. As such, resultant impacts were negligible at all receptor locations for each pollutant species
Whether or not an exceedance of an objective is predicted to arise or be removed in the study area due to a substantial increase or decrease	There were no predicted exceedances of the annual mean AQOs for NO ₂ , PM ₁₀ or PM _{2.5} at any location within the modelling extents
The extent to which an objective is exceeded e.g. an annual mean NO ₂ concentration of 41µg/m ³ should attract less significance than an annual mean of 51 µg/m ³	As above, there were no predicted exceedances at any receptor locations within the modelling extents

5.3.6 As such, the overall significance of operational phase road traffic emission impacts on annual mean NO₂ and PM concentrations was determined not significant.

Damage Cost Assessment

5.3.7 An emissions mitigation assessment was undertaken for all phases of the development in accordance with the BMBC guidance¹ and informs the level of mitigation required to offset development impacts and to provide a guide to required cost of mitigation based on the damage costs.

5.3.8 The calculation provides analysis from 2026, the predicted development opening year, until 2030 to include a five-year period of operation in accordance with the BMBC guidance¹ and DEFRA approach⁸. For the calculation, traffic generation figures were provided by appointed transport consultant for all phases of the development.

5.3.9 Standard vehicle speeds and trip lengths were obtained from the BMBC guidance¹ and summarised in Table 17.

Table 17: Summary of Calculation Inputs

Annual Average Daily Traffic (AADT)	Vehicle Speed (km/h)	Average Trip Length (km)
1,934 (0% HDV)	50	10

5.3.10 The inputs detailed in Table 18 were processed through the Emissions Factor Toolkit (v12) to obtain annual vehicle emissions of NO_x and PM_{2.5} (tonnes/annum) associated with the Proposed Development as detailed in Table 18.

Table 18: Development Annual Road Vehicle Exhaust Emissions

Assessment Year	NO _x Emissions (Tonnes/annum)	PM _{2.5} Emissions (Tonnes/annum)
2026	1.0974	0.1241
2027	0.9655	0.1228

Assessment Year	NO _x Emissions (Tonnes/annum)	PM _{2.5} Emissions (Tonnes/annum)
2028	0.8408	0.1218
2029	0.7248	0.1209
2030	0.6206	0.1202

5.3.11 The DEFRA guidance provides various damage cost factors dependent on emission sources as well as geographical locations. Road Transport Urban (Medium) central damage factors were deemed suitable for the Proposed Development.

5.3.12 The IGBC damage cost factors are detailed in Table 19, presented as 2022 figures.

Table 19: Damage Cost Factors

Pollutant	Central Damage Cost (£/t)
NO _x	9,054
PM _{2.5}	63,766

5.3.13 In accordance with the DEFRA guidance the above 2022 based damage costs were rebased to 2024 to take account of inflation using Gross Domestic Product (GDP) deflator. The adjusted air quality damage costs are summarised in Table 20.

Table 20: Air Quality Damage Costs - 5 Year Period

Assessment Period	Road Transport NO _x Medium (£/tonne)	Road Transport PM _{2.5} Medium (£/tonne)
2026 - 2030	9,529	67,111

5.3.14 The above damage cost factors were then applied to the annual development emissions detailed in Table 18 to determine the total damage costs over the 5-year period to 2030 as shown in Table 21.

5.3.15 A health discount factor is also applied to costs based on Her Majesty's Treasury's (HMT) Green Book. This reflects the rate at which society values the present compared to the future. According to HMT this is currently set at 1.5% per year.

Table 21: Air Quality Damage Cost

Assessment Year	Discounted Central Benefit NO _x (£)	Discounted Central Benefit PM _{2.5} (£)
2026	10,457.93	8,329.67
2027	9,064.85	8,120.23
2028	7,777.02	7,931.71
2029	6,605.13	7,759.41
2030	5,572.37	7,598.17

5.3.16 The values in Table 21 are applied to the emissions given in Table 18 and summed for each pollutant. The final damage costs are summarised in Table 22.

Table 22: Air Quality Damage Costs - 5 Year Period

Pollutant	Total Damage Costs (£)
NO _x	39,477.30
PM _{2.5}	39,739.19
Total	79,216.49

5.3.17 As outlined in Table 19, the total damage cost for the all phases of the Proposed Development was calculated at £79,216.49. This cost should be used as an indicator to the level of emissions offsetting measures required as part of the Proposed Development scheme. These may include

on site and/or off-site measures. It is expected that details of the mitigation strategy will be secured via a reasonable planning condition.

6.0 Mitigation

6.1 Construction Phase

6.1.1 The IAQM guidance⁴ provides several control measures to reduce fugitive dust impacts during the construction phase. These measures were adapted based on professional judgment for the Proposed Development site and summarised in Table 23.

Table 23: Fugitive Dust Mitigation Measures

Impact	Recommended Control Measure and Requirement		
Communications	1	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	H
	2	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.	H
	3	Display the head or regional office contact information	H
	4	Develop and implement a Dust Management Plan, which may include measures to control other emissions.	H
Site Management	5	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner	H
	6	Make the complaints log available to the local authority when asked	H
	7	Record any exceptional incidents that cause dust and/or air emissions and the action taken to resolve the situation in the log book.	H
	8	Hold regular liaison meetings with other high-risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/ deliveries which might be using the same strategic road network routes.	H
Monitoring	9	Undertake 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 100 m of site boundary, with cleaning to be provided if necessary.	H
	10	Carry out regular site inspections to monitor compliance with the Dust Management Plan, record inspection results, and make an inspection log available to the local authority when asked	H
	11	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.	H
	12	Agree dust deposition, dust flux, or real-time PM ₁₀ continuous monitoring locations with the Local Authority.	H
Preparing & Maintaining Site	13	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	H
	14	Erect solid screens or barriers around dusty activities or the site boundary.	H
	15	Fully enclose site or specific operations where there is a high potential for dust production	H
	16	Avoid site runoff of water or mud	H

Impact	Recommended Control Measure and Requirement		
	18	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.	H
	19	Cover, seed or fence stockpiles to prevent wind whipping	H
Operating Vehicle/Machinery & Sustainable Travel	20	Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone and the London NRMM standards	H
	21	Ensure all vehicles switch off engines when stationary - no idling vehicles	H
	22	Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.	H
	23	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)	H
	24	Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials	H
	25	Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)	H
Operations	26	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction,	H
	27	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.	H
	28	Use enclosed chutes and conveyors and covered skips.	H
	29	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	H
	30	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.	H
Waste Management	31	Avoid bonfires and burning of waste materials	H
Earthworks & Construction	36	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.	D
	37	Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable	D
	38	Only remove the cover in small areas during work and not all at once	D
	39	Avoid scabbling (roughening of concrete surfaces) if possible	D
	40	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.	H
	41	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.	D
	42	For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.	D

Impact	Recommended Control Measure and Requirement		
Trackout	43	Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site.	H
	44	Avoid dry sweeping of large areas.	H
	45	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport, as necessary.	H
	46	Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	H
	47	Record all inspections of haul routes and any action in a site log book.	H
	48	Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.	H
	49	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	H
	50	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.	H
	51	Access gates to be located at least 10 m from receptors where possible	H

*D – desired

*H – highly recommended

6.1.2 Assuming the relevant mitigation measures outlined in Table 23 are implemented, the residual effect from all dust generating activities (Step 4) is predicted to be negligible and therefore not significant in accordance with the IAQM guidance⁴.

7.0 Conclusions

- 7.1.1 A qualitative dust risk assessment was undertaken in accordance with the IAQM methodology to define a mitigation strategy. Assuming good practice and the implementation of suggested dust control measures, detailed in Table 23, residual impacts are predicted to be not significant.
- 7.1.2 Potential impacts during the operational phase of the development may occur due to NO₂ and fine PM emissions associated with vehicles travelling to and from the site. A dispersion modelling assessment was undertaken to quantify air quality impacts at existing sensitive receptor locations. Results were verified using monitoring results obtained from BMBC.
- 7.1.3 The results of the site exposure modelling predicted that annual and hourly mean concentrations across the Proposed Development site comply with the national AQOs at all proposed sensitive receptor locations. Further mitigation to protect future occupiers is therefore not required and operational phase exposure impacts were predicted to be not significant.
- 7.1.4 Impacts on NO₂, PM₁₀ and PM_{2.5} concentrations during the operational phase were predicted to be negligible at all sensitive receptor locations within the vicinity of the site. The overall significance of potential impacts was determined to be not significant, in accordance with the EPUK and IAQM guidance⁴.
- 7.1.5 In accordance with the BMBC document¹ a damage cost assessment was undertaken to determine the level of mitigation measures required to offset development led impacts. This was calculated on the entire site (all phases), The findings of the damage cost analysis indicated a figure of £79,216.49 should be applied as an indicator to inform the level of mitigation measures required as part of the Proposed Development scheme. These may include on site and/or off-site measures and should be fully discussed and approved by BMBC prior to implementation. At this stage details are unknown and it is understood that a fixed strategy will be determined at a later stage following discussions with BMBC.
- 7.1.6 In summary it is predicted that both development impacts and onsite pollutant exposure are deemed not significant and should not form a constraint to planning consent

8.0 Abbreviations

AADT	Annual Average Daily Traffic
ADM	Atmospheric Dispersion Modelling
ADMS	Atmospheric Dispersion Modelling Software
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Strategy
ASR	Annual Status Report
BMBC	Barnsley Metropolitan Borough Council
CERC	Cambridge Environmental Research Consultants
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DM	Do Minimum
DS	Do Something
EA	Environment Agency
EPUK	Environmental Protection UK
EV	Electric Vehicle
EU	European Union
GMCA	Greater Manchester Combined Authority
HDV	Heavy Duty Vehicle
HGV	Heavy Goods Vehicle
IAQM	Institute of Air Quality Management
LA	Local Authority
LAQM	Local Air Quality Management
LDV	Light Duty Vehicle
NGR	National Grid Reference
NO ₂	Nitrogen Dioxide
NO _x	Oxides of nitrogen
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
NRMM	Non-Road Mobile Machinery
PM ₁₀	Particulate Matter with an aerodynamic diameter less than 10µm
PM _{2.5}	Particulate Matter with an aerodynamic diameter less than 2.5µm
RMSE	Route Mean Square Error
UK	United Kingdom
z ₀	Roughness Length

Appendix A – Assessment Inputs

Dispersion modelling was undertaken using the ADMS-Roads dispersion model (version 5.0.0.1) which is developed by Cambridge Environmental Research Consultants (CERC) and is routinely used throughout the UK for the prediction of pollutant dispersion from road sources. The Environment Agency and DEFRA also widely accept modelling predictions from this software package.

The model requires input data that details the following parameters:

- Traffic flow data;
- Vehicle emission factors;
- Spatial co-ordinates of emissions;
- Street width;
- Meteorological data;
- Roughness length; and
- Monin-Obukhov length.

Traffic Flow Data

Traffic flows for the 2019 baseline were obtained from the Department for Transport (DfT) database. For the future year scenarios growth factors provided by TEMPRO v8.0 were applied to 2019 baseline traffic to take account of forecasted growth in 2026.

Baseline vehicle flows for Barnsley Road, and anticipated vehicle flows generated by the Proposed Development during operation were obtained from a 2019 Air Quality Assessment undertaken by REC Ltd (ref: AQ106803) for an earlier iteration of the Proposed Development.

Vehicle speeds were estimated based on the free flow potential of each link and local speed limits. Assumptions account for speed reductions at junctions and peak hour congestion in line with Section 7.285 of LAQM.TG22³. Mean road widths were estimated from aerial photography using Google Earth Pro software.

A summary of the traffic data used to inform each operation scenario is presented Table A1.

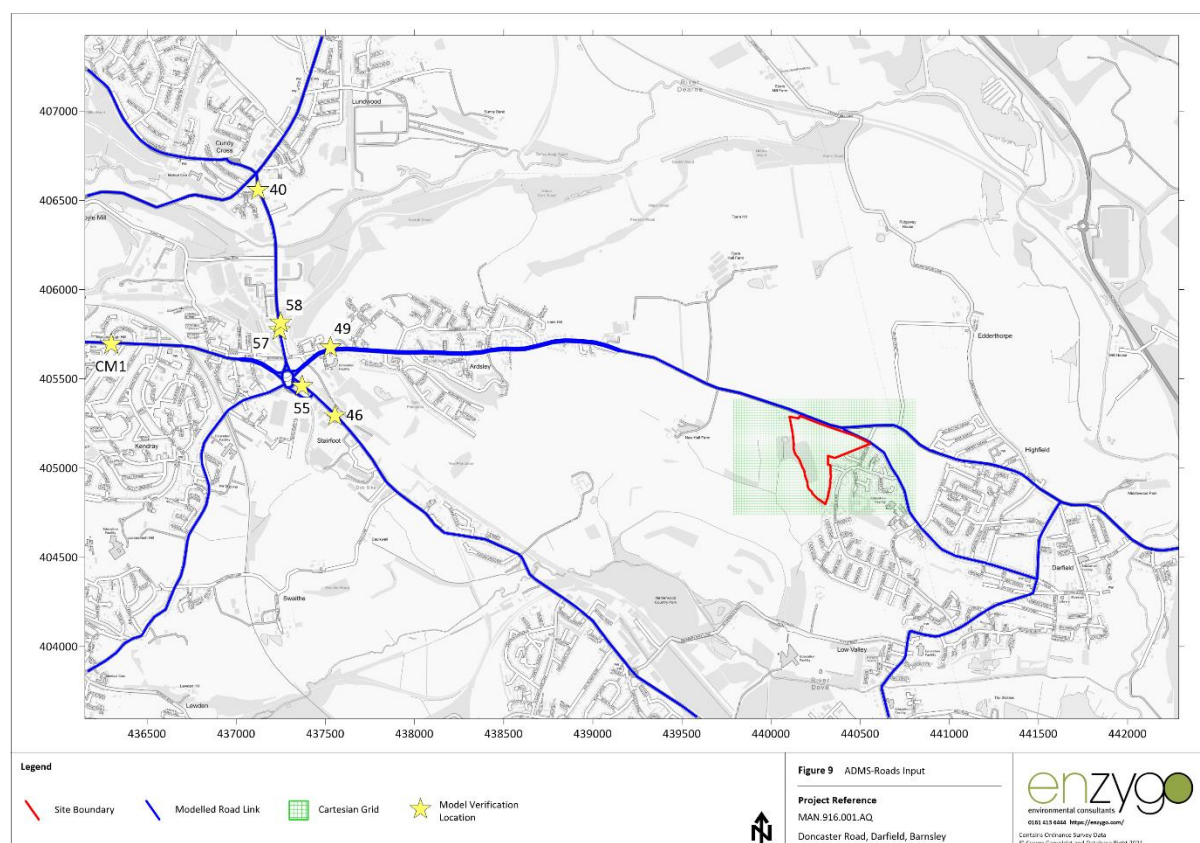
Table A1: 24-hour AADT Traffic Data

Road Link		Baseline Data Source	Verification Scenario 2019		DM Scenario 2026		DS Scenario 2026		Trip Gen (AADT)
			AADT	HGV%	AADT	HGV%	AADT	HGV%	
L1	A635 (Doncaster Road East) - East of Site Access	DfT - 77566	14,413	4.4	15,093	4.4	15,969	4.4	876
L2	A635 (Doncaster Road East) - West of Site Access	DfT - 77566	14,413	4.4	15,093	4.4	16,151	4.4	1058
L3	A365 (Salterbrook Road)	DfT - 77564	11,780	3.7	12,336	3.7	13,224	3.7	888
L4	Barnsley Road - East of Site Access	REC - 106803	1,916	8.6	2,006	8.6	2,198	8.6	192
L5	Barnsley Road - West of Site Access	REC - 106803	1,916	8.6	2,006	8.6	2,089	8.6	83
L6	B6096 (Snape Hill Road)	DfT - 807834	7,166	1.4	7,504	1.4	7,504	1.4	0
L7	A635 (Doncaster Road East) - Dual Carriageway WB	DfT - 77566	7,207	4.4	7,547	4.4	8,076	4.4	529
L8	A635 (Doncaster Road East) - WB Roundabout Approach	DfT - 77566	7,207	4.4	7,547	4.4	8,076	4.4	529
L9	A635 (Doncaster Road East) - Dual Carriageway EB	DfT - 77566	7,207	4.4	7,547	4.4	8,076	4.4	529
L10	A635 (Doncaster Road East) - EB Roundabout Approach	DfT - 77566	7,207	4.4	7,547	4.4	8,076	4.4	529
L11	A635/A633 Roundabout	Calculation	15,122	4.4	15,835	4.4	16,329	4.4	494
L12	A633 (Wombwell Lane) - Roundabout Exit	DfT - 57338	9,242	2.8	9,678	2.8	9,854	2.8	177
L13	A633 (Wombwell Lane)	DfT - 57338	18,483	2.8	19,355	2.8	19,708	2.8	353
L14	A633 (Bleachcroft Way)	DfT - 57338	9,242	2.8	9,678	2.8	9,854	2.8	177
L15	B6100 (Hunningley Lane) - Roundabout Approach/Exit	Calculation	4,781	9.9	5,007	9.9	5,360	9.9	353
L16	B6100 (Hunningley Lane)	Calculation	4,781	9.9	5,007	9.9	5,360	9.9	353
L17	A635 (Doncaster Road West) - Westbound Split	DfT - 38061	9,844	3.9	10,308	3.9	10,485	3.9	177
L18	A635 (Doncaster Road West) - Eastbound Split	DfT - 38061	9,844	3.9	10,308	3.9	10,485	3.9	177
L19	A635 (Doncaster Road West)	DfT - 38061	19,687	3.9	20,616	3.9	20,969	3.9	353
L20	A633 (Grange Lane) - Northbound Split	DfT - 37448	9,122	4.9	9,553	4.9	9,729	4.9	177
L21	A633 (Grange Lane) - Southbound Split	DfT - 37448	9,122	4.9	9,553	4.9	9,729	4.9	177
L22	A633 (Grange Lane)	DfT - 37448	18,244	4.9	19,105	4.9	19,458	4.9	353

Road Link		Baseline Data Source	Verification Scenario 2019		DM Scenario 2026		DS Scenario 2026		Trip Gen (AADT)
			AADT	HGV%	AADT	HGV%	AADT	HGV%	
L23	A633 (Grange Lane) - A628 Junction	DfT - 37448	18,244	4.9	19,105	4.9	19,458	4.9	353
L24	A628 (Pontefract Road South)	DfT - 37436	12,290	4.2	12,870	4.2	12,988	4.2	118
L25	A628 (Pontefract Road South) - A633 Junction	DfT - 37436	12,290	4.2	12,870	4.2	12,988	4.2	118
L26	A633 (Rotherham Road)	DfT - 7387	8,550	3.8	8,954	3.8	9,071	3.8	118
L27	A633 (Rotherham Road) - A628 Junction	DfT - 7387	8,550	3.8	8,954	3.8	9,071	3.8	118
L28	A628 (Pontefract Road North)	DfT - 80862	17,250	4.2	18,064	4.2	18,182	4.2	118
L29	A628 (Pontefract Road North) - A633 Junction	DfT - 80862	17,250	4.2	18,064	4.2	18,182	4.2	118

Figure 9 presents the modelled road link locations used within the operational phase assessment.

Figure 9 – ADMS Road Inputs



Emission Factors

Emission factors for each link were calculated using the traffic flows detailed in Table A1 and the Emissions Factor Toolkit (EFT) (version 12.0) released in December 2023, which incorporates updated COPERT 5.6 vehicle emissions factors for NO_x and PM.

The 2026 future scenarios assume a reduction to future year emission factors guided by increasing EV fleets and future advancements to low emission technologies as provided by the EFT.

Assessment Area

Ambient concentrations were predicted at distinct receptor locations across the site to quantify pollutant exposure at proposed sensitive receptor locations presented in Figure 3.

Gridded outputs over the region NGR: 439790, 404740 to 440810, 405385, were processed and combined with 2026 DEFRA background concentrations detailed in Table 8 to provide total pollutant concentrations across the site. Contours are shown in Figure 6, Figure 7 and Figure 8.

NO_x to NO₂ Conversion

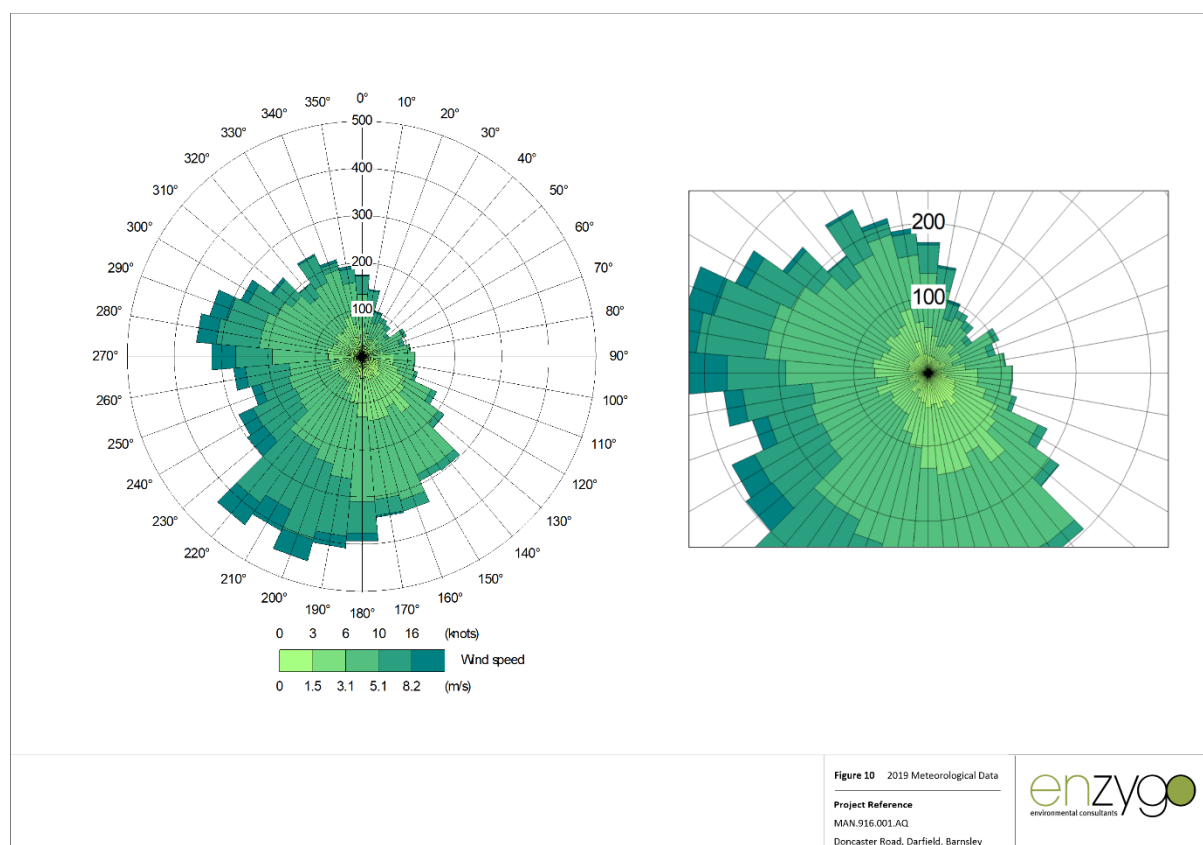
Predicted annual mean NO_x concentrations from the dispersion model were converted to NO₂ concentrations using the NO_x to NO₂ Calculator (v.8.1) provided by DEFRA, which is the method detailed within LAQM.TG22³.

Meteorological Data

Hourly sequential data used in this assessment was obtained from Robin Hood Airport meteorological station, located 26 km southeast of the Proposed Development.

Figure 10 presents the meteorological wind rose.

Figure 10 – 2019 Meteorological Wind Rose



The choice of data is considered suitable to represent meteorological conditions across the modelled domain.

All meteorological data used in the assessment was provided by ADM Ltd.

Meteorological Parameters

The specific roughness length (z_0) values specified with ADMS-5 are summarised in Table A2.

Table A2: Roughness Lengths

Scenario	Roughness Length (m)	ADMS Description
All Assessment Scenarios	0.5	Parkland, open suburbia
Met Station	0.2	Agricultural areas (min)

The Monin-Obukhov length values are summarised in Table A3.

Table A3: Monin-Obukhov Lengths

Scenario	Monin-Obukhov Length (m)	ADMS Description
All Assessment Scenarios	30	Mixed Urban and Industrial
Met Station	10	Small Towns <50,000

Background Concentrations

Table A4 displays the specific background concentrations as predicted by DEFRA, utilised to represent the condition at the monitoring locations used within the verification process.

Table A4: Predicted 2019 Background Concentrations for Monitoring Locations

Monitoring Location	DEFRA Grid Square	Pollutant	Background Concentration ($\mu\text{g}/\text{m}^3$)
CM1	436500, 405500	PM ₁₀	12.67
46, 49, 55, 57 & 58	437500, 405500	NO _x	16.51
		NO ₂	12.37
40	437500, 406500	NO _x	14.94
		NO ₂	11.28

Table A5 displays the predicted background concentrations by DEFRA used in the operational phase assessment for the sensitive receptor locations.

Table A5: Predicted 2026 Background Concentrations at Sensitive Receptors

Receptor Location	DEFRA Grid Square	Pollutant	Background Concentration ($\mu\text{g}/\text{m}^3$)
HR1, HR2, HR4 & HR5	440500, 405500	NO _x	9.84
		NO ₂	7.65
		PM ₁₀	12.25
		PM _{2.5}	6.95
HR3	440500,404500	NO _x	10.69
		NO ₂	8.26
		PM ₁₀	10.26
		PM _{2.5}	6.51
HR6 & HR7	441500, 405500	NO _x	9.74
		NO ₂	7.58
		PM ₁₀	12.05
		PM _{2.5}	6.90
HR8 - HR11	438500, 405500	NO _x	10.54
		NO ₂	8.16
		PM ₁₀	11.47
		PM _{2.5}	6.71
HR12 - HR14 & HR16 - HR21	437500, 405500	NO _x	12.04
		NO ₂	9.24
		PM ₁₀	11.78
		PM _{2.5}	6.77
HR15	437500, 404500	NO _x	10.16
		NO ₂	7.88
		PM ₁₀	11.57
		PM _{2.5}	6.64
HR22 – HR26	437500, 406500	NO _x	11.22
		NO ₂	8.65
		PM ₁₀	10.54
		PM _{2.5}	6.59

Similar to emission factors, background concentrations for 2026 were used to represent predicted background concentrations during the future year operation scenarios.

Model Verification

The predicted results from a dispersion model may differ from measured concentrations for many reasons, including:

- Estimates of background concentrations;
- Uncertainties in source activity data such as traffic flows and emission factors;
- Variations in meteorological conditions;
- Overall model limitations; and
- Uncertainties associated with monitoring data, including locations.

Model verification is the process by which these and other uncertainties are investigated and where possible minimised. In reality, the differences between modelled and monitored results are likely to be a combination of all of these aspects.

Verification was undertaken for 2019, using traffic data, meteorological data, and monitoring results from this year. The verification process was undertaken at representative monitoring locations adjacent to the affected road network. Using 2019 data provided a worst case scenario when compared to using 2022 data.

DEFRA guidance LAQM.TG22² advises that the initial verification should consider the performance of the model in predicting road sourced NO_x. The unadjusted roadside NO_x predictions are presented in Table A6 alongside the monitored road contributions obtained from the NO_x to NO₂ Calculator (v.8.1). The unadjusted road NO_x concentrations reflect predictions following actions taken to reduce the uncertainties of input data for the model.

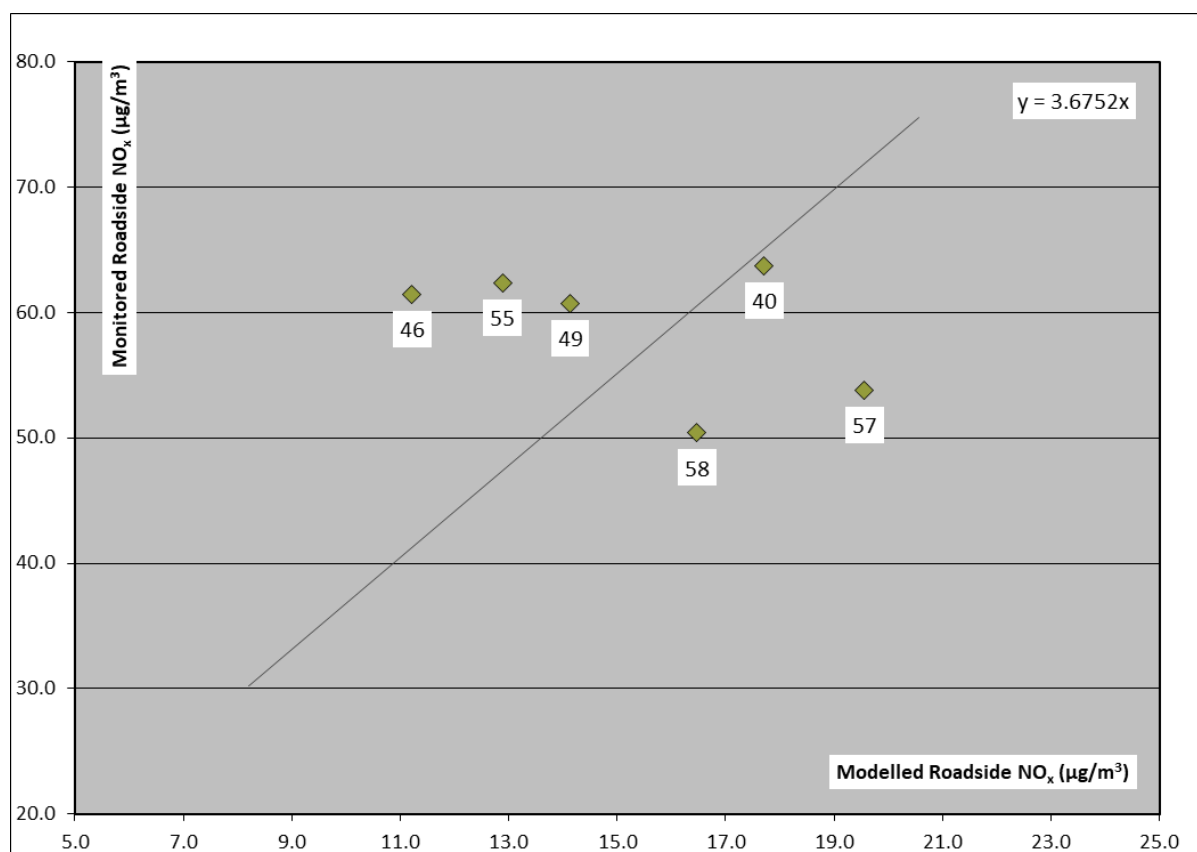
Table A6: Unadjusted NO_x Results

Site ID	Monitored Road NO _x Concentration (µg/m ³)	Unadjusted Modelled Road NO _x Concentration (µg/m ³)	Adjusted % Difference [(Modelled - Monitored)/Monitored] x 100
46	61.45	11.22	-82%
49	60.74	14.13	-77%
55	62.39	12.89	-79%
57	53.81	19.56	-64%
58	50.41	16.47	-67%
40	63.72	17.71	-72%

The modelled NO_x results show an underprediction of modelled NO_x concentrations. As reasonable efforts were made to reduce inaccuracies it was necessary to apply a factor to adjust the modelling results in order to improve the accuracy of the model.

The monitored and modelled NO_x road contributions were therefore graphed and the equation of the trend line based on the linear progression through zero was calculated, as shown in Graph A1 below.

Graph A1 - Modelled and Monitored NO_x Road Contributions



The adjustment factor (3.6752) was applied to the modelled road NO_x contributions with adjusted results presented Table A7.

Table A7: Adjusted NO_x Results

Site ID	Monitored Road NO _x Concentration (µg/m³)	Adjusted Modelled Road NO _x Concentration (µg/m³)	Adjusted % Difference [(Modelled - Monitored)/Monitored] x 100
46	61.45	41.23	-33%
49	60.74	51.95	-14%
55	62.39	47.36	-24%
57	53.81	71.89	+34%
58	50.41	60.55	+20%
40	63.72	65.09	+2%

The adjusted modelled NO₂ concentrations are compared with the total monitored NO₂ concentrations in Table A8. LAQM.TG22¹ recommends that modelled and monitored NO₂ values are within 25%.

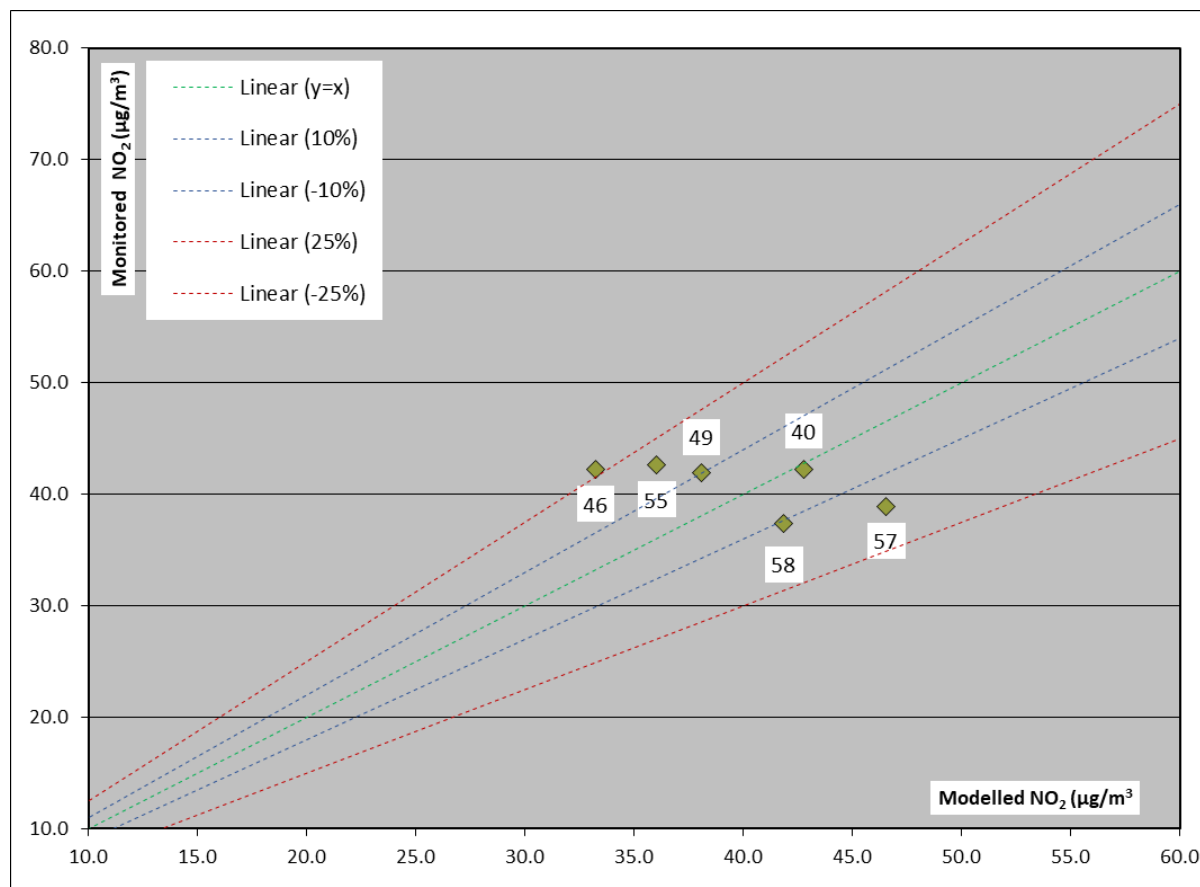
Table A8: Adjusted Modelled and Monitored NO₂ Concentrations

Site ID	Monitored NO ₂ Concentration (µg/m³)	Adjusted Modelled NO ₂ Concentration (µg/m³)	% Difference
46	42.20	33.23	-21%
49	41.90	38.08	-9%
55	42.60	36.04	-15%
57	38.90	46.56	+20%

Site ID	Monitored NO ₂ Concentration (µg/m ³)	Adjusted Modelled NO ₂ Concentration (µg/m ³)	% Difference
58	37.40	41.82	+12%
40	42.20	42.78	+1%

A graphical representation of the adjusted NO₂ concentrations is provided within Graph A6.2.2.

Graph A2 - Comparison of Monitored and Adjusted Modelled NO₂ Concentrations



As demonstrated in Table A8 and Graph A2, modelled NO₂ concentrations following adjustment are within 25% of monitored concentrations at all locations and within 10% at two sites. The results also show no overall tendency for the model to over or underestimate.

Additional methods for determining model performance are provided below in accordance with Box 7.20 of LAQM.TG22¹ are presented in Table A9. This includes correlation coefficient; root mean square error and fractional bias.

Table A9: Model Performance

Method	Calculated Value	Ideal Value
Correlation Coefficient	-0.63	1.00
Root Mean Square Error	6.01 (15.02%)	0.0 (<25%)
Fractional Bias	0.03	0.0

BMBC undertakes PM₁₀ monitoring at the A635 Roadside automatic analyser which enables the calculation of separate PM₁₀ verification factor. The process is shown in Table A10.

Table A10: PM₁₀ Verification Process

Site ID	Modelled Road PM ₁₀ Contribution	Monitored Road PM ₁₀ Contribution	Background PM ₁₀	Monitored PM ₁₀	Adjustment Factor
MC1	1.17 ^a	8.65 ^b	11.35 ^c	20.00 ^e	7.3932 ^f

Where:

- ^a Raw modelled road contribution from ADMS model file (.plt)
- ^b Monitored road contribution (monitored average concentration – background concentration)
- ^c DEFRA background concentration
- ^d Monitored annual average PM concentration; and
- ^e Adjustment Factor [Monitored Road Contribution/Modelled Road Contribution] - Applied to Modelled Road PM Contribution

The verification factor of 7.3932 was applied to all PM₁₀ and PM_{2.5} modelling results.

Appendix B - Assessment Results

Predicted Concentrations at Sensitive Receptors

Nitrogen Dioxide (NO₂)

Annual mean NO₂ concentrations were predicted for 2026 DM and DS scenarios and are summarised in Table B1.

Table B1: Predicted Annual Mean NO₂ Concentrations

Potential Impact		Predicted Annual Mean Concentration (µg/m ³)		
		DM	DS	Change
HR1	Brookfield Road	14.90	15.38	0.48
HR2	13 Sorrento Way	9.35	9.44	0.09
HR3	Darfield Primary School	8.94	8.97	0.03
HR4	16 Belvedere Drive	10.28	10.41	0.13
HR5	Tempest Avenue	14.19	14.63	0.44
HR6	2 Quern Way	12.75	13.11	0.36
HR7	23 Highfield Road	15.52	16.05	0.53
HR8	553 Doncaster Road	13.75	14.11	0.36
HR9	774 Doncaster Road	16.47	17.01	0.54
HR10	439 Doncaster Road	15.27	15.73	0.46
HR11	714 Doncaster Road	19.16	19.87	0.71
HR12	Oakhill Primary School	19.11	19.68	0.57
HR13	584 Doncaster Road	23.48	24.33	0.85
HR14	88 Wombwell Lane	23.53	23.79	0.26
HR15	15 Wombwell Lane	25.75	26.05	0.30
HR16	1 Nursery Gardens	14.26	14.55	0.29
HR17	47 Hunningley Close	15.91	16.32	0.41
HR18	Highgrove Care Home	18.04	18.23	0.19
HR19	494 Doncaster Road	32.07	32.44	0.37
HR20	1 Grange Lane	24.26	24.57	0.31
HR21	1 Grange Lane	25.91	26.21	0.30
HR22	117 Grange Lane	20.62	20.82	0.20
HR23	119 Grange Lane	24.19	24.39	0.20
HR24	98 Grange Lane	23.68	23.89	0.21
HR25	206 Pontefract Road	17.95	18.06	0.11
HR26	10 Rotherham Road	18.80	18.93	0.13

As indicated in Table B1, annual mean NO₂ concentrations were below the relevant AQO at all receptor locations considered. Predicted impacts on annual mean NO₂ concentrations are summarised in Table B2.

Table B2: Predicted NO₂ Impacts

Potential Impact		% Change in Concentration Relative to AQO	Long Term Average Concentration	IAQM Impact Descriptor
HR1	Brookfield Road	1.20	75% or Less of AQO	Negligible
HR2	13 Sorrento Way	0.23	75% or Less of AQO	Negligible
HR3	Darfield Primary School	0.08	75% or Less of AQO	Negligible
HR4	16 Belvedere Drive	0.33	75% or Less of AQO	Negligible
HR5	Tempest Avenue	1.10	75% or Less of AQO	Negligible
HR6	2 Quern Way	0.90	75% or Less of AQO	Negligible
HR7	23 Highfield Road	1.33	75% or Less of AQO	Negligible
HR8	553 Doncaster Road	0.90	75% or Less of AQO	Negligible
HR9	774 Doncaster Road	1.35	75% or Less of AQO	Negligible
HR10	439 Doncaster Road	1.15	75% or Less of AQO	Negligible
HR11	714 Doncaster Road	1.78	76-94% of AQO	Negligible
HR12	Oakhill Primary School	1.43	75% or Less of AQO	Negligible
HR13	584 Doncaster Road	2.12	75% or Less of AQO	Negligible
HR14	88 Wombwell Lane	0.65	75% or Less of AQO	Negligible
HR15	15 Wombwell Lane	0.75	75% or Less of AQO	Negligible
HR16	1 Nursery Gardens	0.73	75% or Less of AQO	Negligible
HR17	47 Hunningley Close	1.03	75% or Less of AQO	Negligible
HR18	Highgrove Care Home	0.48	75% or Less of AQO	Negligible
HR19	494 Doncaster Road	0.92	75% or Less of AQO	Negligible
HR20	1 Grange Lane	0.77	75% or Less of AQO	Negligible
HR21	1 Grange Lane	0.75	75% or Less of AQO	Negligible
HR22	117 Grange Lane	0.50	75% or Less of AQO	Negligible
HR23	119 Grange Lane	0.50	75% or Less of AQO	Negligible
HR24	98 Grange Lane	0.53	75% or Less of AQO	Negligible
HR25	206 Pontefract Road	0.27	75% or Less of AQO	Negligible
HR26	10 Rotherham Road	0.32	75% or Less of AQO	Negligible

As indicated in Table B2 impacts on annual mean NO₂ concentrations as a result of road vehicle exhaust emissions associated with the development were predicted to be negligible at all receptor locations. It is therefore considered that the overall impacts as a result of the proposed development are not significant. Further justifications are discussed in Section 5.2 of the main report.

Particulate Matter (PM₁₀)

Annual mean PM₁₀ concentrations were predicted for 2026 DM and DS scenarios and are summarised Table B3.

Table B3: Predicted Annual Mean PM₁₀ Concentrations

Potential Impact	Predicted Annual Mean Concentration (µg/m ³)			
	DM	DS	Change	
HR1	Brookfield Road	17.68	18.06	0.38

Potential Impact		Predicted Annual Mean Concentration ($\mu\text{g}/\text{m}^3$)		
		DM	DS	Change
HR2	13 Sorrento Way	13.47	13.53	0.06
HR3	Darfield Primary School	10.74	10.77	0.03
HR4	16 Belvedere Drive	14.13	14.22	0.09
HR5	Tempest Avenue	17.16	17.51	0.35
HR6	2 Quern Way	15.91	16.18	0.27
HR7	23 Highfield Road	18.05	18.47	0.42
HR8	553 Doncaster Road	15.61	15.89	0.28
HR9	774 Doncaster Road	17.71	18.14	0.43
HR10	439 Doncaster Road	16.77	17.12	0.35
HR11	714 Doncaster Road	19.82	20.38	0.56
HR12	Oakhill Primary School	16.53	16.82	0.29
HR13	584 Doncaster Road	19.57	20.07	0.50
HR14	88 Wombwell Lane	21.78	21.98	0.20
HR15	15 Wombwell Lane	24.45	24.69	0.24
HR16	1 Nursery Gardens	14.87	15.06	0.19
HR17	47 Hunningley Close	15.99	16.26	0.27
HR18	Highgrove Care Home	16.38	16.48	0.10
HR19	494 Doncaster Road	22.83	23.03	0.20
HR20	1 Grange Lane	21.64	21.85	0.21
HR21	1 Grange Lane	17.68	18.06	0.38
HR22	117 Grange Lane	13.47	13.53	0.06
HR23	119 Grange Lane	10.74	10.77	0.03
HR24	98 Grange Lane	14.13	14.22	0.09
HR25	206 Pontefract Road	17.16	17.51	0.35
HR26	10 Rotherham Road	15.91	16.18	0.27

As indicated in Table B3 annual mean PM_{10} concentrations were below the relevant AQO at all receptor locations considered. Predicted impacts on annual mean PM_{10} concentrations are summarised in Table B4.

Table B4: Predicted PM_{10} Impacts

Potential Impact		% Change in Concentration Relative to AQO	Long Term Average Concentration	IAQM Impact Descriptor
HR1	Brookfield Road	0.95	75% or Less of AQO	Negligible
HR2	13 Sorrento Way	0.15	75% or Less of AQO	Negligible
HR3	Darfield Primary School	0.07	75% or Less of AQO	Negligible
HR4	16 Belvedere Drive	0.23	75% or Less of AQO	Negligible
HR5	Tempest Avenue	0.88	75% or Less of AQO	Negligible
HR6	2 Quern Way	0.67	75% or Less of AQO	Negligible
HR7	23 Highfield Road	1.05	75% or Less of AQO	Negligible

Potential Impact		% Change in Concentration Relative to AQO	Long Term Average Concentration	IAQM Impact Descriptor
HR8	553 Doncaster Road	0.70	75% or Less of AQO	Negligible
HR9	774 Doncaster Road	1.08	75% or Less of AQO	Negligible
HR10	439 Doncaster Road	0.88	75% or Less of AQO	Negligible
HR11	714 Doncaster Road	1.40	75% or Less of AQO	Negligible
HR12	Oakhill Primary School	0.72	75% or Less of AQO	Negligible
HR13	584 Doncaster Road	1.25	75% or Less of AQO	Negligible
HR14	88 Wombwell Lane	0.50	75% or Less of AQO	Negligible
HR15	15 Wombwell Lane	0.60	75% or Less of AQO	Negligible
HR16	1 Nursery Gardens	0.48	75% or Less of AQO	Negligible
HR17	47 Hunningley Close	0.68	75% or Less of AQO	Negligible
HR18	Highgrove Care Home	0.25	75% or Less of AQO	Negligible
HR19	494 Doncaster Road	0.50	75% or Less of AQO	Negligible
HR20	1 Grange Lane	0.53	75% or Less of AQO	Negligible
HR21	1 Grange Lane	0.95	75% or Less of AQO	Negligible
HR22	117 Grange Lane	0.15	75% or Less of AQO	Negligible
HR23	119 Grange Lane	0.07	75% or Less of AQO	Negligible
HR24	98 Grange Lane	0.23	75% or Less of AQO	Negligible
HR25	206 Pontefract Road	0.88	75% or Less of AQO	Negligible
HR26	10 Rotherham Road	0.67	75% or Less of AQO	Negligible

As indicated in Table B4 impacts on annual mean PM₁₀ concentrations as a result of road vehicle exhaust emissions associated with the development were predicted to be negligible at all receptor locations.

It is therefore considered that the overall impacts as a result of the Proposed Development are not significant. Further justifications are discussed in Section 5.2 of the main report.

Particulate Matter (PM_{2.5})

Annual mean PM_{2.5} concentrations were predicted for 2026 DM and DS scenarios and are summarised Table B5.

Table B5: Predicted Annual Mean PM_{2.5} Concentrations

Potential Impact		Predicted Annual Mean Concentration (µg/m ³)		
		DM	DS	Change
HR1	Brookfield Road	9.78	9.97	0.19
HR2	13 Sorrento Way	7.58	7.62	0.04
HR3	Darfield Primary School	6.76	6.77	0.01
HR4	16 Belvedere Drive	7.92	7.98	0.06
HR5	Tempest Avenue	9.50	9.68	0.18
HR6	2 Quern Way	8.91	9.05	0.14
HR7	23 Highfield Road	10.02	10.24	0.22
HR8	553 Doncaster Road	8.87	9.02	0.15

Potential Impact		Predicted Annual Mean Concentration ($\mu\text{g}/\text{m}^3$)		
		DM	DS	Change
HR9	774 Doncaster Road	9.96	10.19	0.23
HR10	439 Doncaster Road	9.47	9.66	0.19
HR11	714 Doncaster Road	11.05	11.37	0.32
HR12	Oakhill Primary School	9.26	9.40	0.14
HR13	584 Doncaster Road	10.85	11.10	0.25
HR14	88 Wombwell Lane	11.98	12.07	0.09
HR15	15 Wombwell Lane	13.35	13.47	0.12
HR16	1 Nursery Gardens	8.39	8.49	0.10
HR17	47 Hunningley Close	8.99	9.12	0.13
HR18	Highgrove Care Home	9.17	9.22	0.05
HR19	494 Doncaster Road	12.55	12.64	0.09
HR20	1 Grange Lane	11.92	12.03	0.11
HR21	1 Grange Lane	9.78	9.97	0.19
HR22	117 Grange Lane	7.58	7.62	0.04
HR23	119 Grange Lane	6.76	6.77	0.01
HR24	98 Grange Lane	7.92	7.98	0.06
HR25	206 Pontefract Road	9.50	9.68	0.18
HR26	10 Rotherham Road	8.91	9.05	0.14

As indicated in Table B5 annual mean $\text{PM}_{2.5}$ concentrations were below the relevant AQO at all receptor locations considered. Predicted impacts on annual mean $\text{PM}_{2.5}$ concentrations are summarised in Table B6.

Table B6: Predicted $\text{PM}_{2.5}$ Impacts

Potential Impact		% Change in Concentration Relative to AQO	Long Term Average Concentration	IAQM Impact Descriptor
HR1	Brookfield Road	0.76	75% or Less of AQO	Negligible
HR2	13 Sorrento Way	0.16	75% or Less of AQO	Negligible
HR3	Darfield Primary School	0.04	75% or Less of AQO	Negligible
HR4	16 Belvedere Drive	0.24	75% or Less of AQO	Negligible
HR5	Tempest Avenue	0.72	75% or Less of AQO	Negligible
HR6	2 Quern Way	0.56	75% or Less of AQO	Negligible
HR7	23 Highfield Road	0.88	75% or Less of AQO	Negligible
HR8	553 Doncaster Road	0.60	75% or Less of AQO	Negligible
HR9	774 Doncaster Road	0.92	75% or Less of AQO	Negligible
HR10	439 Doncaster Road	0.76	75% or Less of AQO	Negligible
HR11	714 Doncaster Road	1.28	75% or Less of AQO	Negligible
HR12	Oakhill Primary School	0.56	75% or Less of AQO	Negligible
HR13	584 Doncaster Road	1.00	75% or Less of AQO	Negligible
HR14	88 Wombwell Lane	0.36	75% or Less of AQO	Negligible
HR15	15 Wombwell Lane	0.48	75% or Less of AQO	Negligible

Potential Impact		% Change in Concentration Relative to AQO	Long Term Average Concentration	IAQM Impact Descriptor
HR16	1 Nursery Gardens	0.40	75% or Less of AQO	Negligible
HR17	47 Hunningley Close	0.52	75% or Less of AQO	Negligible
HR18	Highgrove Care Home	0.20	75% or Less of AQO	Negligible
HR19	494 Doncaster Road	0.36	75% or Less of AQO	Negligible
HR20	1 Grange Lane	0.44	75% or Less of AQO	Negligible
HR21	1 Grange Lane	0.76	75% or Less of AQO	Negligible
HR22	117 Grange Lane	0.16	75% or Less of AQO	Negligible
HR23	119 Grange Lane	0.04	75% or Less of AQO	Negligible
HR24	98 Grange Lane	0.24	75% or Less of AQO	Negligible
HR25	206 Pontefract Road	0.72	75% or Less of AQO	Negligible
HR26	10 Rotherham Road	0.56	75% or Less of AQO	Negligible

As indicated in Table B6 impacts on annual mean PM_{2.5} concentrations as a result of road vehicle exhaust emissions associated with the development were predicted to be negligible at all receptor locations.

It is therefore considered that the overall impacts as a result of the Proposed Development are not significant. Further justifications are discussed in Section 5.3 and Table 16.

Appendix C – IAQM Construction Phase Methodology

There is the potential for fugitive dust emissions to occur as a result of construction phase activities. These were assessed in accordance with the methodology outlined within the IAQM guidance. Activities are divided into four types to reflect their different potential impacts. These are:

- Demolition
- Earthworks;
- Construction; and
- Trackout.

The potential for dust emissions was assessed for each activity that is likely to take place and considered three separate dust effects:

- Annoyance due to dust soiling;
- Harm to ecological receptors; and
- The risk of health effects due to a significant increase in exposure to PM₁₀ and PM_{2.5}.

The assessment steps are detailed below.

Step 1

Step 1 screens the requirement for a more detailed assessment. Should human receptors be identified within 250 m from the site boundary or 50 m from the construction vehicle route up to 500 m from the site entrance, then the assessment should proceed to Step 2. Additionally, should ecological receptors be identified within 50 m of the boundary site or 50 m from the construction vehicle route up to 500 m from the site entrance, then the assessment should also proceed to Step 2.

Should sensitive receptors not be present within the relevant distances then negligible impacts would be expected and further assessment is not necessary.

Step 2

Step 2 assesses the risk of potential dust impacts. A site is allocated to a risk category based on two factors:

- The scale and nature of the works, which determines the magnitude of dust arising as: small, medium or large (Step 2A); and
- The sensitivity of the area to dust impacts, which can be defined as low, medium or high sensitivity (Step 2B).

The two factors are combined in Step 2C to determine the risk of dust impacts without mitigation applied. Step 2A defines the potential magnitude of dust emission through the construction phase. The relevant criteria are summarised in Table C1.

Table C1: Construction Dust - Magnitude of Emission

Magnitude	Activity	Criteria
Large	Demolition	<ul style="list-style-type: none"> Total building volume greater than 50,000m³ Potentially dusty construction material (e.g. concrete) On-site crushing and screening Demolition activities greater than 20m above ground level
	Earthworks	<ul style="list-style-type: none"> Total site area greater than 10,000m² Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) More than 10 heavy earth moving vehicles active at any one time Formation of bunds greater than 8m in height More than 100,000 tonnes of material moved
	Construction	<ul style="list-style-type: none"> Total building volume greater than 100,000m³ On site concrete batching Sandblasting
	Trackout	<ul style="list-style-type: none"> More than 50 Heavy Duty Vehicle (HDV) trips per day Potentially dusty surface material (e.g. high clay content) Unpaved road length greater than 100m
Medium	Demolition	<ul style="list-style-type: none"> Total building volume 20,000m³ to 50,000m³ Potentially dusty construction material Demolition activities 10m to 20m above ground level
	Earthworks	<ul style="list-style-type: none"> Total site area 2,500m² to 10,000m² Moderately dusty soil type (e.g. silt) 5 to 10 heavy earth moving vehicles active at any one time Formation of bunds 4m to 8m in height Total material moved 20,000 tonnes to 100,000 tonnes
	Construction	<ul style="list-style-type: none"> Total building volume 25,000m³ to 100,000m³ Potentially dusty construction material (e.g. concrete) On site concrete batching
	Trackout	<ul style="list-style-type: none"> 10 to 50 HDV trips per day Moderately dusty surface material (e.g. high clay content) Unpaved road length 50m to 100m
Small	Demolition	<ul style="list-style-type: none"> Total building volume under 20,000m³ Construction material with low potential for dust release (e.g. metal cladding or timber) Demolition activities less than 10m above ground level Demolition during wetter months
	Earthworks	<ul style="list-style-type: none"> Total site area less than 2,500m² Soil type with large grain size (e.g. sand) Less than 5 heavy earth moving vehicles active at any one time Formation of bunds less than 4m in height Total material moved less than 20,000 tonnes Earthworks during wetter months
	Construction	<ul style="list-style-type: none"> Total building volume less than 25,000m³ Construction material with low potential for dust release (e.g. metal cladding or timber)
	Trackout	<ul style="list-style-type: none"> <10 HDV (3.5t) outward movements in any one day Surface material with low potential for dust release

Magnitude	Activity	Criteria
		<ul style="list-style-type: none"> Unpaved road length <50m

Step 2B defines the sensitivity of the area around the development site for construction, earthworks and trackout. The factors influencing the sensitivity of the area are shown in Table C2.

Table C2: Examples of Factors Defining Sensitivity of an Area

Sensitivity	Receptors	
	Human	Ecological
High	<ul style="list-style-type: none"> Users expect of high levels of amenity High aesthetic or value property People expected to be present continuously for extended periods of time Locations where members of the public are exposed over a time period relevant to the AQO for PM₁₀ e.g. residential properties, hospitals, schools and residential care homes 	<ul style="list-style-type: none"> Internationally or nationally designated site e.g. Special Area of Conservation
Medium	<ul style="list-style-type: none"> Users would expect to enjoy a reasonable level of amenity Aesthetics or value of their property could be diminished by soiling 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 e.g. parks and places of work 	<ul style="list-style-type: none"> Nationally designated site e.g. Sites of Special Scientific Interest
Low	<ul style="list-style-type: none"> Enjoyment of amenity would not reasonably be expected Property would not be expected to be diminished in appearance Transient exposure, where people would only be expected to be present for limited periods. e.g. public footpaths, playing fields, shopping streets, playing fields, farmland, footpaths, short term car park and roads 	<ul style="list-style-type: none"> Locally designated site e.g. Local Nature Reserve

The sensitivity of the area to dust soiling effects on people and property is shown in Table C3.

Table C3: Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		Less than 20	Less than 50	Less than 100	Less than 250
High	More than 100	High	High	Medium	Low
	10 - 100	High	Medium	Low	Low
	1 - 10	Medium	Low	Low	Low
Medium	More than 1	Medium	Low	Low	Low
Low	More than 1	Low	Low	Low	Low

Table C4 outlines the sensitivity of the area to human health impacts.

Table C4: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	Number of Receptors	Distance from the Source (m)			
			Less than 20	Less than 50	Less than 100	Less than 250
High	Greater than 32µg/m ³	More than 100	High	High	High	Medium
		10 - 100	High	High	Medium	Low
		1 - 10	High	Medium	Low	Low
	28 - 32µg/m ³	More than 100	High	High	Medium	Low

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	Number of Receptors	Distance from the Source (m)				
			Less than 20	Less than 50	Less than 100	Less than 250	
		10 - 100	High	Medium	Low	Low	
		1 - 10	High	Medium	Low	Low	
	24 - 28µg/m ³	More than 100	High	Medium	Low	Low	
		10 - 100	High	Medium	Low	Low	
		1 - 10	Medium	Low	Low	Low	
	Less than 24µg/m ³	More than 100	Medium	Low	Low	Low	
		10 - 100	Low	Low	Low	Low	
	Less than 24µg/m ³	More than 100	Medium	Low	Low	Low	
		10 - 100	Low	Low	Low	Low	
		1 - 10	Low	Low	Low	Low	
	Medium	Greater than 32µg/m ³	More than 10	High	Medium	Low	Low
			1 - 10	Medium	Low	Low	Low
28 - 32µg/m ³		More than 10	Medium	Low	Low	Low	
		1 - 10	Low	Low	Low	Low	
24 - 28µg/m ³		More than 10	Low	Low	Low	Low	
		1 - 10	Low	Low	Low	Low	
Less than 24µg/m ³		More than 10	Low	Low	Low	Low	
		1 - 10	Low	Low	Low	Low	
Low	-	More than 1	Low	Low	Low	Low	

Table C5 outlines the sensitivity of the area to ecological impacts.

Table C5: Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from the Source (m)	
	Less than 20	Less than 50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Step 2C combines the dust emission magnitude with the sensitivity of the area to determine the risk of unmitigated impacts.

Table C6 outlines the risk category from demolition activities.

Table C6: Dust Risk Category from Demolition

Receptor Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Medium
Medium	High	Medium	Low
Low	Medium	Low	Negligible

Table C7 outlines the risk category from earthworks and construction activities.

Table C7: Dust Risk Category from Earthworks and Construction

Receptor Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Medium	Low
Low	Low	Low	Negligible

Table C8 outlines the risk category from trackout.

Table C8: Dust Risk Category from Trackout

Receptor Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Medium	Low
Low	Low	Low	Negligible

Step 3

Step 3 requires the identification of site-specific mitigation measures within the IAQM guidance to reduce potential dust impacts based upon the relevant risk categories identified in Step 2. For sites with negligible risk mitigation measures beyond those required by legislation are not required. However, additional controls may be applied as part of good practice.

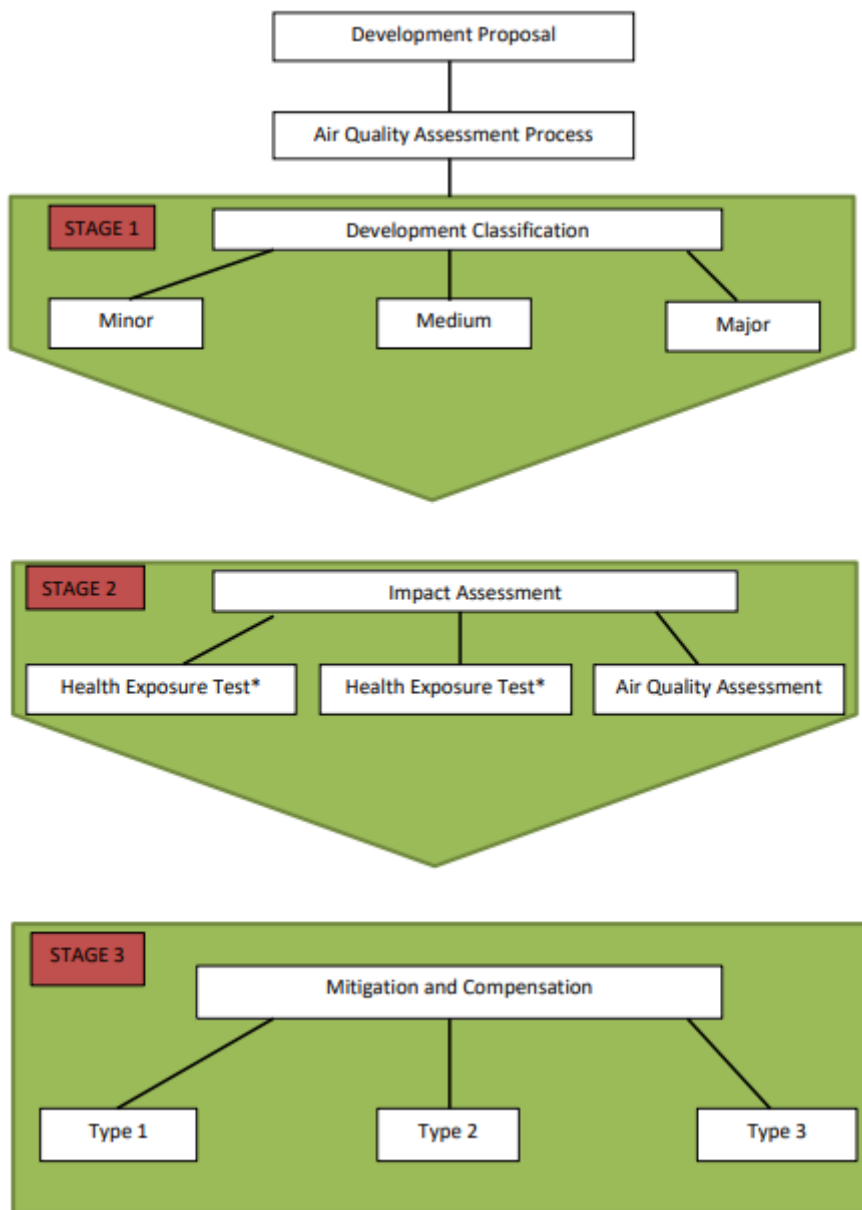
Step 4

Once the risk of dust impacts has been determined and the appropriate mitigation measures identified, the final step is to determine the significance of any residual impacts. For almost all construction activity, the aim should be to control effects using effective mitigation.

Experience shows that this is normally possible. Hence the residual effect will normally be not significant.

Appendix D – BMBC Air Quality and Emissions Guidance Process

The figure below summaries the Air Quality Assessment and Mitigation Flow Chart:



Stage 1 - Development Type Classification

The three levels of development classification were determined using the Department for Transport (DfT) criteria¹². These are outlined in Table D1.

Table D1: Criteria for Development Classification

Land Use	Description	Criteria
Food Retail (A1)	Retail sale of food goods to the public - supermarkets, superstore, convenience food store	> 800m ² Gross Floor Area (GFA)

¹² <http://webarchive.nationalarchives.gov.uk/20100409053417/http://www.dft.gov.uk/adobe/pdf/165237/202657/guidanceontaappendixb>

Land Use	Description	Criteria
Non-Food Retail (A1)	Retail sale of non-food goods to the public; but includes sandwich bars or other cold food purchased and consumed off site	> 1,500m ² (GFA)
Financial and professional services (A2)	Banks, building societies and bureaux de change, professional services, estate agents, employment agencies, betting shops	> 2,500m ² (GFA)
Restaurants and Cafes (A3)	Use for the sale of food for consumption on the premises	> 2,500m ² (GFA)
Drinking Establishments (A4)	Use as a public house, wine-bar for consumption on or off the premises	> 600m ² (GFA)
Hot Food Takeaway (A5)	Use for the sale of hot food for consumption on or off the premises	> 500m ² (GFA)
Business (B1)	(a) Offices other than in use within Class A2 (financial & professional) (b) Research & development – laboratories, studios (c) Light industry	> 2,500m ² (GFA)
General industrial (B2)	General industry (other than B1).	> 4,000m ² (GFA)
Storage or Distribution (B8)	Storage or distribution centres - wholesale warehouses, distribution centres & repositories	> 5,000m ² (GFA)
Hotels (C1)	Hotels, boarding houses & guest houses	> 100 bedrooms
Residential Institutions (C2)	Hospitals, nursing homes used for residential accommodation and care	> 50 beds
Residential Institutions (C2)	Boarding schools and training centres	> 150 students
Residential Institutions (C2)	Institutional hostels, homeless centres	> 400 residents
Dwelling Houses (C3)	Dwellings for individuals, families or not more than six people in a single household	> 50 units
Non-Residential Institutions (D1)	Medical & health services, museums, public libraries, art galleries, non-residential education, places of worship and church halls	> 1,000m ² (GFA)
Assembly and Leisure (D2)	Cinemas, dance & concert halls, sports halls, swimming, skating, gym, bingo, and other facilities not involving motorised vehicles or firearms	> 1,500m ² (GFA)
Other: 1. Any development generating 30 or more two-way vehicle movements in any hour 2. Any developments generating 100 or more two-way vehicle movements per day 3. Any development proposing 100 or more parking spaces 4. Any relevant development proposed in a location where the local transport infrastructure is inadequate 5. Any relevant development proposed in a location adjacent to an AQMA		

The development classification is defined in accordance with the following principles:

- MINOR: Development proposals that fall below the criteria in Table D1.
- MEDIUM: Development proposals that meet the requirements in Table D1.
- MAJOR: Development proposals that meet the requirements in Table D1 and the additional criteria set out in Table D2.

Additional Trigger Criteria for Major Developments

Table D2: Additional Trigger Criteria for Major Developments

Description
Where the proposed development falls within the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 2011 and includes air quality and/or transport as a specific likely impact;
Proposals located within an AQMA;
Proposals that could increase the existing traffic flow on roads of > 10,000 Annual Average Daily Traffic (AADT) by 5% or more;
Proposals that increase traffic 5% on road canyons with > 5,000 AADT;
Proposals that could introduce or significantly alter congestion (DfT Congestion) and includes the introduction of substantial road infrastructure changes;
Proposals that reduce average speeds by more than 10kph;
Proposals that include additional HDV movements by more than 10% of total trips; and
Where significant demolition and construction works are proposed.

Stage 2 - Air Quality Impact Assessment

Minor and Medium Developments

Smaller development proposals may not in themselves create an additional air quality problem but will add to local air pollution and potentially introduce more people likely to be exposed to existing levels of poor air quality. An assessment of the likelihood of introducing additional exposure will be determined using the following criteria:

- The proposal is adjacent to or within an AQMA;
- The proposal is in a location 20m from roads at or above the relevant national objective highlighted on the DEFRA GIS modelled maps;
- The proposal is one of the Land Use types:
 - C1 to C3 in Table D1;
 - C4 (Homes of Multiple Occupation); and
 - D1 in Table D1
- The proposal is within 20m of roads with > 10,000 AADT.

The outcome of the exposure assessment will determine the level of mitigation required make the development acceptable. Should there be no acceptable mitigation the recommendation to the planning officer will be to consider refusing the proposal on air quality grounds.

Major Developments

The scale and nature of this type of proposal is such that a detailed air quality assessment will be required to determine the impact on public health and the local environment. The assessment requires the identification of the level of exposure through the change in pollutant concentrations including cumulative impacts arising from the proposal, during both demolition/construction operations and operational phases. Mitigation measures should be identified and modelled where practicable.

The calculation of pollutant emissions costs from the development.

- A. The methodology to be used for the determination of pollutant concentration change should meet the requirements of the LAQM TG(22)³.
- B. The pollutant emissions costs calculation will identify the environmental damage costs associated with the proposal and determine the amount (value) of mitigation that is expected to be spent on measures to mitigate the impacts. The calculation utilises the most recent DEFRA Emissions Factor Toolkit ⁴ to estimate the additional pollutant emissions from a proposed development and the latest DEFRA IGCB Air Quality Damage Costs for the specific pollutant of interest, to calculate the resultant damage costs⁵. The calculation process includes:
 - Identifying the additional trip rates generated by the proposal (from the Transport Assessment);
 - The emissions calculated for the pollutants of concern (NO_x and PM₁₀)
 - The air quality damage costs calculation for the specific pollutant emissions
 - The result is totalled for a five year period to enable mitigation implementation.

The calculation is summarised in the DEFRA guidance⁸ which provides further details on the damage cost process. The derived calculated damage costs for each major development are not for local authority use, but to assist the developer in assessing the proportionate financial commitment for the required mitigation.

Stage 3 – Mitigation

The outcome of Stage 2 (Assessment) identifies the level of air quality impact and is then used to determine the level of mitigation required to negate the potential effects upon health and the local environment.

The scale of damage cost will determine the level of appropriate mitigation required for specific proposals. Measure identification will be assisted by:

- Outcomes from the Transport Statement/Assessment;
- Specific needs identified in site specific spatial policy allocations;
- Travel Awareness/Planning and/or Highway Development where these are required;
- DEFRA's air quality guidance (Defra Measures Guidance)

Default mitigation measures are presented for each type of proposal that demonstrate a minimum requirement.

TYPE 1 (Minor) Proposal Mitigation:

If the proposal meets the exposure criteria in Stage 2, further mitigation is required to reduce the level of exposure. This will be in the form of:

- Possible short term screening monitoring or utilising the distance calculation provided by Defra (DEFRA Distance) at the proposed location to identify the level of exposure;
- Redesigning the proposal to reduce the ingress of pollution;

- Including a stand-off distance and/or vegetation boundary from the development.

Table D3 provides the minor default mitigation.

TYPE 1 (Minor) Proposal Default Mitigation

Table D3: Type 1 - Minor Proposal Default Mitigation

Development	Mitigation
Residential	1 charging point per unit (dwelling with dedicated parking) or 1 charging point per 10 spaces (unallocated parking)
Commercial/Retail:	10% of parking spaces
Industrial:	10% of parking spaces
Demolition/Construction	Adherence to the IAQM Best Practice Guidance for all demolition and construction works

TYPE 2 (Medium) Proposal Mitigation:

Proposals meeting the Type 2 criteria in table 1 will require a detailed Travel Plan. In respect of the Travel Plan it is essential that:

- The content of the travel plan is fully assessed prior to its approval in conjunction with local authority travel plan and highway development control officers. Pre-application advice will be essential.
- The agreed targets and objectives included in the travel plan are secured for implementation by mutual agreement of the local authority and the developer/applicant (normally by means of a Section 106 agreement).
- The outputs of the travel plan (typically trip levels and mode split) are annually monitored against the agreed targets and objectives.
- Should the travel plan not deliver the anticipated outputs or meet the targets and objectives further mitigation/alternative/compensation measures need to be identified and implemented.
- A named co-ordinator is essential to the success of the travel plan. For larger schemes a commitment in terms of staff resource allocation will be expected.

Table D4 provides the medium default mitigation.

TYPE 2 (Medium) Proposal Default Mitigation

Table D4: Type 2 – Medium Proposal Default Mitigation

Development	Mitigation
Residential	Travel Plan including agreed mechanisms for discouraging high emission vehicle use and encouraging modal shift (i.e. public transport, cycling and walking) as well as the uptake of low emission fuels and technologies.
	Improved pedestrian links to public transport stops.
	Provision of new bus stops infrastructure including shelters, raised kerbing, information displays.
	Provision of subsidised or free ticketing (Corporate and residential Metrocards, Student Metrocards).
	Site layout to include improved pedestrian pathways to encourage walking.

Development	Mitigation
	Improved convenient and segregated cycle paths to link to local cycle network.
Commercial Specific:	All commercial vehicles should comply with current or the most recent European Emission Standards from scheme opening, to be progressively maintained for the lifetime of the development.
	Fleet operations should provide a strategy for reducing emissions, including the uptake of low emission fuels and technologies such as ultra-low emission service vehicles.
	Fleet operators should consider joining schemes such as the South Yorkshire ECO Stars scheme

TYPE 3 (Major) Proposal Mitigation:

The pollution damage costs attributed to the proposal emission changes will determine the level of mitigation compensation required to offset impacts. A list of measures beyond the proposal scheme design are listed below. The type, scale of measures will be agreed with the planning authority.

Table D5 provides the medium default mitigation.

Table D5: Type 3 – Major Proposal Default Mitigation

Support measures to reduce the need to travel:
Alternative working practices – flexitime, teleworking, homeworking, videoconferencing, compressed work periods.
Local sourcing of staff, products, and raw materials.
Development and use of hub distribution centres employing low emission deliveries.
Provision of discounted on-site shopping, eating, child-care, banking facilities.
Support measures to reduce polluting motorised vehicle use:
Development of car clubs and car sharing with financial incentives and promotion.
Use of pooled low emission vehicles – cars, vans, taxis, bicycles.
Support smart driving training schemes.
Provision of dedicated low emission shuttle bus including managed pick-up and drop-off.
Contribution to the emerging low emission vehicle refuelling infrastructure.
Contribution to site low emission waste collection services.
Incentives for the take-up of low emission vehicle technologies and fuels.
Measures to support improved public transport:
Provision of new or enhanced public transport services to the site.
Shuttle services to public transport interchange, rail station or park and ride facilities.
Support improving information systems for public transport.
Promoting low emission bus service provision.
Support air quality monitoring programmes
Further measures to promote walking and cycling:
Improvements to district walking and cycling networks including lighting, shelters, and information points and timetables.
Support cycle training and awareness schemes.
Bike/e-bike hiring schemes.
Guaranteed ride home in emergencies.
Support secure and safe cycle parking facilities.

Measures to promote sustainable travel plans:
Support local travel to school and school travel plans initiatives.
Marketing aimed at persuading a switch to sustainable modes with incentives;
Promotion of subsidised/sponsored travel plan measures through social and other media.
Supporting community/ local organisation groups to promote sustainable travel.

Such agreed measures will be taken forward by condition where possible, or through the use of Section 106 agreements.

Mitigation Statements

Each development will require a brief mitigation statement which must include:

- The calculated damage cost (Major proposals).
- Proposed mitigation/compensation measures.
- Estimated mitigation cost (Major proposals) that is equivalent to the value of the emissions calculation (appropriate to the type and size of development and local policy requirements);
- A proposed demolition/construction management plan that includes:
 - A brief project description and likely sources of dust emissions;
 - Measures to be adopted to minimise dust emissions;
 - Emergency measures to be adopted in the event of unforeseen circumstances;
 - Incident logging and reporting procedures.

Validation checklist

A completed checklist is required for each of the proposals.



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