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LIDL GB LTD

HOYLAND, BARNSLEY

AIR QUALITY ASSESSMENT

JANUARY 2022

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LIDL GB LTD

HOYLAND, BARNSLEY

AIR QUALITY ASSESSMENT

JANUARY 2022

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CONTENTS

APPENDICES

DRAWINGS	TITLE	SCALE
GM12047-001	Existing Sensitive Receptor Locations	1:1,500

EXECUTIVE SUMMARY

An air quality assessment has been undertaken to accompany a planning application for a proposed Lidl supermarket off Cross Keys Lane in Hoyland, Barnsley.

For the construction phase of the development, the risk of dust soiling effects is classed as medium for earthworks and construction activities and high for trackout. The risk of human health effects is classed as low for earthworks, construction and trackout. Mitigation measures are proposed to reduce any potential impacts based on best practice guidance.

For the operational phase assessment, annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations have been modelled at five existing receptor locations using the most recent Emission Factor Toolkit available from DEFRA (v 11). Predicted annual mean pollutant concentrations have been compared to the relevant air quality objectives and target level.

In accordance with the Barnsley Metropolitan Borough Council document "Air Quality Emissions Good Practice Planning Guidance" (March 2020), an air quality Damage Cost Calculation has also been undertaken.

The impact of the development during the operational phase is predicted to be negligible at all five existing sensitive receptors that have been considered. Air quality effects are, therefore, considered to be 'not significant'.

The assessment demonstrates that the proposed development will not lead to an unacceptable risk from air pollution or to any breach of national air quality objectives. Therefore, the proposed development is compliant with national policy and there are no material reasons in relation to air quality why the proposed scheme should not proceed, subject to appropriate planning conditions.

1 INTRODUCTION

1.1 Background

1.1.1 Wardell Armstrong LLP (WA) has been commissioned by Lidl GB Ltd to undertake an air quality assessment to accompany a planning application for a proposed Lidl supermarket off Cross Keys Lane, Hoyland.

1.1.2 The north of the proposed development site is bound by open green space and residential dwellings. To the east of the site lies Cross Keys Lane, an access road for a public house, residential dwellings and industrial premises that are situated along the road. The south and west of the site are bound by Sheffield Road, and a roundabout that connects it to the A6195.

1.1.3 This report details the results of the air quality assessment which has been undertaken to accompany the planning application for the proposed development. The report discusses the potential dust and fine particulate matter impacts associated with the construction phase, and an assessment of the potential air quality impacts associated with the additional road traffic generated by the proposed development. Air pollutant concentrations are considered at existing sensitive receptor locations in the vicinity of the proposed development. As the proposals are for retail use, and no residential uses are proposed, the long-term air quality objectives are not considered within the proposed development site itself. The risk of breaches of the short-term objectives is considered within the assessment.

2 LEGISLATION AND POLICY CONTEXT

2.1 Relevant Air Quality Legislation and Guidance

2.1.1 The air quality assessment has been undertaken in accordance with the following legislation and guidance:

- EU Ambient Air Quality Directive 2008/50/EC (i.e. the CAFE Directive);
- The Environment Act 1995;
- Department of Environment, Food and Rural Affairs, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, July 2007;
- The Air Quality Standards Regulations 2010;
- Department for Environment, Food and Rural Affairs, Local Air Quality Management Technical Guidance LAQM.TG(16), February 2018;
- Ministry of Housing, Communities and Local Government, National Planning Policy Framework, July 2021; and
- Department for Communities and Local Government, Planning Practice Guidance: Air Quality, June 2021.

2.1.2 Further details of these documents are included in **Appendix A**.

2.2 Assessment Criteria

2.2.1 The relevant air quality objectives and limit values for this assessment are included within Table 1.

Table 1: Air Quality Objectives and Limit Values Relevant to the Assessment*

Pollutant	Objective/Limit Value	Averaging Period	Obligation
Nitrogen Dioxide (NO_2)	200µg/m^3, not to be exceeded more than 18 times a year	1-hour mean	All local authorities
	40µg/m^3	Annual mean	All local authorities
Particulate Matter (PM_{10})	50µg/m^3, not to be exceeded more than 35 times a year	24-hour mean	England, Wales and Northern Ireland
	40µg/m^3	Annual mean	England, Wales and Northern Ireland
Particulate Matter ($PM_{2.5}$)	Limit Value of 25µg/m^3	Annual mean	England, Wales and Northern Ireland
**In accordance with the Air Quality Standards Regulations 2010*			

2.2.2 Further details of where these objectives and limit values apply are provided in **Appendix A**.

3 ASSESSMENT METHODOLOGY

3.1 Consultation and Scope of Assessment

3.1.1 An assessment methodology was discussed with Chris Shields, Environmental Health Officer at Barnsley Metropolitan Borough Council (BMBC), via email correspondence between 26th November and 6th December 2021.

3.1.2 A summary of the consultation undertaken is provided in Table 2.

Table 2: Summary of Consultation

Assessment Stage	Proposed Method	Response
Construction phase assessment to consider dust and fine particulate matter (PM_{10})	Qualitative assessment in accordance with Institute of Air Quality Management (IAQM) guidance	No objection to method
Operational phase assessment to consider nitrogen dioxide (NO_2) and fine particulate matter (PM_{10} and $PM_{2.5}$)	Detailed assessment using the ADMS-Roads atmospheric dispersion model, in accordance with Environmental Protection UK (EPUK)/IAQM guidance, and with all predicted concentrations compared to air quality objectives/limit values.	No objection to method – additionally requested consideration of short-term objectives
	2019 meteorological data from Emley Moor No.2 recording station	No objection to method.
	Background NO_2, PM_{10} and $PM_{2.5}$ concentrations from 2018-based DEFRA default maps	No objection to method
	Assessment undertaken using EFT11 emission factors	No objection to method – requested detail on position on sensitivity analysis
	Model verification to be undertaken using BMBC NO_2 diffusion tube DT24, plus DT26, DT27 and DT28 (dependent on traffic data availability)	No objection to method.
	Defra Damage Cost Calculation to be undertaken	No objection to method.

3.1.3 Mr Shields confirmed the above methodology was acceptable on 6th December 2021.

3.2 Construction Phase Assessment

3.2.1 To assess the impacts associated with dust and fine particulate matter releases during the construction phase of the development, an assessment has been undertaken in accordance with guidance from the Institute of Air Quality Management (IAQM)[1].

[1] Institute of Air Quality Management, Guidance on the Assessment of Dust from Demolition and Construction, February 2014

Further details of the construction assessment methodology are provided in **Appendix B**.

3.2.2 The closest sensitive human receptors to where construction phase activities will take place are a mix of residential and commercial uses and are detailed in Table 3.

Table 3: Existing Sensitive Receptors Considered in the Construction Phase Assessment

Receptor	Direction from the Site	Approximate Distance from the Site Boundary (m)
Existing residential properties on Cross Keys Lane	North	Approximately 17m at closest point
Existing residential properties on Regent Street	East	Approximately 13m at closest point
The Keys Public House	South-east	Approximately 22m at closest point
Rockingham Colliery Cricket Club	South	Approximately 28m to car park

3.2.3 There are no ecological receptors, or potentially dust sensitive statutory designated habitat sites, within 50m of the site and/or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s). Ecological effects do not therefore need to be considered within this assessment.

3.2.4 The criteria used to assess the construction impact of the proposed development, and the associated significance of effects, at existing sensitive receptors are included in **Appendix B**.

3.3 Operational Phase Assessment

3.3.1 The air dispersion model ADMS-Roads (CERC, Version 5.0) has been used to assess the impacts associated with road traffic emissions during the operational phase assessment. The impacts have been assessed in accordance with guidance from Environmental Protection UK (EPUK) and the IAQM[2]. Further details of the modelling and assessment methodology are provided in **Appendix C**.

3.3.2 NO_2, PM_{10} and $PM_{2.5}$ concentrations have been predicted at existing receptors as these are the pollutants considered most likely to exceed the objectives and limit

[2] Moorcroft and Barrowcliffe et al, Land-Use Planning and Development Control: Planning for Air Quality (v1.2), January 2017

values.

3.3.3 As the proposed development is for retail use, and no residential uses are proposed, pollutant concentrations within the proposed development site have not been assessed against the annual mean objectives. The assessment considers the likelihood of the short-term objectives within the study area.

3.3.4 Air dispersion modelling has been carried out to estimate pollutant concentrations, due to road traffic emissions, for three assessment scenarios as follows:

- **Scenario 1:** 2019 Base Year, the most recent year for which traffic flow information and meteorological data are available;
- **Scenario 2:** 2027 Opening/Future Year, without the proposed development in place; and
- **Scenario 3:** 2027 Opening/Future Year, with the proposed development in place.

Existing Sensitive Receptors

3.3.5 A number of representative existing sensitive receptors (identified as ESR 1 to ESR 5) have been selected for consideration in the air quality assessment. These have been chosen based on their sensitivity and their proximity to roads and junctions which will be affected by development generated traffic.

3.3.6 Details of the receptors considered are provided in Table 4, and their locations are shown on drawing GM12047-001.

Table 4: Existing Sensitive Receptors Considered in Operational Phase Assessment

Receptor	Address	Grid Reference		Receptor Type
		Easting	Northing	
ESR 1	Cross Keys Lane	435228	400557	Residential
ESR 2	Cross Keys Lane	435278	400426	Residential
ESR 3	Sheffield Road	435340	400352	Residential
ESR 4	Cross Keys Lane	435268	400470	Residential
ESR 5	Sheffield Road	435431	400285	Residential

3.3.7 The criteria used to assess the operational impact of the proposed development, and the associated significance of effects, at existing sensitive receptors are included in **Appendix C**.

3.4 Limitations and Uncertainties

3.4.1 Air quality assessments make use of official sources of information (i.e., vehicle emission factors and background concentrations) which are increasingly considered to be overly optimistic. Monitoring data collected by the UK Government and local authorities shows that annual mean NO_2 concentrations have remained higher than previously expected (especially in roadside locations). This is widely thought to be due to the lower-than-expected decline in NO_x emissions from diesel vehicles (even though new Euro standards have been introduced), coupled with an overall increase in the number of diesel vehicles on the road.

3.4.2 The vehicle emission factors used in this assessment are from Defra's latest Emission Factor Toolkit (EFT v11)[3], which was released in November 2021 and is the most up-to-date version available.

3.4.3 A position statement was produced by the IAQM in 2018 which dealt specifically with the use of EFT v8.0 and the consideration of uncertainties in predicting future air quality[4]. The statement concluded that the approaches for dealing with this uncertainty should be decided on a case-by-case basis, but may include the use of a sensitivity test in which it is assumed that NO_x emissions will not reduce as quickly over time as within the EFT.

3.4.4 A later study provided evidence that EFT v9.0 may be relied upon to predict the 'most likely' future emissions reductions, as long as model verification has been undertaken using monitored data from 2016 or later[5].

3.4.5 The IAQM has recently withdrawn their 2018 position statement on the consideration of uncertainties in predicting future air quality[6]. A growing body of evidence suggests that the latest COPERT vehicle emission factors used in EFT v9.0 (and later) reflect real-world NO_x emissions more accurately. As a result, the IAQM judge that "an exclusively

[3] Defra Local Air Quality Management webpages (https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html)
[4] Institute of Air Quality Management, Dealing with Uncertainty in Vehicle NO_x Emissions within Air Quality Assessments v1.1, July 2018
[5] Air Quality Consultants, Performance of Defra's Emission Factor Toolkit 2013 – 2019, February 2020
[6] Available on the Institute of Air Quality Management website (https://iaqm.co.uk/wp-content/uploads/2013/02/iaqm_uncertainty_vehicle_NOx_emission_withdrawn-02.pdf)

vehicle emissions-based sensitivity test is no longer necessary". This is provided that the assessment has been verified using monitoring data from 2016 or later.

3.4.6 In accordance with Defra guidance, the air quality assessment has been carried out using EFT v11. As model verification has been undertaken, following the latest guidance from the IAQM, it is not considered necessary to carry out a sensitivity analysis. Further information on the vehicle emission factors used in the assessment are provided in **Appendix C**.

3.4.7 Several steps have been taken to ensure the model is as accurate and representative as possible. These comprise:

- Consultation has been undertaken with BMBC to confirm their agreement with the methodology used within the assessment;
- The latest Defra LAQM tools have been incorporated into the assessment following their release in November 2021;
- Meteorological data, obtained from a representative meteorological recording station, has been incorporated into the assessment;
- Nearby Council operated diffusion tube monitoring locations have been considered within the assessment to allow model verification to take place. Model verification factor(s) have been applied to NO_x concentrations, which are then input into the Defra NO_x to NO_2 calculator tool to predict total NO_2 concentrations at each receptor considered in the assessment;
- Extensive detailed modelling of the roads included in the study area has been undertaken. Individual road lengths, widths and vehicle speeds have been reviewed in detail, as have the locations of the ESRs and diffusion tube(s), in relation to their proximity to the modelled roads, to ensure all information is as accurate as possible.

4 BASELINE SITUATION

4.1 Barnsley Metropolitan Borough Council Local Air Quality Management

4.1.1 The proposed development site is located within the administrative area of Barnsley Metropolitan Borough Council (BMBC), which is responsible for the management of local air quality.

4.1.2 Currently, BMBC has declared six Air Quality Management Areas (AQMAs), all of which were declared for the exceedance of the NO_2 annual mean objective.

4.1.3 The nearest AQMA declared by BMBC, AQMA No.1, is situated 360m away from the proposed development site. The AQMA covers an area along the M1 between Junctions 35a and 38, extending 100m either side of the embankment.

4.1.4 A review of the 2020 BMBC Annual Status Report (the latest report available) was undertaken to identify monitoring locations within the vicinity of the proposed development. The nearest roadside diffusion tube, DT24, is located near the A6135, around 25m from the site. This diffusion tube monitored an annual mean concentration of NO2 of 30.3 µg/m^3 during 2019. Additionally, there are three diffusion tubes, DT25, DT26 and DT27, situated near the A61, the closest being 320m from the site. These monitoring locations recorded concentrations of 38.6 µg/m^3, 40.3 µg/m^3 and 39.8 µg/m^3.

4.1.5 Based on the available traffic data coverage, DT24 has been included in the model for the purpose of verification, and further details are provided in **Appendix C.**

Background Air Pollutant Concentrations

4.1.6 The air quality assessment needs to take into account background concentrations upon which local, traffic derived pollution is superimposed.

4.1.7 As there are currently no representative NO_2, PM_{10} or $PM_{2.5}$ background monitoring locations in the vicinity of the proposed development site, background concentrations for these pollutants have been obtained from the 2018-based Defra default concentration maps, for the appropriate grid squares[7].

4.1.8 The background pollutant concentrations used in this assessment are detailed in Table 6.

[7] Accessed through the Defra Local Air Quality Management webpages (http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html)

Table 6: Background Pollutant Concentrations Used in the Air Quality Assessment				
Receptors	**Oxides of Nitrogen (NO_x)***	**Nitrogen Dioxide (NO_2)**	**Particulates (PM_{10})**	**Particulates ($PM_{2.5}$)**
2019 Annual Mean Concentrations (µg/m³)				
ESR 1-5 (435500, 400500)	17.35	12.95	11.66	7.43
2027 Annual Mean Concentrations (µg/m³)				
ESR 1-5 (445500, 385500)	12.07	9.27	10.88	6.81

4.2 Modelled Baseline Concentrations at Existing Sensitive Receptors

4.2.1 The baseline assessment (i.e., scenarios 1 and 2) has been carried out for the existing sensitive receptors considered in accordance with Defra guidance (i.e., using EFT v10.1). The adjusted NO_2 and unadjusted PM_{10} and $PM_{2.5}$ concentrations are detailed in Table 7.

Table 7: Predicted NO_2, PM_{10} and $PM_{2.5}$ Concentrations at Existing Sensitive Receptors for Scenarios 1 and 2						
Receptor	**Calculated Annual Mean Concentrations (µg/m³)**					
	Scenario 1: 2019 Base Year			**Scenario 2: 2027 Opening/Future Year, Without Development**		
	NO_2	**PM_{10}**	**$PM_{2.5}$**	**NO_2**	**PM_{10}**	**$PM_{2.5}$**
ESR 1	14.61	11.74	7.48	10.08	10.96	6.85
ESR 2	19.14	11.96	7.61	12.17	11.18	6.97
ESR 3	30.29	12.59	7.97	17.67	11.81	7.33
ESR 4	16.68	11.84	7.53	11.01	11.05	6.90
ESR 5	30.23	12.59	7.97	17.64	11.81	7.33

4.2.2 The results show that the predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations are below the relevant objective and limit values in both the 2019 base year scenario and the 2027 without development scenario.

5 IMPACT ASSESSMENT

5.1 Construction Phase Assessment

Step 2 – Impact Assessment

5.1.1 In accordance with the IAQM guidance, the main activities to be considered during the construction phase of a proposed development are demolition, earthworks, construction and trackout.

5.1.2 There is no demolition to be carried out during the construction phase, therefore it has been scoped out of the assessment. Earthworks cover the processes of soil-stripping, ground-levelling, excavation and landscaping. Construction activities will focus on the proposed buildings, access roads and car parking areas. Trackout is defined as the transport of dust and dirt by vehicles travelling from a construction site onto the public road network. This may occur through the spillage of dusty materials onto road surfaces or through the transportation of dirt by vehicles that have travelled over muddy ground on the site. This dust and dirt can then be deposited and re-suspended by other vehicles.

Step 2A

5.1.3 Step 2A of the assessment defines the potential dust emission magnitude from earthworks, construction and trackout in the absence of site-specific mitigation.

5.1.4 Examples of the criteria for the dust emission classes are detailed in **Appendix B**. The results of this step are detailed in Table 8.

Step 2B

5.1.5 Step 2B of the construction phase dust assessment defines the sensitivity of the area, taking into account the significance criteria detailed in **Appendix B**, for earthworks, construction and trackout. The sensitivity of the area to each activity is assessed for potential dust soiling, human health effects and ecological effects (where applicable).

5.1.6 For earthworks and construction, there are currently between 10 and 100 receptors (residential and commercial) within 50m of where these activities may take place, which is assumed to be the site boundary for the purpose of this assessment.

5.1.7 The routing of construction vehicles used in the construction of the proposed development is not currently known, and therefore a worst-case approach has been adopted in the assessment.

5.1.8 As a result, for trackout, there are between 10 and 100 receptors (mainly residential) within 20m of where trackout may occur for a distance of up to 250m from the site entrance.

Step 2C

5.1.9 Step 2C of the construction phase dust assessment defines the risk of impacts from each activity, by combining the dust emission magnitude with the sensitivity of the surrounding area.

5.1.10 The risk of dust impacts from each activity, with no mitigation in place, has been assessed in accordance with the criteria detailed in **Appendix B**. The results of this step are detailed in Table 8.

Summary of Step 2

5.1.11 Table 8 details the results of Step 2 of the construction phase assessment for human receptors.

Table 8: Construction Phase Dust Assessment for Human Receptors

	Activity			
	Demolition	**Earthworks**	**Construction**	**Trackout**
Step 2A				
Dust Emission Magnitude	N/A	Medium[a]	Medium[b]	Medium[c]
Step 2B				
Sensitivity of Closest Receptors	N/A	High	High	High
Sensitivity of Area to Dust Soiling Effects	N/A	Medium	Medium	High
Sensitivity of Area to Human Health Effects	N/A	Low[d]	Low[d]	Low[d]
Step 2C				
Dust Risk: Dust Soiling	N/A	Medium Risk	Medium Risk	High Risk
Dust Risk: Human Health	N/A	Low Risk	Low Risk	Low Risk

a. Total site area estimated to be between 2,500 - 10,000m^2

b. Total building volume estimated to be between 25,000 - 100,000m^3

c. Number of construction phase vehicles estimated to be between 10 and 50 movements per day

d. Background annual mean PM_{10} concentration is taken from the LAQM Defra default concentration maps, for the appropriate grid square for 2021

Step 3 – Mitigation

5.1.12 During the construction phase, the implementation of effective mitigation measures will substantially reduce the potential for nuisance dust and fine particulate matter to be generated.

5.1.13 Step 2C of the assessment has identified that the risk of dust soiling and human health effects is not negligible for all the activities and therefore site-specific mitigation will need to be implemented to ensure dust effects from these activities will be not significant.

Recommendations for Site-Specific Mitigation

5.1.14 Specific mitigation relating to dust control may be in the form of construction best practices or could include a dust management plan. Recommendations for mitigation within the IAQM guidance include:

- Re-vegetation of earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable;
- Protection of surfaces and exposed material from winds until disturbed areas are sealed and stable;
- Dampening down of exposed stored materials, which will be stored as far from sensitive receptors as possible;
- Ensuring 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;
- Avoiding activities that generate large amounts of dust during windy conditions;
- Ensuring 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;
- Avoiding dry sweeping of large areas;
- Using water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use;
- Ensuring vehicles entering and leaving the site are covered to prevent escape of materials during transport;

- Implementing a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable);
- Minimising of vehicle movements and limitation of vehicle speeds – the slower the vehicle speeds, the lower the dust generation;
- Ensuring there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever the site size and layout permits; and
- Access gates to be located at least 10m from receptors, where possible.

5.1.15 All dust and air quality complaints should be recorded, and appropriate measures be taken to identify causes and reduce emissions in a timely manner. Exceptional incidents which cause dust and/or emissions, and the action taken to resolve the situation, should be recorded in a logbook and made available to BMBC on request.

5.1.16 It is recognised that the final design solutions will be developed with the input of the Contractor to maximise construction efficiencies, to use modern construction techniques and sustainable materials and to incorporate the particular skills and experience offered by the appointed contractor.

Step 4 – Residual Effects

5.1.17 Step 4 of the construction phase dust assessment has been undertaken to determine the significance of the dust effects arising from earthworks, construction and trackout associated with the proposed development.

5.1.18 The implementation of effective mitigation measures during the construction phase, such as those detailed in Step 3, will substantially reduce the potential for nuisance dust and fine particulate matter to be generated and any residual impact should be **not significant**.

5.2 Operational Phase Assessment

Existing Sensitive Receptor – Human Health

5.2.1 The impact assessment has been carried out for the representative existing sensitive receptors considered (i.e., ESR 1 to ESR 5) using EFT v11.

5.2.2 Table 9 details the predicted NO_2 concentrations for the 2027 opening/future year, for both the without development and with development scenarios in accordance with Defra guidance (i.e., using EFT v11). The impact has been assessed in accordance with the descriptors included in **Appendix C**.

Table 9: Predicted Adjusted NO_2 Concentrations at Existing Sensitive Receptors for Scenarios 2 and 3 – Using the Emission Factor Toolkit v11

Receptor	Calculated Annual Mean NO_2 Concentrations (µg/m^3)[a]				
	Without Development	With Development		Concentration Change as Percentage of AQAL	Impact[b]
		Concentration	Percentage in Relation to AQAL		
ESR 1	10.08	10.11	<75%	<0.5%	**Negligible**
ESR 2	12.17	12.86	<75%	2 – 5%	**Negligible**
ESR 3	17.67	17.95	<75%	1%	**Negligible**
ESR 4	11.01	11.16	<75%	<0.5%	**Negligible**
ESR 5	17.64	17.89	<75%	1%	**Negligible**

[a] NO_2 concentrations obtained by inputting predicted NO_x concentrations into the NO_x to NO_2 calculator, in accordance with LAQM.TG(16)

[b] Assessed using the Impact Descriptors from the EPUK/IAQM guidance, included in Appendix C. Changes of less than 0.5% should be described as negligible

5.2.3 Table 10 details the PM_{10} concentrations for the 2027 opening/future year, for both the without development and with development scenarios. The impact has been assessed in accordance with the descriptors included in **Appendix C**.

Table 10: Predicted Unadjusted PM_{10} Concentrations at Existing Sensitive Receptors for Scenarios 2 and 3 – Using the Emission Factor Toolkit v11					
Receptor	**Calculated Annual Mean NO_2 Concentrations (µg/m³)**				
	Without Development	**With Development**		**Concentration Change as Percentage of AQAL**	**Impact[a]**
		Concentration	**Percentage in Relation to AQAL**		
ESR 1	10.96	10.96	<75%	<0.5%	**Negligible**
ESR 2	11.18	11.24	<75%	<0.5%	**Negligible**
ESR 3	11.81	11.85	<75%	<0.5%	**Negligible**
ESR 4	11.05	11.07	<75%	<0.5%	**Negligible**
ESR 5	11.81	11.84	<75%	<0.5%	**Negligible**
[a]Assessed using the Impact Descriptors from the EPUK/IAQM guidance, included in Appendix C. Changes of less than 0.5% should be described as negligible					

5.2.4 Table 11 details the $PM_{2.5}$ concentrations for the 2027 opening/future year, for both the without development and with development scenarios. The impact has been assessed in accordance with the descriptors included in **Appendix C**.

Table 11: Predicted Unadjusted $PM_{2.5}$ Concentrations at Existing Sensitive Receptors for Scenarios 2 and 3 – Using the Emission Factor Toolkit v11					
Receptor	**Calculated Annual Mean NO_2 Concentrations (µg/m³)**				
	Without Development	**With Development**		**Concentration Change as Percentage of AQAL**	**Impact[a]**
		Concentration	**Percentage in Relation to AQAL**		
ESR 1	6.85	6.85	<75%	<0.5%	**Negligible**
ESR 2	6.97	7.01	<75%	<0.5%	**Negligible**
ESR 3	7.33	7.34	<75%	<0.5%	**Negligible**
ESR 4	6.90	6.91	<75%	<0.5%	**Negligible**
ESR 5	7.33	7.34	<75%	<0.5%	**Negligible**
[a]Assessed using the Impact Descriptors from the EPUK/IAQM guidance, included in Appendix C. Changes of less than 0.5% should be described as negligible					

5.2.5 The results of the assessment show that all predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations, in all scenarios considered, are below the relevant annual mean objectives and limit values. The short-term (1-hour) objective for NO_2 does not need

to be considered, as in LAQM.TG(16) (para. 7.91) it is stated that "*Previous research carried out on behalf of Defra and the Devolved Administrations identified that exceedances of the NO_2 1-hour mean are unlikely to occur where the annual mean is below 60µg/m³*". Predicted NO_2 concentrations at all receptor locations are well below this level.

5.2.6 At the request of the EHO, a calculation is presented below to ascertain if the development will lead to a breach of the 35 maximum annual permitted exceedances of the 50µg/m³ 24-hr objective for PM_{10}, using the method outlined in the LAQM.TG(16) guidance, section 7.93:

"As for NO_2, using a dispersion model to predict exceedances of the PM_{10} short-term (24 hour mean) objective may be challenging. Therefore, to estimate potential exceedances of the PM_{10} 24-hour mean objective, local authorities should use the following relationship, provided in previous Technical Guidance, but still considered adequate:

No. 24-hour mean exceedances = -18.5 + 0.00145 × annual mean³ + (206/annual mean)."

5.2.7 The guidance notes that the formula should not be applied where annual mean PM_{10} is below 14.80 µg/m³ (and it is therefore assumed there is no likelihood of the shoert-term objective being breached); however, in the absence of any other suitable method it has been decided to apply this method here; this caveat should be noted.

5.2.8 The formula has been applied to ESR 3, which is predicted to experience the highest PM_{10} annual mean concentrations, i.e., 11.85 µg/m³ in 2027. The resulting number of predicted exceedances of the 50 µg/m³ objective is 1.30 in 2027; as such there is no risk of receptors in the study area experiencing 35 exceedances of this objective per year.

Assessment of Significance for Human Receptors

5.2.9 The significance of the overall effects of the proposed development has been assessed in accordance with the EPUK/IAQM guidance. This assessment is based on professional judgement and details of the assessor's experience is included in **Appendix D**.

5.2.10 The assessment of significance has taken into account a number of factors, including:

- Baseline NO_2, PM_{10} and $PM_{2.5}$ concentrations in the 2019 base year are below

the relevant annual mean objectives and limit value for all existing receptors;

- Baseline NO_2, PM_{10} and $PM_{2.5}$ concentrations in 2027 are below the relevant annual mean objectives and limit values at all of the five existing sensitive receptors considered;
- The assessment predicts a negligible impact on NO_2 PM_{10} and $PM_{2.5}$ concentrations at all five existing sensitive receptors considered, with the development in place.

5.2.11 Based on the above factors, in accordance with the EPUK/IAQM guidance, the effect of the proposed development on human receptors is considered to be **not significant**.

Emissions Mitigation Assessment

5.2.12 The BMBC 'Air Quality and Emissions Good Practice Planning Guidance' document (most recent version issued November 2021) classifies the proposed development as a 'medium' sized proposal. In accordance with this document, any proposed development classed as medium or larger requires an emissions mitigation (damage cost) assessment to be undertaken as part of the air quality assessment.

5.2.13 A damage cost assessment provides a basis for quantifying a financial commitment required to offset potential development-generated traffic emissions. An air pollution damage cost assessment utilises the current DEFRA Emission Factor Toolkit (version 11), available on the Defra website, to estimate the annual link emissions associated with the additional development generated vehicle trips over a 5-year period.

5.2.14 The damage cost calculation has been undertaken using the most recent guidance available from Defra[8] (July, 2020), which includes updated damage cost values for both NO_X and $PM_{2.5}$. The total number of trips in a 24-hour period, generated by the proposed development, is included within the damage cost assessment to determine the transport related emissions. The damage cost calculation uses central damage cost values provided by Defra and applies these to the opening year of the proposed development. Full operation of the development is assumed in the opening year.

5.2.15 Consultation has been undertaken with Bryan G Hall, the appointed Transport Consultants for the scheme. The transport consultants have advised that 50% of the

[8] Defra Air Quality Appraisal: Damage Cost Guidance, available at https://www.gov.uk/government/publications/assess-the-impact-of-air-quality/air-quality-appraisal-damage-cost-guidance

trips to and from the site will be new trips and 50% vehicles already on the network, therefore the total new vehicle trip generation for the proposed development (i.e., new trips generated by the proposed development, as Annual Average Daily Traffic - AADT) in a 24-hour period is 1009 vehicles (HGVs 0.05%). The average trip length is assumed to be 10km and the average speed is 50kph. The calculation has been undertaken for both NO_x and particulate matter (PM) emissions, as these are the major pollutants associated with road traffic emissions. The Defra guidance gives a road transport sector estimated central cost (2019) of £81,518/tonne for $PM_{2.5}$. For NO_x, the Defra guidance gives a road transport sector central cost (2019) of £9,066/tonne.

5.2.16 In accordance with guidance, an uplift factor of 2% per year is applied to these costs. The EFT output (tonnes/annum) for each of the five assessed years is detailed in Table 13.

Table 13: EFT Output (tonnes/annum)

Year	NO_x	$PM_{2.5}$
2027	0.501583	0.063777
2028	0.449674	0.063582
2029	0.40523	0.063418
2030	0.367749	0.063272
2031	0.358107	0.063179

5.2.17 The emissions from Table 13 are then multiplied by the uplifted estimated sector costs. Table 14 details the central transport sector cost for each assessed year, beginning with the estimated development opening year of 2027.

Table 14: Calculated Cost for Each Year (£)

Year	NO_x	$PM_{2.5}$
2027	5434.51	6213.27
2028	4969.53	6318.13
2029	4567.93	6427.91
2030	4228.33	6541.34

Table 14: Calculated Cost for Each Year (£)		
Year	**NO_x**	**$PM_{2.5}$**
2031	4199.82	6662.41

5.2.18 The total damage cost of both NO_x and $PM_{2.5}$ for the proposed development over a five-year period is £55,563. In accordance with the BMBC Air Quality and Emissions Good Practice Planning Guidance, it is expected that this should be used to contribute to on-site mitigation measures, however it is also possible contributions could also be made to off-site mitigation measures planned by BMBC. A range of recommended mitigation measures are outlined in the guidance, as follows (the guidance states that these lists are not meant to cover all possible mitigation measures, and that measures provided in mitigation of potential traffic impacts are permitted to count towards air quality mitigation measures):

5.2.19 Type 1 (Minor) Mitigation – Electric vehicle charging points

- *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 London Best Practice Guidance*

Details of the electric charging specification are provided in appendix 4 of the guidance.

5.2.20 Type 2 (Medium) Mitigation

- *All Developments:*
    - *Travel Plan, including an agreed mechanism for discouraging high emission vehicle use and encouraging modal shift (i.e., to public transport, cycling and walking), as well as uptake of low emission fuels and technologies;*
    - *Improved pedestrian access to public transport;*
    - *New or improved bus stop infrastructure including shelters; raised kerbing; information displays;*
    - *Provision of subsidised or free public transport ticketing;*

- *Site layout designed to encourage walking; Cycle paths to link to local cycle network. 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 operators 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.*

5.2.21 The input data for the assessed year of 2027 for the damage cost calculation can be seen in Figure 1, below.

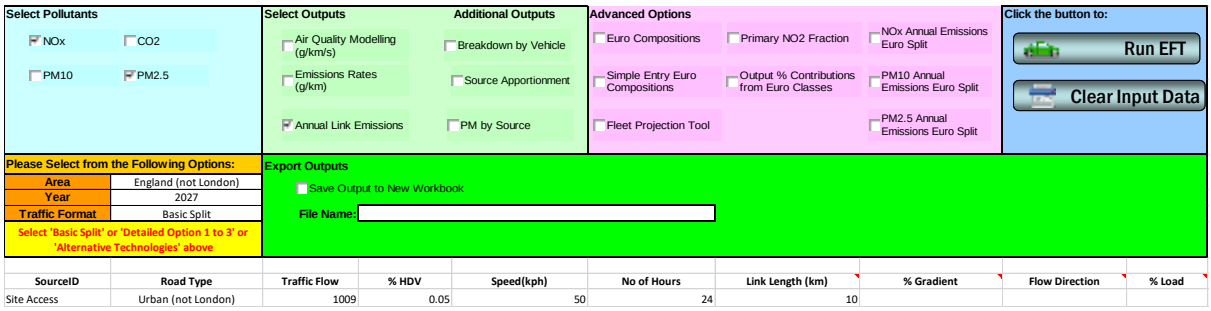


Figure 1: Damage cost Assessment inputs

6 CONCLUSIONS

6.1 Construction Phase Assessment

6.1.1 The construction phase assessment has been undertaken to determine the risk and significance of dust and fine particulate matter effects from demolition, earthworks, construction and trackout associated with the proposed development, in accordance with guidance published by the IAQM.

6.1.2 With site specific mitigation measures in place, the significance of dust and fine particulate matter effects from earthworks, construction and trackout is considered to be **not significant**.

6.2 Operational Phase Assessment

Existing Sensitive Receptors

6.2.1 An air quality assessment has been undertaken to consider the potential impact of development generated vehicles on air quality at five existing human receptors.

6.2.2 The assessment has been undertaken in accordance with Defra guidance, by using the latest vehicle emission factors from EFT v11.

6.2.3 Pollutant concentrations in 2027, with the development in place, are below the relevant annual mean objectives and limit values at all of the receptors considered.

6.2.4 The assessment predicts that the development will have a negligible impact on concentrations of NO_2, PM_{10} and $PM_{2.5}$ at all five existing sensitive receptors considered in 2027. The effect of the proposed development on human receptors is therefore considered to be **not significant.**

Emissions Mitigation Assessment

6.2.5 The BMBC Air Quality and Emissions Good Practice Planning Guidance requires that an emissions mitigation (damage cost) assessment is undertaken for the proposed development. The damage cost calculation has used the central damage cost values for road transport which have been applied to the 2027 opening year of the proposed development onwards, for a total of five years, in accordance with Defra guidance.

Recommendations for Mitigation

6.2.6 The impact of the proposed development is predicted to be not significant. However, mitigation measures will assist in reducing any potential impact and general best practice measures in relation to air quality could be implemented.

6.2.7 The result of the damage cost calculation shows the total damage cost of both NO_x and $PM_{2.5}$ emissions for the proposed development over a five-year period is £55,563, based on a projected total new vehicle trip generation of 1009 vehicles (expressed as AADT). It is expected that this funding should be used to contribute to on-site mitigation measures, such as those suggested in paragraph 5.2.17-18, in accordance with the BMBC Air Quality and Emissions Good Practice Planning Guidance (November 2021).

6.3 Summary

6.3.1 The assessment demonstrates that the proposed development will accord with all relevant national planning policy and will not lead to an unacceptable risk from air pollution. There are no material reasons in relation to air quality why the proposed scheme should not proceed, subject to appropriate planning conditions.

APPENDICES

Appendix A: Air Quality Legislation and Guidance

National Air Quality Strategy

A.1 The Environment Act 1995 requires the UK government to prepare a national Air Quality Strategy. The first UK strategy was published in March 1997, setting out policies for the management of ambient air quality. This was subsequently updated in 2007[1].

A.2 The 2007 strategy establishes the framework for air quality management in England, Scotland, Wales and Northern Ireland. Air quality standards and objectives are set out for eight pollutants which may potentially occur at levels that give cause for concern. The strategy also provides details of the role that local authorities are required to take in working towards improvements in air quality, known as the Local Air Quality Management (LAQM) regime.

Air Quality Standards and Objectives

A.3 Air quality standards and objectives are set out in the strategy for the following pollutants: nitrogen dioxide (NO_2), sulphur dioxide (SO_2), carbon monoxide (CO), lead (Pb), fine particulate matter (PM_{10}), benzene (C_6H_6), 1, 3–butadiene (C_4H_6) and ozone (O_3).

A.4 Objectives for each pollutant, except O_3, were first given statutory status in the Air Quality Regulations 2000[2] and Air Quality (Amendment) Regulations 2002[3]. These objectives are defined in the strategy as:

"the maximum ambient concentration not to be exceeded, either without exception or with a permitted number of exceedances, within a specified timescale."

[1] Department of Environment, Food and Rural Affairs, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. July 2007
[2] The Air Quality Regulations 2000. SI No 928
[3] The Air Quality (Amendment) Regulations 2002

A.5 EU limit values, set out within the Ambient Air Quality Directive 2008/50/EC[4] (i.e., the CAFE Directive), were transposed into UK legislation on 11th June 2011 as The Air Quality Standards Regulations 2010. These are mostly the same as the air quality objectives in terms of concentrations; however, there are differences in determining how compliance is achieved. Although the UK is no longer part of the EU, no changes have yet been made to the objectives and limit values used in the management and assessment of air quality.

A.6 Whilst there is no specific objective for $PM_{2.5}$ in England and Wales, a limit value of 25µg/m^3 is referred to in the regulations, which has been adopted for use in this assessment (as recommended by the LAQM Helpdesk). An objective has been set for $PM_{2.5}$ in Scotland since early 2016.

A.7 Examples of where these objectives and limit values apply are detailed in the Defra LAQM Technical Guidance document LAQM.TG(16)[5] and are included in Table A1.

Table A1: Examples of Where the Air Quality Objectives Should Apply

Averaging Period	Objectives Should Apply at:	Objectives Should Generally 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 or other 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 and 8-hour mean	All locations where the annual mean objectives would apply, together with hotels. Gardens of residential properties[a]	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	All locations where the annual mean and 24 and 8-hour objectives apply. Kerbside sites (e.g. pavements of busy shopping streets).	Kerbside sites where public would not be expected to have regular access

[4] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe

[5] Department for Environment, Food and Rural Affairs, Local Air Quality Management Technical Guidance LAQM.TG(16), February 2018

Table A1: Examples of Where the Air Quality Objectives Should Apply		
Averaging Period	**Objectives Should Apply at:**	**Objectives Should Generally Not Apply at:**
	Those parts of car parks 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 to which the public might reasonably be expected to spend one hour or longer	
15-minute mean	All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer	
[a] Such locations should represent parts of the garden where relevant public exposure is likely, for example where there is seating or play areas. It is unlikely that relevant public exposure to pollutants would occur at the extremities of the garden boundary, or in front gardens, although local judgement should always be applied		

Local Air Quality Management

A.8 LAQM legislation in the Environment Act 1995 requires local authorities to conduct the periodic review and assessments of air quality. These aim to identify all those areas where the objectives are being, or are likely to be, exceeded. Where exceedances are likely to occur, local authorities are required to declare an Air Quality Management Area (AQMA).

A.9 LAQM.TG(16) presents a streamlined approach for LAQM in England and Scotland; however, Northern Ireland is still considering changes to LAQM and therefore works according to the previous regime.

A.10 The Welsh Government amended the LAQM regime in Wales in 2017 by issuing new statutory policy guidance in order to bring the system into line with the Well-being of Future Generations (Wales) Act 2015[6]. This aims to achieve compliance with the national air quality objectives in specific hotspots and to reduce exposure to pollution more widely, so as to achieve the greatest public health benefit.

[6] Well-being of Future Generations (Wales) Act 2015 (anaw 2)

A.11 Local authorities in England are required to produce Annual Status Reports (ASRs), and in Scotland and Wales, Annual Progress Reports (APRs). These replace all other reports which previously had to be submitted including Updating and Screening Assessments, Progress Reports and Detailed Assessments (which would be produced to assist with an AQMA declaration).

A.12 Local authorities now have the option of a fast-track AQMA declaration option. This allows more expert judgement to be used and removes the need for a Detailed Assessment where a local authority is confident of the outcome. Detailed Assessments should however still be used if there is any doubt.

A.13 As part of the UK Government's requirement to improve air quality, selected local authorities in England are also currently investigating the feasibility of setting up Clean Air Zones (CAZs). These are areas where targeted action and co-ordinated resources aim to improve air quality within an urban setting, in order to achieve compliance with the EU limit values within the shortest possible time.

A.14 The first CAZs were implemented in Bath in March 2021, and in Birmingham in June 2021. The Greater Manchester CAZ will be introduced from 30 May 2022. In addition, the London Ultra Low Emission Zone (ULEZ) was expanded to incorporate the North and South Circular roads in October 2021. Charges will apply to certain types of vehicles travelling within these areas, including buses, coaches, taxis, private hire vehicles and heavy-duty vehicles (HDVs).

National Planning Policy Framework

A.15 The National Planning Policy Framework (NPPF)[7], introduced in March 2012 and most recently updated in July 2021, requires that:

"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of AQMAs and CAZs, and the cumulative impacts from individual sites in local areas.

[7] Ministry of Housing, Communities and Local Government, National Planning Policy Framework, July 2021

Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications.

Planning decisions should ensure that any new development in AQMAs and CAZs is consistent with the local air quality action plan."

Planning Practice Guidance

A.16 The Planning Practice Guidance (PPG)[8], updated in November 2019, states that whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impacts in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife).

A.17 Where a proposed development is anticipated to give rise to concerns about air quality, an appropriate assessment needs to be carried out. Where the assessment concludes that the proposed development (including mitigation) will not lead to an unacceptable risk from air pollution, prevent sustained compliance with national objectives or fail to comply with the requirements of the Habitats Regulations, then the local authority should proceed to decision with appropriate planning conditions and/or obligations.

Local Planning Guidance

A.18 Barnsley Metropolitan Borough Council (BMBC) issued a guidance document, the *Air Quality and Emissions Good Practice Planning Guidance,* in November 2021, which outlines the level of air quality assessment and mitigation measures required by BMBC, depending on the size and nature of a proposed development.

[8] Department for Communities and Local Government. Planning Practice Guidance: Air Quality, November 2019

Appendix B: Methodology for Construction Phase Assessment

Institute of Air Quality Management Guidance

B.1 The methodology for the construction phase dust assessment is set out in guidance from the Institute of Air Quality Management (IAQM)[9].

Step 1

B.2 Step 1 is to screen the requirement for a more detailed assessment. The guidance states that an assessment will normally be required where there are existing sensitive human receptors within 350m of the site boundary and/or within 100m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

B.3 With regards to ecological receptors, the guidance states that an assessment will normally be required where there are existing receptors within 50m of the site boundary and/or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

B.4 Where any of these criteria are met, it is necessary to proceed to Step 2.

Step 2

B.5 Step 2 determines the potential risk of dust arising in sufficient quantities to cause annoyance and/or health or ecological impacts. The risk is related to:

- The activities being undertaken (demolition, number of vehicles and plant etc);
- The duration of these activities;
- The size of the site;
- The meteorological conditions (wind speed, direction and rainfall);
- The proximity of receptors to the activity;
- The adequacy of the mitigation measures applied to reduce or eliminate dust; and
- The sensitivity of receptors to dust.

B.6 The risk of dust impacts is determined using four risk categories: negligible, low, medium and high risk. A site is allocated to a risk category based upon the following two factors (known as Step 2A and Step 2B).

[9] Institute of Air Quality Management, Guidance on the Assessment of Dust from Demolition and Construction (v1.1), June 2016

B.7 **Step 2A** assesses the scale and nature of the works which determines the potential dust emission magnitude as small, medium or large. Examples of how the magnitude may be defined are included in Table B1.

Table B1: Determining the Dust Emission Magnitude of Construction Phase Activities

Activity	Dust Emission Class		
	Large	**Medium**	**Small**
Demolition	Total building volume >50,000m^3; Potentially dusty construction material (e.g. concrete); On-site crushing and screening; Demolition activities >20m above ground level	Total building volume 20,000-50,000m^3; Potentially dusty construction material; Demolition activities 10-20m above ground level	Total building volume <20,000m^3; Construction material with low potential for dust release (e.g. metal cladding or timber)
Earthworks	Total site area >10,000m^2; Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size); >10 heavy earth moving vehicles active at any one time; Formation of bunds >8m in height; Total material moved >100,000 tonnes	Total site area 2,500-10,000m^2; Moderately dusty soil type (e.g. silt); 5-10 heavy earth moving vehicles active at any one time; Formation of bunds 4-8m in height; Total material moved 20,000-100,000 tonnes	Total site area <2,500m^2; Soil type with large grain size (e.g. sand); <5 heavy earth moving vehicles active at any one time; Formation of bunds <4m in height; Total material moved <20,000 tonnes; Earthworks during wetter months
Construction	Total building volume >100,000m^3; On-site concrete batching; Sandblasting	Total building volume 25,000-100,000m^3; Potentially dusty construction material (e.g. concrete); On-site batching	Total building volume <25,000m^3; Construction material with a low potential for dust release (e.g. metal cladding or timber)
Trackout	>50 HDV (>3.5t) outward movements[a] in any one day[b]; Potentially dusty surface material (e.g. high clay content); Unpaved road length >100m	10-50 HDV (>3,5t) outward movements[a] in any one day[b]; Moderately dusty surface material (e.g. high clay content); Unpaved road length 50-100m	<10 HDV (>3.5t) outward movements[a] in any one day[b]; Surface material with low potential for dust release; Unpaved road length <50m

a. A vehicle movement is a one way journey i.e. from A to B, and excludes the return journey
b. HDV movements during a construction project may vary over its lifetime, and the number of movements is the maximum not the average

B.8 **Step 2B** considers the sensitivity of the area to dust impacts which is defined as low, medium or high. The sensitivity categories for different types of receptors are described in Table B2.

Table B2: Sensitivity Categories for Dust Soiling, Human Health and Ecological Effects

Sensitivity Category	Dust Soiling Effects	Health effects of PM_{10}	Ecological Effects
High	Users can reasonably expect to enjoy a high level of amenity; Appearance, aesthetics or value of a property would be diminished; Examples include dwellings, museums and other culturally important collections, medium and long term car parks and car show rooms	Locations where members of the public are exposed over a period of time relevant to the air quality objective for PM_{10}; Examples include residential properties, hospitals, schools, and residential care homes	Locations with an international or national designation and the designated features may be affected by dust soiling; Locations where there is a community of a particularly dust sensitive species; Examples include a Special Area of Conservation with dust sensitive features
Medium	Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; The appearance, aesthetics or value of their property could be diminished; People or property wouldn't reasonably be expected to be continuously present or regularly for extended periods of time; Examples include parks and places of work	Locations where people are exposed as workers and exposure is over a period of time relevant to the air quality objective for PM_{10}; Examples include office and shop workers but will generally not include workers occupationally exposed to PM_{10}	Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; Locations with a national designation where the features may be affected by dust deposition; Examples include a Site of Special Scientific Interest with dust sensitive features

Table B2: Sensitivity Categories for Dust Soiling, Human Health and Ecological Effects			
Sensitivity Category	**Dust Soiling Effects**	**Health effects of PM_{10}**	**Ecological Effects**
Low	Enjoyment of amenity would not reasonably be expected; Property would not be diminished in appearance, aesthetics or value; People or property would be expected to be present only for limited periods of time; Examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads	Locations where human exposure is transient; Examples include public footpaths, playing fields, parks and shopping streets	Locations with a local designation where the features may be affected by dust deposition; Examples include a Local Nature Reserve with dust sensitive features

B.9 Based on the sensitivity of individual receptors, the overall sensitivity of the area to dust soiling, human health and ecological effects is then determined using the criteria detailed in Tables B3 to B5, respectively.

Table B3: Sensitivity of the Area to Dust Soiling Effects on People and Property[ab]					
Receptor Sensitivity	**Number of Receptors**	**Distance from Source (m)[c]**			
		<20m	**<50m**	**<100m**	**<350m**
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

a. The sensitivity to the area should be derived for each of the four activities
b. Estimate the total number of receptors within the stated distance. Only the highest level of sensitivity from the table needs to be considered
c. For trackout, distances should be measured from the side of the roads used by construction traffic. Without site specific mitigation, trackout may occur for up to 500m from large sites, 200m from medium sites and 50m from small sites, measured from the site exit. The impact declines with distance from the site and it is only necessary to consider trackout impacts up to 50m from the edge of the road

Table B4: Sensitivity of the Area to Human Health Impacts[ab]							
Receptor Sensitivity	**Annual Mean PM_{10} Concentration[c]**	**Number of Receptors[d]**	**Distance from Source (m)[e]**				
			<20m	**<50m**	**<100m**	**<200m**	**<350m**
High	>32µg/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32µg/m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28µg/m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24µg/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32µg/m^3	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32µg/m^3	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

a. *The sensitivity to the area should be derived for each of the four activities*
b. Estimate the total number of receptors within the stated distance. Only the highest level of sensitivity from the table needs to be considered
c. Most straightforwardly taken from the national background maps, but should also take account of local sources. The values are based on 32µg/m^3 being the annual mean concentration at which an exceedance of the 24-hour mean objective is likely in England, Wales and Northern Ireland. In Scotland, there is an annual mean objective of 18µg/m^3
d. In the case of high sensitivity receptors with high occupancy (such as schools or hospitals) approximate the number of people likely to be present. In the case of residential dwellings, just include the number of properties
e. For trackout, distances should be measured from the side of the roads used by construction traffic

Table B5: Sensitivity of the Area to Ecological Impacts[ab]		
Receptor Sensitivity	**Distance from the Source (m)[c]**	
	<20	**<50**
High	High	Medium
Medium	Medium	Low
Low	Low	Low

a. *The sensitivity to the area should be derived for each of the four activities*
b. Only the highest level of sensitivity from the table needs to be considered
c. For trackout, distances should be measured from the side of the roads used by construction traffic

B.10 These two factors are combined in **Step 2C** to determine the risk of dust impacts with no mitigation applied.

B.11 The risk of dust effects is determined for four types of construction phase activities, with each activity being considered separately. If a construction phase activity is not taking place on the site, then it does not need to be assessed. The four types of activities to be considered are:

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

B.12 The risk of dust being generated by demolition activities at the site is determined using the criteria in Table B6.

Table B6: Risk of Dust Impacts for Demolition			
Sensitivity of Area	**Dust Emission Magnitude**		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

B.13 The risk of dust being generated by earthworks and construction at the site is determined using the criteria in Table B7.

Table B7: Risk of Dust Impacts for Earthworks and Construction			
Sensitivity of Area	**Dust Emission Magnitude**		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

B.14 The risk of dust being generated by trackout at the site is determined using the criteria in Table B8.

Table B8: Risk of Dust Impacts for Trackout			
Sensitivity of Area	**Dust Emission Magnitude**		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

Step 3

B.15 Step 3 of the assessment determines the site-specific mitigation required for each of the activities, based on the risk determined in Step 2. Mitigation measures are detailed in guidance published by the Greater London Authority[10], recommended for use outside the capital by LAQM guidance, and the IAQM guidance document itself. Professional judgement should be used to determine the type and scale of mitigation measures required.

B.16 If the risk is classed as negligible, no mitigation measures beyond those required by legislation will be necessary.

Step 4

B.17 Step 4 assesses the residual effect, with mitigation measures in place, to determine whether or not these are significant.

[11] Greater London Authority, The Control of Dust and Emissions from Construction and Demolition: Best Practice Guidance, 2006

Professional Judgement

B.18 The IAQM guidance makes reference to the use of professional judgement when assessing the risks of dust and fine particulate matter from demolition and construction sites. Details of the experience of the personnel involved with the project are provided in **Appendix D**.

Appendix C: Methodology for Operational Phase Assessment

Air Dispersion Modelling Inputs

D.1 The air dispersion model ADMS-Roads (CERC, Version 5.0) has been used to assess the potential air quality impacts associated with development-generated road traffic emissions. This dispersion model is widely used and accepted for the purpose of undertaking assessments to support both planning and Environmental Permit applications.

Traffic Flow Data

D.2 The ADMS-Roads model requires the input of detailed road traffic flow data for those routes which may be affected by the proposed development. Traffic flow data has been provided for this project by Bryan G Hall, the appointed transport consultants for the project. The study extent of the model is shown in Figure C.1.

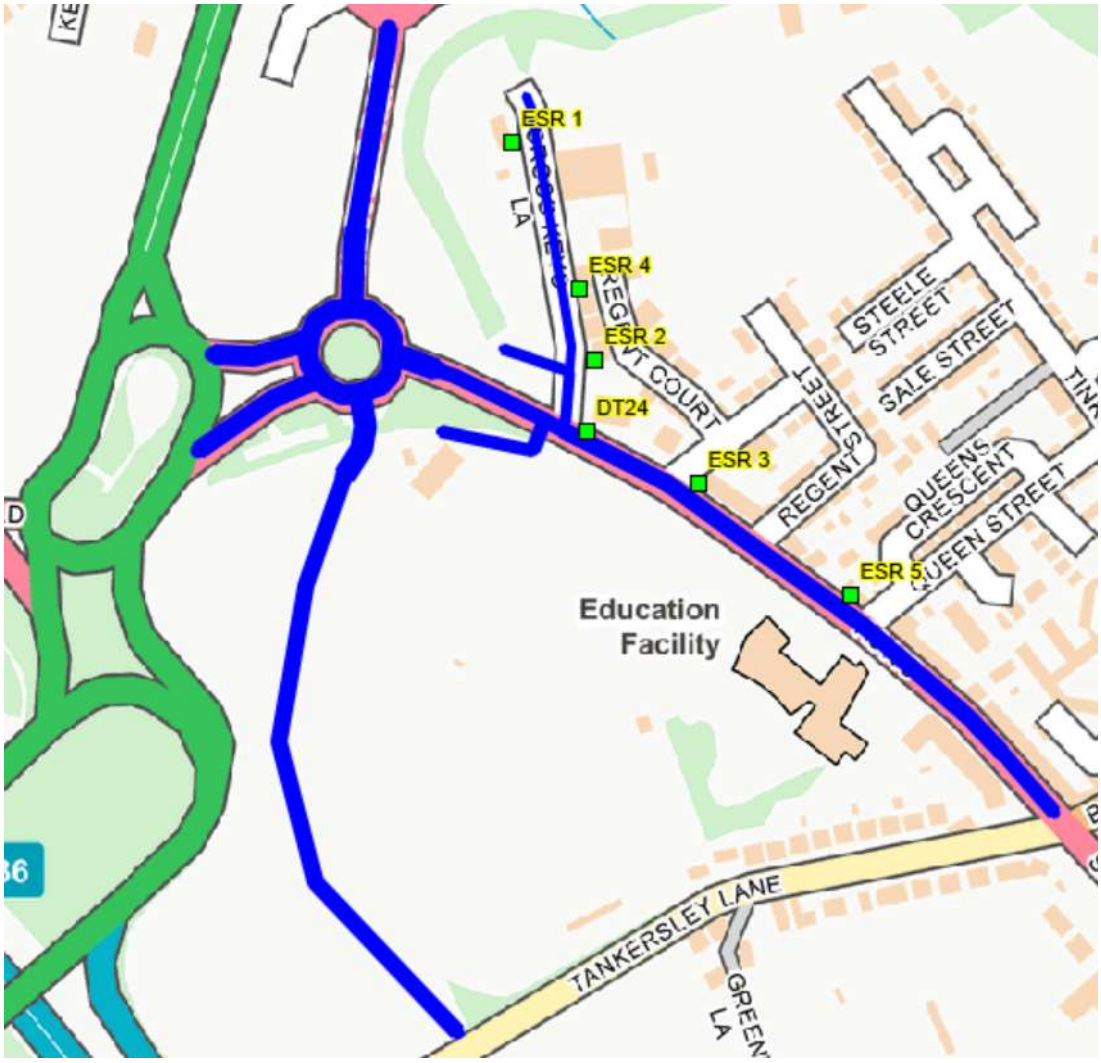


Figure C.1: Study Extent of Air Dispersion Model. The roads modelled in the assessment can be seen in blue

D.3 Data has been provided as 24-hour Annual Average Daily Traffic (AADT) flows, with HGV percentages. No average speed information was available and therefore speed limits have been used, with a reduction to 20kph in locations where congestion or the slowing down of vehicles would be expected.

D.4 The traffic flow data used in the assessment is included in Table C1.

Table C.1: Traffic data used in Air Quality Assessment

Link	Link	2019 Base Year		2027 Without Development		2027 With Development	
		AADT	AADT HGV	AADT	AADT HGV	AADT	AADT HGV
1	Cross Keys Lane North	65	0	69	0	69	0
2	Lidl	0	0	0	0	2017	1
3	Cross Keys Lane South	65	0	69	0	2086	1
4	Cross Keys Lane North	277	5	294	6	2311	7
5	A6135 East	16261	337	17297	358	17815	358
6	Cricket Club	49	0	52	0	52	0
7	A6135 West	16321	343	17296	363	17816	364
8	Sheffield Road North	1958	54	3034	58	3106	58
9	A6135 East	16293	337	17233	358	17738	359
10	Hoyland Common South	381	136	404	144	404	144
11	A6135 West	15275	452	15457	479	15890	480

Vehicle Emission Factors

D.5 The air quality assessment has used vehicle emission factors calculated using the Emissions Factor Toolkit (EFT) version 11, released in November 2021. This is the most up-to-date version of the EFT currently available.

D.6 As discussed in the section 3.4 of the report, in accordance with the latest guidance from the IAQM, a sensitivity analysis has not been undertaken as model verification has been possible using data from later than 2016[11].

[11] Available on the Institute of Air Quality Management website (https://iaqm.co.uk/wp-content/uploads/2013/02/iaqm_uncertainty_vehicle_NOx_emission_withdrawn-02.pdf)

D.7 As a result, vehicle emission factors from EFT v11 have been used for the assessment, with the appropriate year factors applied to the modelling scenarios.

Street Canyons

D.8 LAQM.TG(16) states that '*street canyons can generally be defined as narrow streets where the height of buildings on both sides of the road is greater than the road width*'. The principal effects of a street canyon on the dispersion of pollution from a road source are:

- Pollution being channelled along the canyon;
- Pollution being dispersed across the canyon by circulating flow at road height;
- Pollutants being trapped in recirculation regions;
- Pollutants leaving the canyon between gaps in the buildings;
- Pollutants leaving the canyon from the canyon top; and
- Pollutants leaving the canyon from the downstream end of the canyon.

D.9 The model has not included any street canyons as there are none along the roads included in the study network.

Meteorological Data

D.10 The meteorological data used in the air quality modelling has been obtained from ADM Limited and is from the Emley Moor No.2 recording station, covering the period between 1st January and 31st December 2019. This has complete data capture for wind and temperature.

D.11 The Emley Moor recording station is located approximately 17km from the proposed development and is considered to be the most representative of the conditions at the proposed development, due to its relative location and similar altitude.

D.12 The 2019 wind rose for the Emley Moor Meteorological Recording Station is shown in Figure C2.

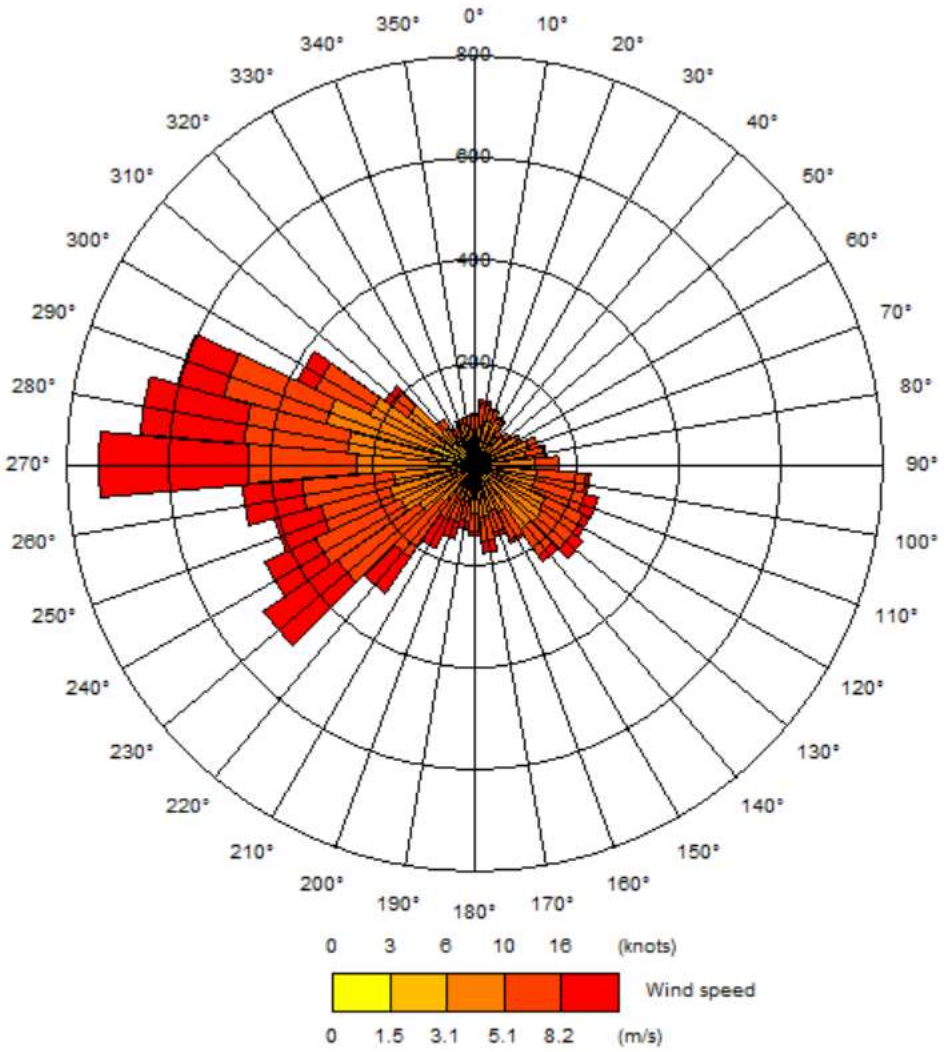


Figure C.2: 2019 Wind Rose for the Emley Moor Meteorological Station

Dispersion and Meteorological Site Characteristics

D.13 The characteristics for the dispersion site and meteorological sites, included in the ADMS-Roads model, are detailed in Table C2.

Table C2: Dispersion and Meteorological Site Characteristics		
Setting	**Dispersion Site**	**Meteorological Site**
Surface Roughness	0.5m	0.02m
Surface Albedo	0.23	0.23
Minimum Monin-Obukhov Length	30m	1m
Priestley-Taylor Parameter	1	1

NO_x to NO_2 Conversion

D.14 In accordance with the guidance within LAQM.TG(16), the ADMS-Roads model has been run to predict the road-contribution NO_x concentrations for each receptor location. These have then been converted to NO_2 concentrations using the Defra NO_x to NO_2 calculator[12].

Model Validation and Verification

D.15 LAQM.TG(16) refers to model validation as *"the general comparison of modelled results against monitoring data carried out by model developers"*. ADMS-Roads is widely accepted by regulatory authorities for use in this type of assessment.

D.16 Model verification is used to check the performance of the model at a local level. The verification of the ADMS-Roads air dispersion model is achieved by modelling concentration(s) at existing monitoring location(s) in the vicinity of the proposed development, and comparing the modelled concentration(s) with the measured concentration(s).

D.17 Following review of the 2021 Annual Status Report (ASR) for BMBC, it is understood there are four roadside air quality monitoring locations in close proximity to the proposed development site. The nearest roadside diffusion tube, DT24, is located near the A6135, around 25m from the site. Additionally, there are three diffusion tubes, DT25, DT26 and DT27, situated near the A61, the closest being 320m from the site. Traffic data for the A61 tubes is not available and therefore tube DT24 has been used to verify the results of the model.

D.18 As no PM_{10} or $PM_{2.5}$ monitoring locations are situated along roads where traffic flow data is available, it has not been possible to carry out model verification for modelled PM_{10} or $PM_{2.5}$ concentrations.

D.19 The monitoring data that has been used in the model verification procedure is detailed in Table C3.

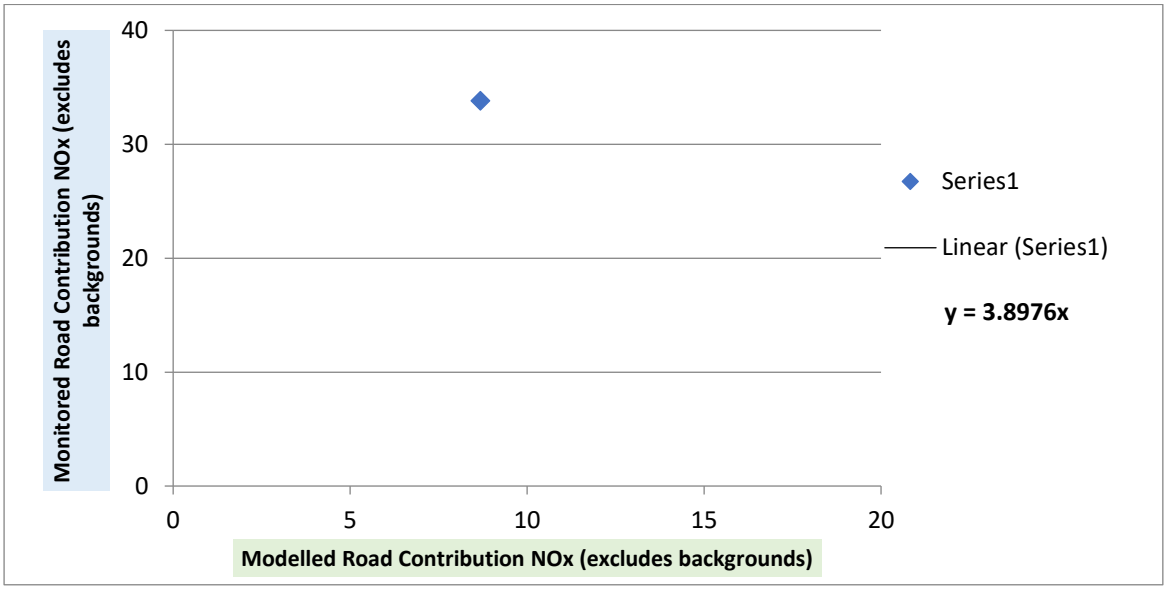
Table C3: NO_2 Monitoring Data Used for Verification Purposes

Monitoring Location Reference	Type	Approximate Grid Reference		2019 Bias Adjusted NO_2 Annual Average Concentration (µg/m³)
		Easting	Northing	
DT24	Roadside Diffusion Tube	435274	400384	30.30

[12] Defra Local Air Quality Management web pages [http://laqm.defra.gov.uk/tools-monitoring-data/no-calculator.html]

D.20 The modelled road-contribution NO_x concentration for the diffusion tube has been compared against the measured road-contribution NO_x concentration for the same location. The measured concentrations have been derived using the Defra NO_x to NO_2 calculator, taking into account the background NO_x concentration for the local area.

D.21 The comparison is shown in the below graph. The equation of the trend line is based on linear regression through zero, which provides an overall adjustment factor of 3.8976.



D.22 This adjustment factor has been applied to the modelled road-contribution NO_x concentrations. The total NO_2 concentrations have been derived by combining the adjusted road-contribution NO_x concentration and background NO_2 concentration, using the Defra NO_x to NO_2 calculator.

D.23 A final comparison has been made between the total measured NO_2 concentrations and total modelled NO_2 concentrations, as shown in Table C4. Following adjustment, modelled concentrations are within 10% of measured concentrations.

Table C4: Comparison Between Measured and Monitored NO_2 Concentrations

Monitoring Location Reference	Measured Total NO_2 Concentration ($\mu g/m^3$)	Modelled Total NO_2 Concentration ($\mu g/m^3$)	Difference (%)
DT24	30.30	30.30	0.00

D.24 A Root Mean Square Error (RMSE) calculation has been undertaken as part of the model verification for NO_2 concentrations. This has been carried out for the monitoring location included within the model verification, in accordance with the guidance detailed in LAQM.TG(16).

D.25 The RMSE calculation following adjustment is detailed in Table C5.

Table C5: RMSE Calculation for Nitrogen Dioxide Concentrations

Diffusion Tube Location	After Verification			
	Observed Value	Predicted Value	Difference	RMSE
DT24	30.30	30.30	0.00	**0.00**

D.26 LAQM.TG(16) states that *"ideally an RMSE value within 10% of the objective would be derived"*, a value of within 25% is considered acceptable.The results of the calculation show that following model verification, the RMSE value is within 10% (i.e. 4µg/m^3) of the objective (i.e. 40µg/m^3). Therefore, the model is considered to be performing to an acceptable standard.

Assessment Criteria

Assessing the Impact of a Proposed Development on Human Receptors

D.27 Guidance has been prepared by Environmental Protection UK (EPUK) and the IAQM[13] with relation to the assessment of the air quality impacts of proposed developments and their significance.

D.28 The impact of a development is usually assessed at specific receptors, and takes into account both the long-term background concentrations, in relation to the relevant Air Quality Assessment Level (AQAL) at these receptors, and the change with the development in place.

D.29 The impact descriptors for individual receptors are detailed in Table C6.

[13] Moorcroft and Barrowcliffe et al, Land-Use Planning and Development Control: Planning for Air Quality (v1.2), January 2017

Table C6: Impact Descriptors for Individual Receptors				
Long Term Average Concentration at Receptor in Assessment Year*	**Percentage Change in Concentration Relative to Air Quality Assessment Level (AQAL)***			
	1%	**2-5%**	**6-10%**	**>10**
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial
**Percentage pollutant concentrations have been rounded to whole numbers, to make it easier to assess the impact. Changes of 0% (i.e. less than 0.5% or 0.2µg/m^3) should be described as Negligible*				

Determining the Significance of Effects

D.30 Impacts on air quality, whether adverse or beneficial, will have an effect on human health that can be judged as either 'significant' or 'not significant'.

D.31 Once the impact of the proposed development has been assessed for the individual impacts, the overall significance is determined using professional judgement. This takes into account a number of factors such as:

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

Appendix D: Professional Experience of Assessors

D.1 The assessment of air quality impacts, and the significance of the associated effects, takes into account the professional judgement of the assessor. Details of the experience of the personnel involved with the project are provided below:

Dr. Paul Sanderson **Senior Environmental**
BSc (Hons) MSc DPhil MIEnvSc MIAQM **Scientist**

Paul is a PhD qualified Air Quality Specialist and Member of The Institution of Environmental Sciences and Institute of Air Quality Management who has completed a number of projects examining the air quality impact of various schemes including residential and commercial developments. He has good experience in the use of ADMS Roads advanced dispersion model for undertaking detailed air quality modelling as well as using the Design Manual for Roads and Bridges (DMRB).

Paul has been involved in large complex EIA schemes as well as smaller individual commissions as part of planning applications and also has experience in air quality monitoring using nitrogen dioxide diffusion tubes as well as undertaking numerous dust assessments.

Paul also has experience in liaising with transport consultants on traffic data requirements for input and taking responsibility for of undertaking the technical aspects relating to the dispersion modelling as well as preparation of technical reports and chapters.

Mark Dawson **Technical Director**
BSc (Hons), MA (Env Law), Dip (Air Pollution Control),
Dip (Acoustics & Noise Control), CEnv, MIEnvSc, MIOA,
MIAQM, FRMetS

Mark holds a Bachelor of Science degree in Geography, the Diploma in Air Pollution Control, the Diploma in Acoustics and Noise Control and a Masters in Environmental Law and Policy. Mark is a Chartered Environmentalist and Member of the Institute of Environmental Sciences, Institute of Acoustics, Institute of Air Quality

Management and Fellow of the Royal Meteorological Society. Mark has over 30 years' experience in regulation and consultancy, having given expert witness evidence to over forty planning inquiries. Mark is the service lead for acoustics and air quality at Wardell Armstrong. He has extensive experience of managing commissions involving environmental impact assessment. He is involved in noise and air quality impact studies for residential, commercial, industrial and retail developments and mineral and waste operations. The majority of the work is carried out in support of planning applications and Mark has long experience of dealing with environmental health officers and planning officers.

DRAWINGS

KEY

- Site Boundary
- Existing Sensitive Receptors

Notes:

Boundaries are indicative.

Aerial imagery shown for context purposes only.

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D

CLIENT

LIDL GB LTD

PROJECT

HOYLAND, BARNSLEY

DRAWING TITLE

AIR QUALITY RECEPTOR LOCATION PLAN

DRG No.	REV
GM12047-001	A

DRG SIZE	SCALE	DATE
A3	1:1,500	21/01/2022

DRAWN BY	CHECKED BY	APPROVED BY
EF	PS	MD

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