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STERLING CAPITAL

CAPITOL PARK, BARNSLEY

AIR QUALITY ASSESSMENT

MARCH 2019

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STERLING CAPITAL

CAPITOL PARK, BARNSLEY

AIR QUALITY ASSESSMENT

MARCH 2019

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SH11957-003	Existing and Proposed Sensitive Receptor Locations	1:5,000

EXECUTIVE SUMMARY

An air quality assessment has been undertaken to accompany a hybrid planning application for a proposed commercial development at Capitol Park, off the M1 motorway, Barnsley.

Annual mean nitrogen dioxide, PM_{10} and $PM_{2.5}$ concentrations have been modelled at six existing receptor locations, using the most recent Emission Factor Toolkit available from DEFRA (v 8.0.1). The air quality assessment has applied 2017 background pollution concentrations and vehicle emission factors to the 2024 opening/future year to provide a robust conservative approach. Predicted annual mean concentrations have been compared to the relevant air quality objectives and target level.

For the construction phase, the risk of dust soiling effects is classed as medium for earthworks and construction and is classed as low for trackout; the risk of human health effects is classed as low for earthworks, construction and trackout. Mitigation measures have been proposed to further reduce any potential impacts based on best practice guidance.

For the operational phase, the assessment has concluded that the development will result in concentrations of NO_2, PM_{10} and $PM_{2.5}$ remaining below the air quality objectives/target values, both without and with the development for the proposed 2024 opening/future year. The impact of the development is predicted to be negligible at all six existing sensitive receptors that were assessed. Air quality effects are therefore considered to be 'not significant'.

The assessment has demonstrated that the proposed development will not lead to an unacceptable risk from air pollution, or to any breach in national objectives. Therefore, there are no material reasons in relation to air quality why the proposed development should not proceed, subject to appropriate planning conditions.

1 INTRODUCTION

1.1 Background

1.1.1 Wardell Armstrong LLP (WA) has been commissioned by Sterling Capital to undertake an air quality assessment to accompany a hybrid planning application for a proposed commercial development at Capitol Park, Barnsley.

1.1.2 To allow the scheme flexibility for any future end-use, the planning application includes two planning uses, B2 and B8 use.

1.1.3 Of the two options, the B2 option is considered to be the worst case scenario in terms of air quality, due to the level of vehicle generation proposed and the larger movement network these would utilise. A comparison of the vehicle generation for both planning uses, is outlined in **Appendix C**.

1.1.4 The development is located to the north of Dodworth and west of the M1 motorway. To the west of the development site is woodland. The development land currently comprises of fields. It is proposed to build eight units on the land, for commercial purposes.

1.1.5 This report details the results of the air quality assessment undertaken in support of an outline 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 of 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.

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 2018;
- Department for Communities and Local Government, Planning Practice Guidance: Air Quality, March 2014; and
- Barnsley Metropolitan Borough Council Air Quality and Emissions Good Practice Planning Guidance, September 2018

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

Table 1: Air Quality Objectives and Limit Values Relevant to the Assessment*			
Pollutant	**Objective/Limit Value**	**Averaging Period**	**Obligation**
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 detailed in **Appendix A**.

3 ASSESSMENT METHODOLOGY

3.1 Consultation and Scope of Assessment

3.1.1 The assessment methodology was discussed and agreed with Mr Chris Shields, Technical Office (Pollution Control) and Mr James Gardham, Environmental Health Officer (Pollution Control) at Barnsley Metropolitan Borough Council (BMBC), via email correspondence, on 16th November 2018.

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 PM_{10}	Qualitative assessment in accordance with Institute of Air Quality Management (IAQM) guidance	No objection to method
Operational phase assessment to consider NO_2 and 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
	2017 meteorological data from Emley Moor No. 2 met station	No objection to method
	Background concentrations from 2015-based DEFRA default maps	No objection to method
	Assessment undertaken using EFT8.0.1 emission factors	No objection to method
	Model verification using roadside diffusion tubes, DT20, DT21 and DT23	No objection to method
	Sensitivity analysis using Calculator Using Realistic Emissions for Diesels (CURED)	Agreed, however requested additional sensitivity analysis assuming no improvement in air quality.

3.2 Construction Phase Impacts

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

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

3.2.2 The closest sensitive human receptors to where construction phase activities will take place are a mixture of residential and commercial 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)
Lane Side Farm	West	Adjacent to site boundary
Lane Head Farm Bungalow	South	Adjacent to site boundary
Existing commercial property located in Capitol Park	South east	Adjacent to site boundary
Existing Residential Dwellings along Highham Common Road	North	Approx. 160m at closest point

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 4.1) 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 sensitive receptors, as these are the pollutants considered most likely to exceed the objectives and limit values.

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

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

- **Scenario 1:** 2017 Verification and Base Year, the most recent year for which traffic flow information, local monitored pollution data and meteorological data is available;
- **Scenario 2:** 2024 Opening/Future Year, without the proposed development in place; and
- **Scenario 3:** 2024 Opening/Future Year, with the proposed development in place.

Existing Sensitive Receptors

3.3.4 A number of representative existing sensitive receptors (identified as ESR 1 to ESR 6) have been selected for consideration in the air quality assessment. These have been chosen based on their sensitivity and their proximity to roads which will be affected by development generated traffic.

3.3.5 Details of these receptors considered are provided in Table 4, and their locations are illustrated on drawing SH11957-003.

Table 4: Existing Sensitive Receptors Considered in Operational Phase Assessment

Receptor	Address	Grid Reference		Receptor Type
		Easting	Northing	
ESR 1	Lane Side Farm, Highham Lane, Barnsley	431460	406332	Residential
ESR 2	Stone Bank, Highham Lane, Dodworth	431623	405783	Residential
ESR 3	24 Middleton Grove, Dodworth	431447	405712	Residential
ESR 4	188 Whinby Road, Dodworth	432061	405851	Residential
ESR 5*	319 Dodworth Road, Barnsley	432316	405976	Residential
ESR 6*	258 Dodworth Road, Barnsley	432386	405984	Residential
*Situated within an Air Quality Management Area				

3.3.6 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**.

Proposed Sensitive Receptors

3.3.7 Due to the development being commercial in nature, no proposed sensitive receptors are to be considered, as the annual mean objective does not apply to commercial use, as in accordance with guidance from Environmental Protection UK (EPUK) and the IAQM[2].

3.4 Limitations and Uncertainties

3.4.1 At present, there is a degree of uncertainty associated with the prediction of future NO_2 concentrations, and consequently the assessment of impacts relating to development generated road traffic emissions.

3.4.2 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 as new Euro standards have been introduced), coupled with an overall increase in the number of diesel vehicles on the road.

3.4.3 The vehicle emission factors used in this assessment are from Defra's Emission Factor Toolkit (EFT v8.0.1)[3], which is the most up-to-date version available. Although this is considered to be more realistic than earlier versions, uncertainty remains.

3.4.4 As the Institute of Air Quality Management (IAQM) have issued a statement[4] indicating that sensitivity analyses should also be carried out in support of EFT v8.0.1 emission assessments, a more realistic sensitivity analysis methodology, utilising the Calculator Using Realistic Emissions for Diesels (CURED) tool[5], has been adopted within the road traffic emissions assessment. The CURED tool, developed by Air Quality Consultants (AQC), assumes that Euro 6a/b and Euro 6c have the same effects as are assumed by COPERT V5.0, but Euro 6d is ineffective. Therefore, for all Euro 6d diesel cars and vans, NO_x emissions are assumed to be no different to those from the equivalent Euro 6c vehicles. It is considered that the results of the CURED sensitivity

[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, July 2018
[5] Air Quality Consultants, Development of the CURED V3A Emissions Model, January 2018

test provide a reasonable worst-case upper-bound to the assessment. A no-improvement sensitivity test, applying 2017 background pollutant concentrations to the 2024 future year has also been carried out. The results of this are provided in **Appendix D**.

3.4.5 This assessment has taken into account the uncertainties associated with predicting future air quality by applying 2017 background pollution concentrations and vehicle emission factors to the 2024 opening year/future year, to provide a robust conservative approach. Further details of the methodology are provided in **Appendix C** and the results are detailed in section 5 of this report.

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 BMBC, which is responsible for the management of local air quality.

4.1.2 There are currently six AQMAs declared within BMBC, as a result of exceedances of the annual mean NO_2 objective. The six AQMAs are as follows:

- AQMA No.1: An AQMA encompassing residential properties 100 metres either side of the central reservation of the M1 motorway in Barnsley;
- AQMA No.2A: Residential properties along Dodworth Road between Junction 37 of the M1 motorway and Town End Roundabout, including a portion of Summer Lane;
- AQMA No.4: Residential properties along the uphill carriageway of Harborough Hill Road from the gyratory;
- AQMA No.5: Residential properties along the uphill carriageway of Burton Road adjacent to the junction with the A633 Rotherham Road;
- AQMA No.6: Residential properties along the A616 Manchester Road in Langsett; and
- AQMA No.7: Residential properties at the junction of Sheffield Road and the A6133 Cemetery Road.

4.1.3 The proposed development site is bordered to the east by the M1 motorway, and therefore the proposed development is adjacent to AQMA No.1. AQMA No.2A is located to the east of the proposed development, at approximately 700m.

4.1.4 There are currently no representative background monitoring locations in the vicinity of the proposed development. There are however a number of roadside and kerbside NO_2 diffusion tubes located within the existing AQMAs. Monitoring data for 2017, provided by BMBC, showed monitored annual mean NO_2 concentrations of between 40 and 52µg/m^3 in the vicinity of the proposed development.

4.2 Background Air Pollutant Concentrations

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

4.2.2 As there are currently no representative NO_2, PM_{10} or $PM_{2.5}$ monitoring locations in the vicinity of the proposed development site, background concentrations have been obtained from the 2015-based Defra default concentration maps, for the appropriate grid squares[6].

4.2.3 The grid square at 432500, 405500 (ESR 4, ESR 5, ESR 6 and DT 23) includes the elevated emissions arising from the M1. To ensure the model does not double-count the M1 emissions, the M1 contribution was removed from the grid square using Defra NO_2 Adjustment for NOx Sector Removal tool. This has also been applied to the CURED procedure.

4.2.4 The CURED sensitivity test adjusts the Euro VI (d) vehicle class to a Euro VI (c) class. There are a number of Euro (d) in circulation in 2017, therefore the CURED procedure is also applied to the 2017 base year. This results in slightly higher background concentration due to the increased emissions emitted.

4.2.5 The background pollutant concentrations used in this assessment are detailed in Table 5.

Table 5: Background Pollutant Concentrations Used in the Air Quality Assessment*

2017 Annual Mean Concentrations (µg/m³) – Emission Factor Toolkit Version 8				
Grid Square	Oxides of Nitrogen (NO_x)	Nitrogen Dioxide (NO_2)	Particulate matter (PM_{10})	Particulate matter ($PM_{2.5}$)
431500, 406500 (ESR 1)	23.15	16.60	13.63	8.63
431500, 405500 (ESR 2, ESR 3)	17.36	12.76	11.29	7.45
432500, 405500 (ESR 4, ESR 5, ESR 6)	16.89**	**12.43****	**13.99**	**8.85**
2024 Annual Mean Concentrations (µg/m³) - Emission Factor Toolkit Version 8				
431500, 406500 (ESR 1)	15.97	**11.85**	**13.19**	**8.2**
431500, 405500 (ESR 2, ESR 3)	12.32	**9.31**	**10.88**	**7.05**
432500, 405500 (ESR 4, ESR 5, ESR 6)	12.16**	**9.19****	**13.54**	**8.39**

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

Table 5: Background Pollutant Concentrations Used in the Air Quality Assessment*				
2017 Annual Mean Concentrations (µg/m³) – Emission Factor Toolkit Version 8				
Grid Square	Oxides of Nitrogen (NO_x)	Nitrogen Dioxide (NO_2)	Particulate matter (PM_{10})	Particulate matter ($PM_{2.5}$)
2017 Annual Mean Concentrations (µg/m³) - CURED				
431500, 406500 (ESR 1)	25.50	**17.70**		
431500, 405500 (ESR 2, ESR 3)	19.12	**13.61**		
432500, 405500 (ESR 4, ESR 5, ESR 6)	26.63**	**18.44****		
2024 Annual Mean Concentrations (µg/m³) - CURED				
431500, 406500 (ESR 1)	19.15	**13.68**		
431500, 405500 (ESR 2, ESR 3)	14.46	**10.54**		
432500, 405500 (ESR 4, ESR 5, ESR 6)	14.16**	**10.33****		
*Obtained from the Defra 2015-based background maps ** Backgrounds adjusted to remove contribution of the M1 motorway				

4.3 Modelled Baseline Concentrations at Existing Sensitive Receptors

4.3.1 The baseline assessment (i.e. Scenarios 1 and 2) has been carried out for the existing sensitive receptors considered. The adjusted NO_2 and unadjusted PM_{10} and $PM_{2.5}$ concentrations are detailed in Table 6.

Table 6: Predicted Adjusted NO_2 and Unadjusted PM_{10} and $PM_{2.5}$ Concentrations at Existing Sensitive Receptors for Scenarios 1 and 2						
Receptor	**Calculated Annual Mean Concentrations (µg/m³) - Emission Factor Toolkit Version 8**					
	Scenario 1: 2017 Base Year			**Scenario 2: 2024 Opening/Future Year, Without Development**		
	NO_2	**PM_{10}**	**$PM_{2.5}$**	**NO_2**	**PM_{10}**	**$PM_{2.5}$**
ESR 1	25.71	13.89	8.78	17.22	13.44	8.34
ESR 2	19.86	11.47	7.56	13.33	11.06	7.15
ESR 3	17.46	11.43	7.53	12.00	11.02	7.13
ESR 4	30.35	14.48	9.14	19.70	14.03	8.66
ESR 5	42.87	14.89	9.38	27.24	14.42	8.87
ESR 6	57.84	15.35	9.66	36.84	14.86	9.12

Table 6: Predicted Adjusted NO_2 and Unadjusted PM_{10} and $PM_{2.5}$ Concentrations at Existing Sensitive Receptors for Scenarios 1 and 2

Receptor	Calculated Annual Mean Concentrations (µg/m³) - Emission Factor Toolkit Version 8					
	Scenario 1: 2017 Base Year			Scenario 2: 2024 Opening/Future Year, Without Development		
	NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$
Calculated Annual Mean Concentrations (µg/m³) - CURED						
ESR 1	26.28			18.69		
ESR 2	20.44			14.39		
ESR 3	18.16			13.12		
ESR 4	35.08			20.25		
ESR 5	47.17			27.66		
ESR 6	61.59			37.07		

NO_2 concentrations obtained by inputting predicted NO_x concentrations into the NO_x to NO_2 calculator[7] in accordance with LAQM.TG(16)
Concentrations underlined show exceedance of the NO_2 objective

4.3.2 The results show that all predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations are below the relevant objectives and limit values in 2024. The predicted NO_2 concentrations at ESR 5 and 6 in 2017 exceed the Air Quality Objective. These sensitive receptors are situated within AQMA No.2, declared by BMBC for exceedance of the NO_2 objective level. This result is therefore expected and air quality is predicted to improve in 2024.

[7] Defra Local Air Quality Management webpages (http://laqm.defra.gov.uk/tools-monitoring-data/no-calculator.html)

5 IMPACT ASSESSMENT

5.1 Construction Phase

Step 2 – Impact Assessment

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

5.1.2 Demolition covers the removal of existing structures on the proposed site. Earthworks cover the processes of soil-stripping, ground-levelling, excavation and landscaping. Construction activities will focus on the proposed buildings, access roads car parking areas. Trackout is defined as the transport of dust and dirt by vehicles travelling from a construction site on to 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 demolition, 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 7.

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.

5.1.6 For demolition, there are currently between 10 and 100 receptors (commercial) within 100m of where this activity will occur.

5.1.7 For earthworks and construction, there are currently between 10 and 100 receptors (residential and commercial) within 20m of where these activities may take place, which is assumed to be the site boundary for the purposes of this assessment.

5.1.8 For trackout, there are between 10 and 100 receptors (residential and commercial) within 20m of where trackout may occur for a distance of up to 500m from the site entrance (assuming construction vehicles travel south from the site and then east towards the M1).

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 7.

Summary of Step 2

5.1.11 Table 7 details the results of Step 2 of the construction phase assessment for human receptors.

Table 7: Construction Phase Dust Assessment for Human Receptors

	Activity			
	Demolition	**Earthworks**	**Construction**	**Trackout**
Step 2A				
Dust Emission Magnitude	Small	Large[b]	Large[c]	Medium[d]
Step 2B				
Sensitivity of Closest Receptors	Medium	High	High	High
Sensitivity of Area to Dust Soiling Effects	Low	Medium	Medium	Medium
Sensitivity of Area to Human Health Effects	Low[e]	Low[e]	Low[e]	Low[e]

Table 7: Construction Phase Dust Assessment for Human Receptors				
	Activity			
	Demolition	Earthworks	Construction	Trackout
Step 2C				
Dust Risk: Dust Soiling	Negligible Risk	Medium Risk	Medium Risk	Low Risk
Dust Risk: Human Health	Negligible Risk	Low Risk	Low Risk	Low Risk
a. Total building volume <20,000 m^3 b. Total site area estimated to be more than 10,000m^2 c. Total building volume estimated to more than 100,000m^3, with potentially dusty construction materials d. Number of construction phase vehicles estimated to be between 10 and 50 movements per day e. Background annual mean PM_{10} concentration is taken from the LAQM Defra default concentration maps, for the appropriate grid square for 2017				

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 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:

- 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;
- Avoidance of activities that generate large amounts of dust during windy conditions;

- 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;
- Avoid dry sweeping of large areas;
- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use;
- Ensure vehicles entering and leaving the site are covered to prevent escape of materials during transport;
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable);
- Minimisation of vehicle movements and limitation of vehicle speeds – the slower the vehicle speeds, the lower the dust generation; and
- Ensure 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.

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 log book 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 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 Current evidence suggests that NO_2 background concentrations and emissions are not decreasing in accordance with expected reductions. The air quality assessment has therefore utilised a more realistic sensitivity analysis methodology, using the CURED tool.

5.2.2 A 'no-improvement' sensitivity analysis, applying 2017 background pollution concentrations and vehicle emission factor to the 2024 opening/future year to provide a robust conservative approach has also been carried out and the results presented in **Appendix D**.

5.2.3 The impact assessment has been carried out for the representative existing sensitive receptors considered (i.e. ESR 1 to ESR 6).

5.2.4 Table 8 details the predicted NO_2 concentrations for the 2024 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 8: Predicted Adjusted NO_2 Concentrations at Existing Sensitive Receptors for Scenarios 2 and 3

Receptor	Calculated Annual Mean NO_2 Concentrations ($\mu g/m^3$)[a] - Emission Factor Toolkit Version 8				
	Without Development	With Development		Concentration Change as Percentage of AQAL	Impact[b]
		Concentration	Percentage in Relation to AQAL		
ESR 1	17.22	17.25	<75%	<0.5%	**Negligible**
ESR 2	13.33	13.35	<75%	<0.5%	**Negligible**
ESR 3	12.00	12.01	<75%	<0.5%	**Negligible**
ESR 4	19.70	19.82	<75%	<0.5%	**Negligible**
ESR 5	27.24	27.34	<75%	<0.5%	**Negligible**
ESR 6	36.84	37.00	76% - 94%	<0.5%	**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

5.2.5 Table 9 details the predicted NO_2 concentrations for the 2024 Opening/Future Year, for both the 'Without Development' and 'With Development' scenarios using the CURED approach. 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

Receptor	Calculated Annual Mean NO_2 Concentrations ($\mu g/m^3$)[a] - CURED				
	Without Development	With Development		Concentration Change as Percentage of AQAL	Impact[b]
		Concentration	Percentage in Relation to AQAL		
ESR 1	18.69	18.72	<75%	<0.5%	**Negligible**
ESR 2	14.39	14.42	<75%	<0.5%	**Negligible**
ESR 3	13.12	13.15	<75%	<0.5%	**Negligible**
ESR 4	20.25	20.36	<75%	<0.5%	**Negligible**
ESR 5	27.66	27.76	<75%	<0.5%	**Negligible**
ESR 6	37.07	37.23	76% - 94%	<0.5%	**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

5.2.6 Table 10 details the PM_{10} concentrations for the 2024 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

Receptor	Calculated Annual Mean PM_{10} Concentrations ($\mu g/m^3$) - Emission Factor Toolkit Version 8				
	Without Development	With Development		Concentration Change as Percentage of AQAL	Impact[a]
		Concentration	Percentage in Relation to AQAL		
ESR 1	13.44	13.44	<75%	<0.5%	**Negligible**
ESR 2	11.06	11.06	<75%	<0.5%	**Negligible**
ESR 3	11.02	11.02	<75%	<0.5%	**Negligible**
ESR 4	14.03	14.03	<75%	<0.5%	**Negligible**

Table 10: Predicted Unadjusted PM_{10} Concentrations at Existing Sensitive Receptors for Scenarios 2 and 3					
Receptor	**Calculated Annual Mean PM_{10} Concentrations (µg/m³) - Emission Factor Toolkit Version 8**				
	Without Development	**With Development**		**Concentration Change as Percentage of AQAL**	**Impact[a]**
		Concentration	**Percentage in Relation to AQAL**		
ESR 5	14.42	14.42	<75%	<0.5%	**Negligible**
ESR 6	14.86	14.87	<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					

5.2.7 Table 11 details the $PM_{2.5}$ concentrations for the 2024 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					
Receptor	**Calculated Annual Mean $PM_{2.5}$ Concentrations (µg/m³) - Emission Factor Toolkit Version 8**				
	Without Development	**With Development**		**Concentration Change as Percentage of AQAL**	**Impact[a]**
		Concentration	**Percentage in Relation to AQAL**		
ESR 1	8.34	8.34	<75%	<0.5%	**Negligible**
ESR 2	7.15	7.15	<75%	<0.5%	**Negligible**
ESR 3	7.13	7.13	<75%	<0.5%	**Negligible**
ESR 4	8.66	8.66	<75%	<0.5%	**Negligible**
ESR 5	8.87	8.87	<75%	<0.5%	**Negligible**
ESR 6	9.12	9.12	<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					

5.2.8 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 objectives and limit values.

Assessment of Significance for Human Health

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 F**.

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

- Baseline pollutant concentrations in 2017 exceed the NO_2 concentration at existing sensitive receptors 5 and 6. These receptors are located within AQMA No.2, declared by BMBC for an exceedance of the NO_2 objective level;
- Baseline pollutant concentrations in 2024 are below the relevant annual mean objectives and limit values at all existing receptors considered; and
- The assessment predicts a negligible impact on concentrations of NO_2, PM_{10} and $PM_{2.5}$ at all 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 health is considered to be not significant.

Recommendations for Mitigation

General Industrial (B2)

5.2.12 The proposed development was modelled with the assumption of a general industrial (B2) use, due to the higher traffic numbers, as compared to a storage or distribution (B8) use, and therefore a predicted higher impact on air quality concentrations.

5.2.13 The BMBC Air Quality and Emissions Good Practice Planning Guidance[8], details the mitigation BMBC would require to be put in place for certain types of development, due to their potential impact on air quality. The impacts are categorised by their scale of impact. Further information on the guidance can be found in **Appendix A**.

5.2.14 For a general industrial (B2) use, the proposed development meets the 'Medium' development classification. Therefore, the proposed development will require a detailed Travel Plan. The Travel Plan will promote and deliver sustainable transport and all transport mitigation may be included within the Travel Plan.

5.2.15 The suggested mitigation to be included in the Travel Plan includes providing 10% of parking spaces with electric vehicle charging and all commercial vehicles should comply with current or the most recent European Emission Standards.

[8] Barnsley Metropolitan Borough Council Air Quality and Emissions Good Practice Planning Guidance, October 2018

Storage or Distribution (B8)

5.2.16 The potential of the proposed development being a storage or distribution (B8) premises was not modelled in this assessment, as the air quality impacts associated with a general industrial (B2) are expected to be worse due to higher traffic numbers, however is considered as part of the potential mitigation requirements.

5.2.17 The BMBC Air Quality and Emissions Good Practice Planning Guidance[8] determines the proposed development will meet the 'Major' development classification, as the additional HGV movements equate to more than 10% of the total trips the proposed development will generate. Such a classification requires a damage cost calculation to be undertaken in line with BMBCs PPG. A damage cost calculation identifies the environmental damage costs associated with the proposed development and determines the value of mitigation that is expected to be spent on measures to mitigate the impact.

Damage Cost Calculation

5.2.18 This utilises the current DEFRA Emission Factor Toolkit (Version 8.0), available on the Defra website[9], to estimate the annual link emissions associated with the additional development generated vehicles over a 5 year period. The calculation attributes a monetary value to those emissions using the figures per tonnes outlined by Defra[10] .

5.2.19 The total number of 24-hour trips is predicted to be 584 AADT with a 26% HGV split. The average trip length is assumed to be 10km and the average speed as 64kph, in accordance with the guidance.

5.2.20 Given the results of the air quality assessment, the calculation has been undertaken for NO_x emissions only. The results are detailed in Table 12.

Table 12: Damage Cost Calculation Undertaken Using EFT and by Taking into Account the Defra Damage Cost Figures

Step	NO_x	$PM_{10}/PM_{2.5}$*
Emission calculation using EFT spreadsheet	525.087875 kg/yr	115.360223 kg/yr
Conversion into tonnes per annum	0.525087875 tonnes/yr	0.115360223 tonnes/yr

[9] Defra Local Air Quality Management website (http://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html)
[10] Defra, [Gov.UK] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/770576/air-quality-damage-cost-guidance.pdf

Table 12: Damage Cost Calculation Undertaken Using EFT and by Taking into Account the Defra Damage Cost Figures		
Step	**NO_x**	**$PM_{10}/PM_{2.5}$***
Defra air quality damage costs per tonne	*NO_x (Central Estimate): £6,199	*NO_x (Central Estimate) £67,946.71
Calculation of air quality damage per year	£3,255.01	£7,838.35
Calculation of air quality damage over 5 year period	£16,275.09	£39,191.74
*The PM_{10} emissions have been calculated using EFT v8. The National Average PM_{10} to $PM_{2.5}$ conversion of 0.642 has been applied to the central estimate of £105,836, resulting in a $PM_{2.5}$ per tonne sum of £67,946.71 **National Average for NO_x and $PM_{10}/PM_{2.5}$		

5.2.21 The total damage cost of NO_x and PM_{10} for the proposed development over a five year period is £55,467.83. The input and output data for the damage cost calculation can be seen in **Appendix E**.

6 CONCLUSIONS

6.1 Construction Phase

6.1.1 The construction phase assessment has been undertaken to determine the risk and significance of dust and fine particulate matter effects from 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 effects from earthworks, construction and trackout is considered to be **not significant.**

6.2 Operational Phase

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 six existing sensitive receptors.

6.2.2 Current evidence suggests that NO_2 background concentrations and emissions are not decreasing in accordance with expected reductions and therefore a more realistic sensitivity analysis methodology was utilised, using the CURED tool. A 'no-improvement' sensitivity analysis, applying 2017 background pollution concentrations and vehicle emission factor to the 2024 opening/future year to provide a robust conservative approach has also been carried out.

6.2.3 Pollutant concentrations in 2024, with the development in place, are below the relevant annual mean objectives and limit values at 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 six existing sensitive receptors considered in 2024. The effect of the proposed development on human health is therefore considered to be **not significant**.

Recommendations for Mitigation

General Industrial (B2)

6.2.5 In accordance with the BMBC Air Quality and Emissions Good Practice Planning Guidance[8], the proposed development will require a detailed Travel Plan, if primarily a general industrial (B2) premises.

Storage or Distribution (B8)

6.2.6 The potential of the proposed development being a storage or distribution premises was not modelled in this assessment due to B2 use being considered as the worst case scenario in air quality terms, however is considered as part of the potential mitigation requirements.

6.2.7 The BMBC Air Quality and Emissions Good Practice Planning Guidance[8] determines the proposed development requires a damage cost calculation. The damage cost of NO_x and PM_{10} for the proposed development over a five year period is £49,640.35.

6.3 Summary

6.3.1 The assessment has demonstrated that the proposed development will not lead to an unacceptable risk from air pollution, nor will it lead to any breach of national objectives as required by national policy. There are no material reasons in relation to air quality why the proposed scheme should not proceed.

APPENDICES

Appendix A: Air Quality Legislation and Guidance

European Legislation

A.1 The European Union (EU) Ambient Air Quality Directive 2008/50/EC[1] (i.e. the CAFE Directive) came into force in June 2008. This EU Directive consolidates previous air quality legislation, with the exception of the 4th daughter Directive[2], and sets air quality limit values for seven pollutants. The Directive also provides a regulatory framework for fine particulate matter smaller than 2.5µm in diameter ($PM_{2.5}$).

A.2 EU Directive 2008/50/EC was transposed into legislation in the UK on 11th June 2010 as The Air Quality Standards Regulations 2010[3].

National Air Quality Strategy

A.3 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[4].

A.4 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.5 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).

[1] 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
[2] Directive 2004/107/EC of the European Parliament and the Council of 15th December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air
[3] The Air Quality Standards Regulations 2010
[4] Department of Environment, Food and Rural Affairs, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, July 2007

A.6 Objectives for each pollutant, except O_3, were first given statutory status in the Air Quality Regulations 2000[5] and Air Quality (Amendment) Regulations 2002[6]. 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."

A.7 The EU limit values, transposed into UK legislation as The Air Quality Standards Regulations 2010, are mostly the same as the air quality objectives in terms of concentrations; however, there are differences in determining how compliance is achieved.

A.8 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.9 Examples of where these objectives and limit values apply are detailed in the Defra LAQM Technical Guidance document LAQM.TG(16)[7] 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

[5] The Air Quality Regulations 2000. SI No 928
[6] The Air Quality (Amendment) Regulations 2002
[7] 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:**
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). 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	Kerbside sites where public would not be expected to have regular access
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.10 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.11 LAQM.TG(16) presents a streamlined approach for LAQM in England and Scotland; however, Wales and Northern Ireland are still considering changes to LAQM and therefore work according to the previous regimes.

A.12 Local authorities in England are required to produce Annual Status Reports (ASRs), and in Scotland, 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.13 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.14 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.15 Five local authorities outside of London were initially selected to implement a CAZ by 2020 (Birmingham, Leeds, Nottingham, Derby and Southampton). A further 23 local authorities were subsequently chosen to investigate the feasibility of establishing a CAZ, and 33 local authorities may potentially have to proceed to this stage where compliance is not achieved.

National Planning Policy Framework

A.16 The National Planning Policy Framework (NPPF)[8], introduced in March 2012 and updated in July 2018, requires that:

"Planning policies 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 on air quality from individual sites in local areas.

Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at 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.17 The Planning Practice Guidance (PPG)[9], updated in March 2014, 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

[8] Ministry of Housing, Communities and Local Government, National Planning Policy Framework, July 2018
[9] Department for Communities and Local Government. Planning Practice Guidance: Air Quality, March 2014

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.18 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.

Barnsley Metropolitan Borough Council Air Quality and Emissions Good Practice Planning Guidance

A.19 The guidance provides a template for integrating air quality considerations into land-use planning and development management policies that can influence the reduction of road transport emissions. The guidance is included in the Barnsley MBC Air Quality Action Plan.

A.20 The air quality assessments follow a three stage process:

- Stage 1: Determining the classification of the development proposal
- Stage 2: Assessing and quantifying the impact on local air quality
- Stage 3: Determining the level of a mitigation required by the proposal to meet Local Development Plan requirements

A.21 A proposed development within the Barnsley Metropolitan Borough Council area has to be assessed against criteria to assess development classification. The criteria are shown in Table A2.

Table A2: Barnsley Metropolitan Borough Council Development Classification

Land Use	Description	TA Required
Food Retail (A1)	Retail sale of food goods to the public – supermarkets, superstore, convenience food store	>800 m^2 (GFA)
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	>1500 m^2 (GFA)
Financial and professional services (A2)	Banks, building societies and bureaux de change, professional services, estate agents, employment agencies, betting shops.	>2500 m^2 (GFA)
Restaurants and Cafes (A3)	Use for the sale of food for consumption on the premises	>2500 m^2 (GFA)
Drinking	Use as a public house, wine-bar for consumption on	>600 m^2 (GFA)

Table A2: Barnsley Metropolitan Borough Council Development Classification		
Land Use	**Description**	**TA Required**
Establishments (A4)	or off the premises.	
Hot Food Takeaway (A5)	Use for the sale of hot food for consumption on or off the premises.	>500 m^2 (GFA)
Business (B1)	(a) Offices other than in use within Class A2 (financial & professional). (b) Research & development – laboratories, studios. (c) Light industry	>2500 m^2 (GFA)
General industrial (B2)	General industry (other than B1).	>4000 m^2 (GFA)
Storage or Distribution (B8)	Storage or distribution centres – wholesale warehouses, distribution centres & repositories	>5000 m^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
Dwellings 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.	>1000 m^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.	>1500 m^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 Air Quality Management Area (AQMA)		

A.22 The three development classifications are:

- Minor Proposal: Development proposals that fall below the above criteria
- Medium Proposal: Development proposals that meet the above requirements
- Major Proposal: Development proposals that meet the above requirements and the additional criteria set out in Table A3.

Table A3: Additional Trigger Criteria for Major Developments
• 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 Air Quality Management Area (AQMA) • Proposals that could increase the existing traffic flow on roads > 10,000 AADT by 5% or more • Proposals that increase traffic by 5% or more on road canyons with an AADT > 5,000 • 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 10 kph • Proposals that include additional HGV movements by more than 10% of total trips. • Where significant demolition works are proposed • Where significant construction works are proposed

A.23 Depending on the type of development classification, as determined by Tables A2 and A3, the suggested mitigation required due to the proposed development is set out in Table A4 – A6 below.

Table A4: TYPE 1 (Minor) Suggested Mitigation Options
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 which may be phased with 5% initial provision and the remainder at an agreed level. Industrial: 10% of parking spaces which may be phased with 5% initial provision and the remainder at an agreed level. Demolition/Construction: Adherence to the London Best Practice Guidance

Table A5: TYPE 2 (Medium) Suggested Mitigation Options
All minor proposal mitigation measures could be considered (as set out in Table A4)
Commercial / Retail – 10% of parking spaces to be provided with an electric vehicle charging point, this may be phased with an initial 5% provision and the remainder at an agreed trigger level
Industrial – 10% of parking spaces to be provided with an electric vehicle charging point; this may be phased with an initial 5% provision and the remainder at an agreed trigger level –this has been moved to Minor
All – Travel Plan, including agreed mechanisms 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 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

Table A6: TTYPE 3 (Major) Suggested Mitigation Options
MEDIUM proposal measures 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 private car use: • Development of car clubs and car sharing with financial incentives and promotion. • Use of pooled low emission vehicles – cars, vans, taxis, bicycles. • Provision of dedicated low emission shuttle bus including managed pick-up and drop-off. • Contribution to the emerging low emission vehicle infrastructure. • Contribution to site low emission waste collection services. • Incentives for the take-up of low emission vehicle technologies and fuels. • Support driver training schemes. 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 services for public transport. • Promoting low emission bus service provision. • Support air quality monitoring programmes.

Table A6: TTYPE 3 (Major) Suggested Mitigation Options
Further measures to promote cycling and walking: • Improvements to district walking and cycling networks including lighting, shelters, and information points and timetables. • Support cycle and training awareness schemes. • Bike/e-bike hiring schemes. • Guaranteed ride home in emergencies. • Support secure and safe cycle parking facilities. Further measures to promote sustainable travel plans: • Support local travel to school and school travel plans initiatives. • Marketing aimed at encouraging a switch to sustainable modes with incentives. • Promotion of subsidised/sponsored travel plan measures through social or other media • Supporting community/local organisation groups to promote sustainable travel.

A.24 Each development will then 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.

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)[10].

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).

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

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[abc]		
Receptor Sensitivity	**Distance from the Source (m)**	
	<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	Medium 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[11], 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

C.1 The air dispersion model ADMS-Roads (CERC, Version 4.1) 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

C.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 Fore Consulting, the appointed transport consultants for the project. The study extent of the model is shown in Figure C.1.

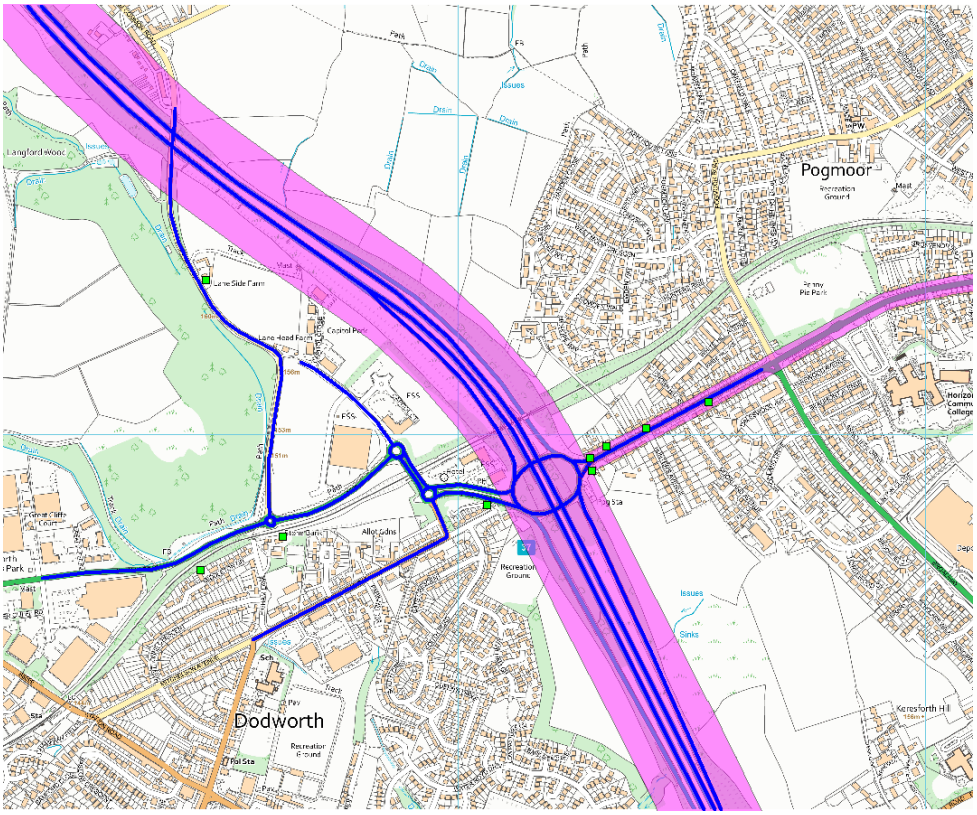


Figure C.1: Study Extent of Air Dispersion Model. The purple areas are sections of the AQMA NO.1 and 2a, while the roads modelled in the assessment can be seen in blue

C.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.

C.4 The traffic data provided by Fore Consulting considered the following committed developments:

- 2016/0259: Smithy Wood Land, Dodworth (36 dwellings);
- 2016/0268: Green Road, Dodworth (50 dwellings);
- 2016/0713 and 2017/0987: Capitol Park Industrial Estate (outline consent for industrial estate and associated application for Unit C to be used as NHS blood storage facility);
- 2017/1002: Capitol Park (approx. 7,000 sqm GFA industrial units, accessed from Capitol Close); and
- B/04/1998/DO: Capitol Park (Industrial development south of Capitol Close).

C.5 Traffic data was provided for consideration of both a B2 industrial and B8 industrial. In air quality terms, a B2 assessment is worse due to a higher number of vehicles and therefore considered for the assessment. The traffic data for the B8 assessment has also been provided for comparison.

C.6 The traffic flow data used in the assessment (B2) is included in Table C1 and for B8 in Table C2.

Table C1 24-hour AADT traffic data used in the assessment (B2 use)

Link	Link Name	Speed Info (kph)	Scenario 1: 2017 Verification and Base Year		Scenario 2: 2024 Without Development		Scenario 3: 2024 Opening/Future Year, With Development	
			LGV	HGV	LGV	HGV	LGV	HGV
001	Whinby Road (West)	64	11708	659	13013	724	13065	728
002	Whinby Road (East)	64	14771	725	16469	797	16569	804
003	Higham Lane	96	7399	189	8305	208	8353	211
004	Whinby Road (West)	64	14762	797	16464	875	16565	883
005	Capitol Close	8	1092	97	2816	121	3472	171
006N	Whinby Road (East) (North)	64	7111	506	8557	563	8835	584
006S	Whinby Road (East) (South)	64	8326	373	9761	417	10038	438
007N	Whinby Road (North West) (North)	64	7098	475	8456	529	8734	550
007S	Whinby Road (North West) (South)	64	8307	363	9741	405	10017	427

Table C1 24-hour AADT traffic data used in the assessment (B2 use)								
Link	**Link Name**	**Speed Info (kph)**	**Scenario 1: 2017 Verification and Base Year**		**Scenario 2: 2024 Without Development**		**Scenario 3: 2024 Opening/Future Year, With Development**	
			LGV	**HGV**	**LGV**	**HGV**	**LGV**	**HGV**
008W	Whinby Road (East) (West)	64	10041	506	11685	563	11919	580
008E	Whinby Road (East) (East)	64	10231	414	11775	462	12007	480
009	B6499	64	7853	128	8874	140	8963	147
010	Dodworth Road	48	21724	899	24424	987	24632	1003
011	M1 Slip Road (South)	20, 112 & 96	19986	1022	22441	1129	22582	1140
012W	Whinby Road (West)	64	10296	557	12054	622	12287	640
012E	Whinby Road (East)	64	10534	465	12215	518	12448	536
013	M1 Slip Road (North)	32, 112 & 96	11909	429	13412	482	13529	491
014N	M1 (North of Roundabout) (North)	112 & 96	40767	4793	44770	5264	44887	5273
014S	M1 (North of Roundabout) (South)	112 & 96	40767	4793	44770	5264	44770	5264
015N	M1 (South of Roundabout) North	112 & 96	41933	5079	46050	5578	46050	5578
015S	M1 (South of Roundabout) South	112 & 96	41933	5079	46050	5578	46191	5589

Table C2 24-hour AADT traffic data used in the assessment (B8 use)								
Link	**Link Name**	**Speed Info (kph)**	**Scenario 1: 2017 Verification and Base Year**		**Scenario 2: 2024 Without Development**		**Scenario 3: 2024 Opening/Future Year, With Development**	
			LGV	**HGV**	**LGV**	**HGV**	**LGV**	**HGV**
001	Whinby Road (West)	64	11708	659	13013	724	13035	736
002	Whinby Road (East)	64	14771	725	16469	797	16511	820
003	Higham Lane	96	7399	189	8305	208	8325	219
004	Whinby Road (West)	64	14762	797	16464	875	16507	899
005	Capitol Close	8	1092	97	2816	121	3093	275
006N	Whinby Road (East) (North)	64	7111	506	8557	563	9737	610
006S	Whinby Road (East) (South)	64	8326	373	9761	417	8815	500
007N	Whinby Road (North West) (North)	64	7098	475	8456	529	8604	576
007S	Whinby Road (North West) (South)	64	8307	363	9741	405	9827	488

Table C2 24-hour AADT traffic data used in the assessment (B8 use)								
Link	**Link Name**	**Speed Info (kph)**	**Scenario 1: 2017 Verification and Base Year**		**Scenario 2: 2024 Without Development**		**Scenario 3: 2024 Opening/Future Year, With Development**	
			LGV	**HGV**	**LGV**	**HGV**	**LGV**	**HGV**
008W	Whinby Road (East) (West)	64	10041	506	11685	563	11810	602
008E	Whinby Road (East) (East)	64	10231	414	11775	462	11848	531
009	B6499	64	7853	128	8874	140	8912	161
010	Dodworth Road	48	21724	899	24424	987	24512	1036
011	M1 Slip Road (South)	20, 112 & 96	19986	1022	22441	1129	22501	1162
012W	Whinby Road (West)	64	10296	557	12054	622	12178	662
012E	Whinby Road (East)	64	10534	465	12215	518	12288	587
013	M1 Slip Road (North)	32, 112 & 96	11909	429	13412	482	13461	509
014N	M1 (North of Roundabout) (North)	112 & 96	40767	4793	44770	5264	44820	5291
014S	M1 (North of Roundabout) (South)	112 & 96	40767	4793	44770	5264	44770	5264
015N	M1 (South of Roundabout) North	112 & 96	41933	5079	46050	5578	46050	5578
015S	M1 (South of Roundabout) South	112 & 96	41933	5079	46050	5578	46110	5611

Vehicle Emission Factors

C.7 The air quality assessment has used vehicle emission factors calculated using the Emissions Factor Toolkit (EFT) version 8.0.1, released in December 2017. This is the most up-to-date version of the EFT currently available.

C.8 As discussed in the section 3.4 of the report, there are uncertainties involved with the prediction of future NO_2 concentrations and therefore the air quality assessment has applied 2017 background pollution concentrations and vehicle emission factors to the 2024 opening/future year to provide a robust conservative approach.

Meteorological Data

C.9 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 2017. This has complete data capture for wind and temperature.

C.10 The Emley Moor No.2 recording station is located approximately 10km 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.

C.11 The 2017 wind rose for the Emley Moor No.2 Meteorological Recording Station is shown in Figure C2.

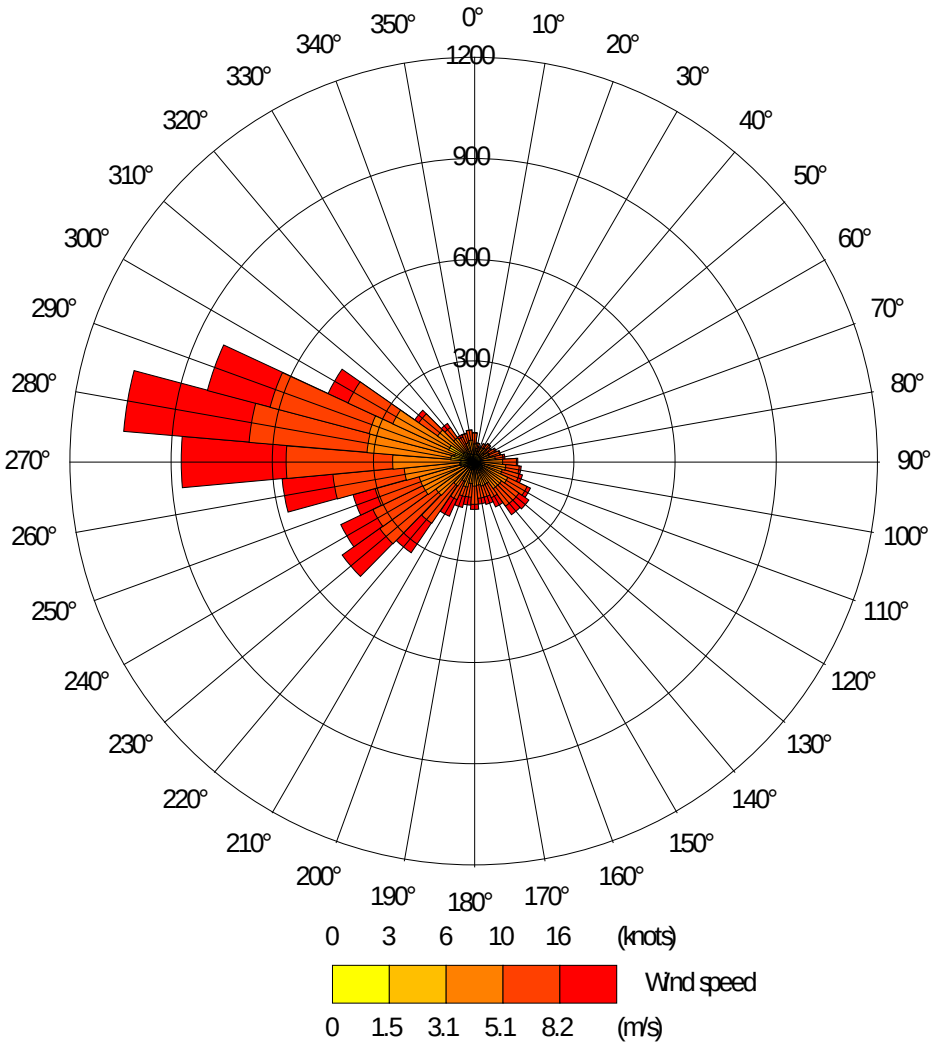


Figure C.2: 2017 Wind Rose for the Emley Moor No.2 Meteorological Station

Dispersion and Meteorological Site Characteristics

C.12 The characteristics for the dispersion site and meteorological sites, included in the ADMS-Roads model, are detailed in Table C3.

Table C3: Dispersion and Meteorological Site Characteristics		
Setting	**Dispersion Site**	**Meteorological Site**
Surface Roughness	1m	0.3m
Surface Albedo	0.23	0.23
Minimum Monin-Obukhov Length	30m	10m
Priestley-Taylor Parameter	1	1

NO_x to NO_2 Conversion

C.13 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

C.14 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.

C.15 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).

C.16 After reviewing the 2017 monitoring data, it is noted that there are four monitoring sites located in the vicinity of the development site, which are DT20, DT21, DT22 and DT23 (all located along Dodworth Road, Pogmoor). It is noted that DT22 is a kerbside diffusion tube location. Defra Technical Guidance document LAQM.TG(16) states that *"kerbside sites are not usually recommended for the adjustment of road traffic modelling results as the inclusion of these sites may lead to an over-adjustment"*. Therefore, DT22 has been excluded from the verification procedure.

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

C.17 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.

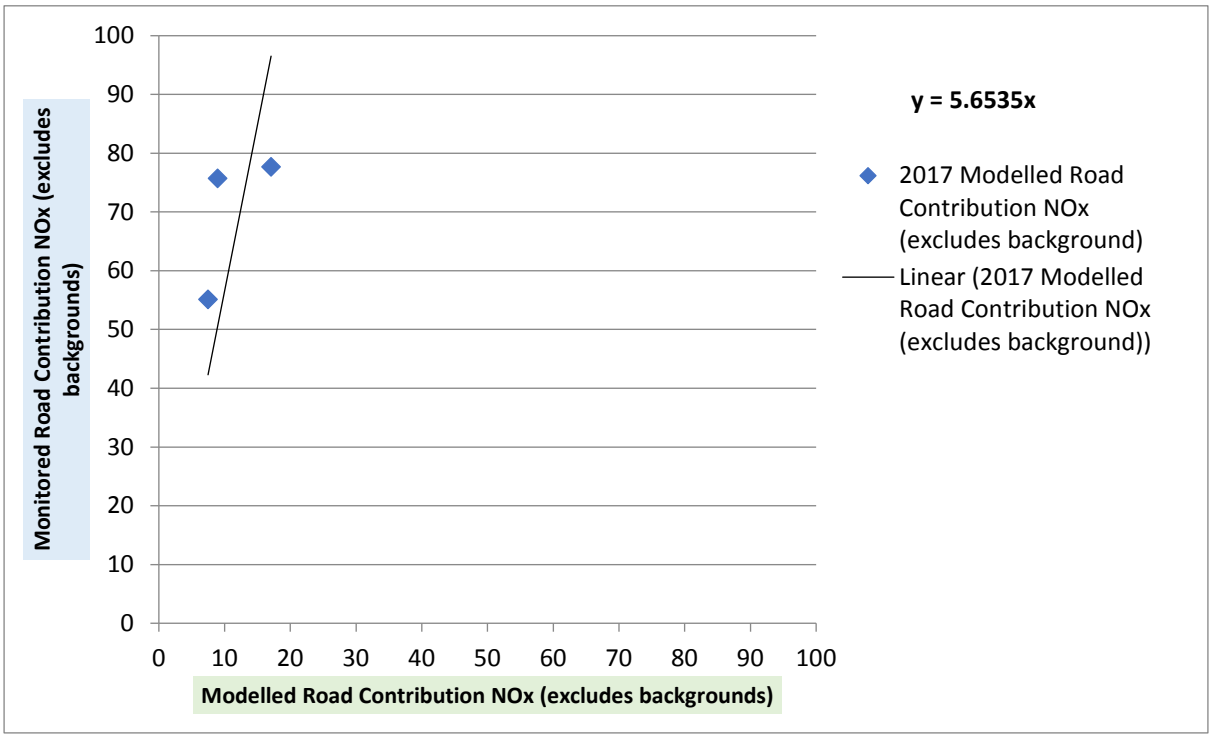
C.18 The monitoring data that has been used in the model verification procedure is detailed in Table C4.

Table C4: NO_2 Monitoring Data Used for Verification Purposes

Monitoring Location Reference	Type	Approximate Grid Reference		2017 Bias Adjusted NO_2 Annual Average Concentration (µg/m^3)
		Easting	Northing	
DT20 (Dodworth Road, Pogmoor)	Roadside Diffusion Tube	432535	406071	40.9
DT21 (Dodworth Road, Pogmoor)	Roadside Diffusion Tube	432402	406013	49.1
DT23 (Dodworth Road, Pogmoor)	Roadside Diffusion Tube	432281	405951	52.0

C.19 The modelled road-contribution NO_x concentrations for each diffusion tube have 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.

C.20 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 5.6535.



C.21 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.

C.22 A final comparison has been made between the total measured NO_2 concentrations and total modelled NO_2 concentrations, as shown in Table C5. Following adjustment, modelled concentrations are within 25% of measured concentrations.

Table C5: 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 (%)
DT20	40.90	35.39	-13.47
DT21	49.10	38.97	-20.63
DT23	52.00	54.83	5.44

C.23 A Root Square Mean Error (RMSE) calculation has been undertaken as part of the model verification for NO_2 concentrations. This has been carried out for the three

monitoring locations included within the model verification, in accordance with the guidance detailed in LAQM.TG(16).

C.24 The RMSE calculation following adjustment is detailed in Table C6.

Table C6: RMSE Calculation for Nitrogen Dioxide Concentrations

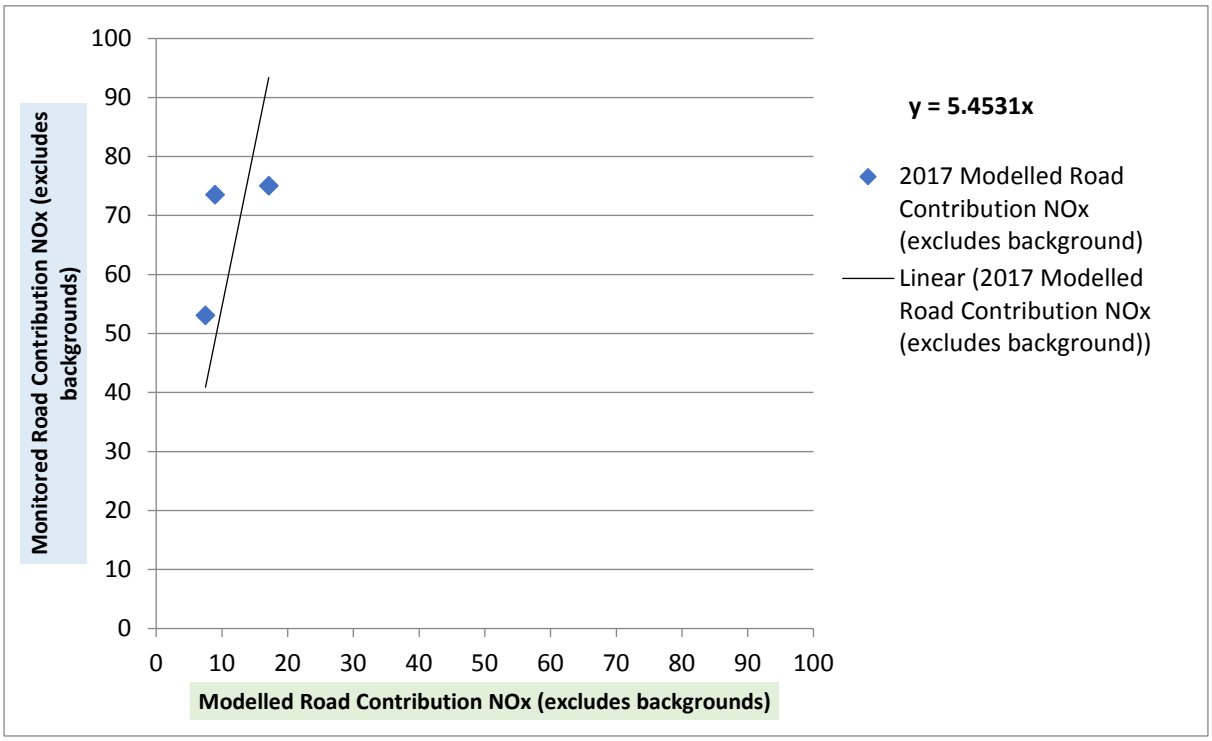
Diffusion Tube Location	After Verification			
	Observed Value	Predicted Value	Difference	RMSE
DT20	40.90	35.39	-5.51	6.86
DT21	49.10	38.97	-10.13	
DT23	52.00	54.83	2.83	

C.25 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.

CURED

C.26 The CURED procedure alters the emissions for Euro VI (d), consequently this reuslts in higher emissions and and increased background concentration. This results in a slightly reduced verification adjustment factor due to the higher backgorund concentrations reducing the gap between the model and monitored data.

C.27 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 5.4531.



C.28 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.

C.29 A final comparison has been made between the total measured NO_2 concentrations and total modelled NO_2 concentrations, as shown in Table C5. Following adjustment, modelled concentrations are within 25% of measured concentrations.

Table C5: 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 (%)
DT46	40.90	35.67	-12.79
DT49	49.10	39.04	-20.49
DT50	52.00	58.72	12.92

C.30 A Root Square Mean Error (RMSE) calculation has been undertaken as part of the model verification for NO_2 concentrations. This has been carried out for the three

monitoring locations included within the model verification, in accordance with the guidance detailed in LAQM.TG(16).

C.31 The RMSE calculation following adjustment is detailed in Table C6.

Table C6: RMSE Calculation for Nitrogen Dioxide Concentrations

Diffusion Tube Location	After Verification			
	Observed Value	Predicted Value	Difference	RMSE
DT20	40.90	35.67	-5.23	7.61
DT21	49.10	39.04	-10.06	
DT23	52.00	58.72	6.72	

C.32 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 Health

C.33 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.

C.34 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.

C.35 The impact descriptors for individual receptors are detailed in Table C7.

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

Table C7: 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

C.36 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'.

C.37 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: Sensitivity Analysis assuming no improvement

D.1 Current evidence suggests that NO_2 background concentrations and emissions are not decreasing in accordance with expected reductions. A sensitivity test assuming no improvements in air quality has been undertaken. The no-improvement sensitivity test applies the 2017 background pollution concentrations and vehicle emission factors to the 2024 Opening Year scenarios.

D.2 Table D1 details the predicted NO_2 concentrations for the 2024 Opening/Future Year, for both the 'Without Development' and 'With Development' scenarios using the no-improvement sensitivity test approach. The impact has been assessed in accordance with the descriptors included in Appendix C.

Table D1: Predicted Adjusted NO_2 Concentrations at Existing Sensitive Receptors for Scenarios 2 and 3

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	26.70	26.75	<75%	<0.5%	**Negligible**
ESR 2	20.63	20.68	<75%	<0.5%	**Negligible**
ESR 3	17.97	17.99	<75%	<0.5%	**Negligible**
ESR 4	32.38	32.61	<75%	1%	**Negligible**
ESR 5	45.69	45.87	<75%	<0.5%	**Negligible**
ESR 6	61.82	62.10	76 – 94%	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

D.3 Table D2 details the PM_{10} concentrations for the 2024 Opening/Future Year, for both the 'Without Development' and 'With Development' scenarios using the no-improvement sensitivity test approach. The impact has been assessed in accordance with the descriptors included in Appendix C.

Table D2: Predicted Unadjusted PM_{10} Concentrations at Existing Sensitive Receptors for Scenarios 2 and 3					
Receptor	**Calculated Annual Mean NO_2 Concentrations ($\mu g/m^3$)[a]**				
	Without Development	**With Development**		**Concentration Change as Percentage of AQAL**	**Impact[b]**
		Concentration	**Percentage in Relation to AQAL**		
ESR 1	13.92	13.92	<75%	<0.5%	**Negligible**
ESR 2	11.49	11.49	<75%	<0.5%	**Negligible**
ESR 3	11.45	11.45	<75%	<0.5%	**Negligible**
ESR 4	14.54	14.55	<75%	<0.5%	**Negligible**
ESR 5	14.98	14.99	<75%	<0.5%	**Negligible**
ESR 6	15.50	15.51	<75%	<0.5%	**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*					

D.4 Table 14 details the PM2.5 concentrations for the 2024 Opening/Future Year, for both the 'Without Development' and 'With Development' scenarios using the no-improvement sensitivity test approach. The impact has been assessed in accordance with the descriptors included in Appendix C.

Table D3: Predicted Unadjusted $PM_{2.5}$ Concentrations at Existing Sensitive Receptors for Scenarios 2 and 3					
Receptor	**Calculated Annual Mean NO_2 Concentrations ($\mu g/m^3$)[a]**				
	Without Development	**With Development**		**Concentration Change as Percentage of AQAL**	**Impact[b]**
		Concentration	**Percentage in Relation to AQAL**		
ESR 1	8.80	8.80	<75%	<0.5%	**Negligible**
ESR 2	7.57	7.57	<75%	<0.5%	**Negligible**
ESR 3	7.54	7.54	<75%	<0.5%	**Negligible**
ESR 4	9.18	9.18	<75%	<0.5%	**Negligible**

Table D3: Predicted Unadjusted $PM_{2.5}$ Concentrations at Existing Sensitive Receptors for Scenarios 2 and 3

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 5	9.44	9.45	<75%	<0.5%	**Negligible**
ESR 6	9.75	9.76	<75%	<0.5%	**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

Appendix E: Damage Cost Calculation

Select Pollutants		Select Outputs	Additional Outputs	Advanced Options
☑ NOx	☐ CO2	☐ Air Quality Modelling (g/km/s)	☐ Breakdown by Vehicle	☐ Euro Compositions
☑ PM10	☐ PM2.5	☐ Emissions Rates (g/km)	☐ Source Apportionment	☐ Output % Contribution from Euro Classes
		☐ Annual Link Emissions	☐ PM by Source	☐ Primary NO2 Fraction
		☑	☐	☐

Please Select from the Following Options:	
Area	England (not London)
Year	2024
Traffic Format	Basic Split
Select 'Basic Split' or 'Detailed Option 1 to 3' or 'Alternative Technologies' above	

Export Outputs

☐ Save Output to New Workbook

File Name: SH11957 Capitol Park

SourceID	Road Type	Traffic Flow	%HDV	Speed(kph)	No of Hours
Emissions Calcs	Urban (not London)	584	26	64	24

Source Name	Pollutant Name	All Vehicles (Annua	All LDVs (Annual E	All HDVs (Annual Emissions (kg/yr except CO2 tonnes/
Emissions Calcs	NOx	525.08788	307.08143	218.00644
Emissions Calcs	PM10	115.36022	48.41708	66.94315

Appendix F: Professional Experience of Assessors

F.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:

Emily Forster **Graduate**
BSc, AIAQM, AMIEnvSc, TechIOA **Environmental Scientist**

Emily joined Wardell Armstrong in October 2017 as a Graduate Environmental Scientist, upon completion of a Bsc in Geography. Emily carries out air quality assessments to accompany planning applications and, therefore, she has experience of undertaking air quality assessments for a wide range of projects including residential developments in urban and rural settings, city centres and industrial developments. Emily has a good range of skills and knowledge of air quality modelling and monitoring through her involvement in air quality projects, as standalone reports or as part of Environmental Impact Assessments (EIAs), which she has also completed for dust assessments. Emily has experience of odour surveying and has prepared several reports.

Mariam Weatherley **Principal Environmental**
BSc (Hons) MSc CEnv MIEnvSc MIAQM **Scientist**

Mariam is a Chartered Environmental Scientist in the Stoke office, with wide experience in the environmental profession predominantly in relation to air quality, gained from 14 years employment in this sector. Mariam's background in environmental consultancy has provided her with a good range of skills and knowledge through the involvement in air quality projects both as individual commissions and as part of EIAs for public and private sector clients. Mariam has an advanced knowledge of modelling techniques and monitoring (including monitoring strategies, passive monitoring techniques and automatic stations) and has led teams of air quality specialists on technical assessments.

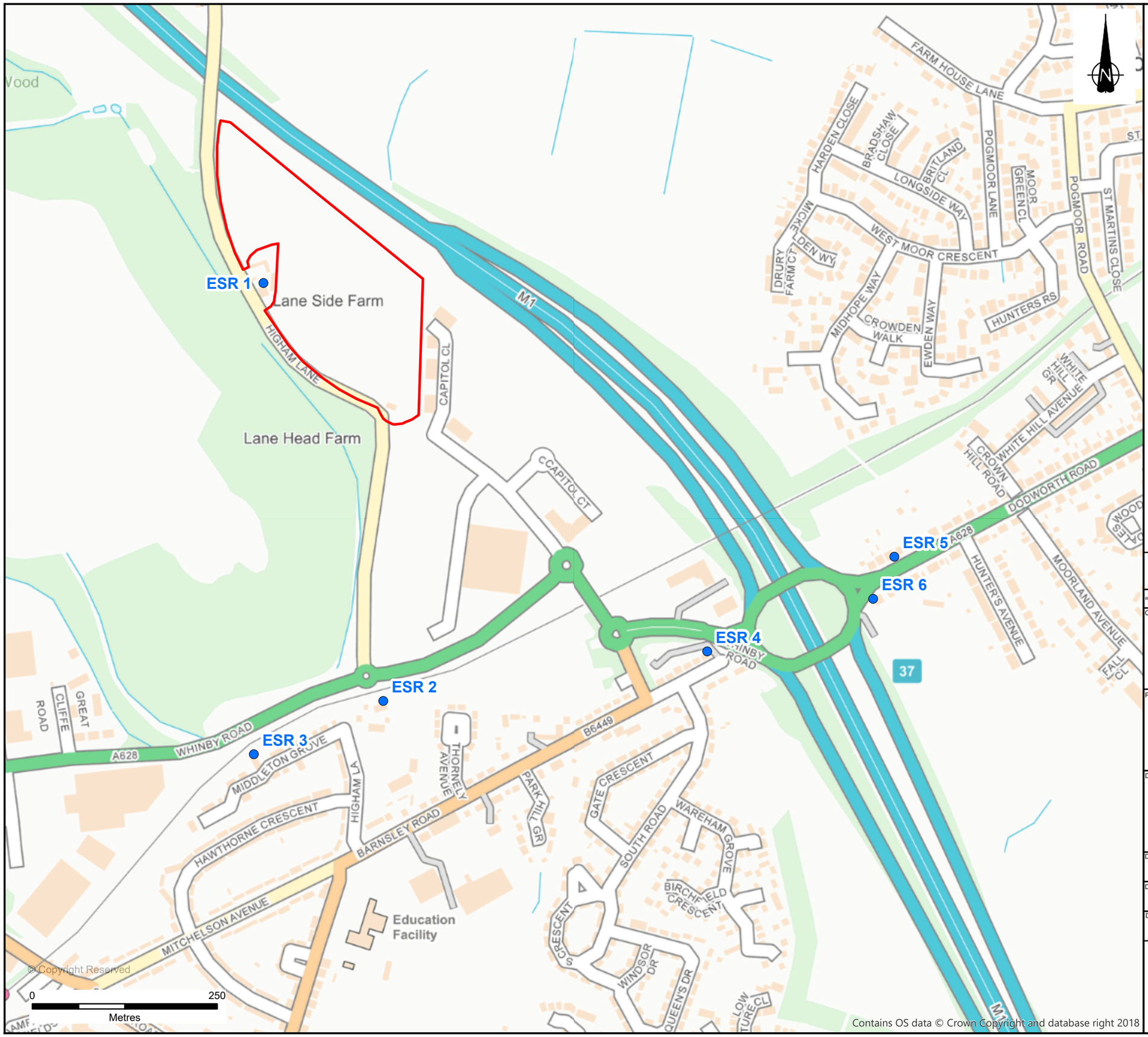
Malcolm Walton **Technical Director**

BSc (Env Health) Dip (Acoustics & Noise Control)

MCIEH AMIOA

Malcolm holds a Bachelor of Science degree in Environmental Health and the Diploma in Acoustics and Noise Control. Malcolm is a Member of the Chartered Institute of Environmental Health and an Associate Member of the Institute of Acoustics. Malcolm joined Wardell Armstrong in September 2001 following 12 years working as an Environmental Health Officer in several local authorities, responsible for the enforcement of environmental legislation and in particular air pollution and noise nuisance. Malcolm has experience in the technical co-ordination of environmental appraisal of large schemes to UK and international standards. Malcolm regularly carries out and co-ordinates noise and air quality assessment work associated with planning applications including EIA work and PPC permit application/compliance. He regularly acts as expert witness in planning inquiries in respect of noise, air quality and odour.

DRAWINGS



REVISION	DETAILS	DATE	DRAWN	CHKD	APP'D
B	Amend Site Boundary	12/02/2019	EF	MW	MTW

CLIENT

STERLING CAPITOL PLC

PROJECT

CAPITOL PARK, BARNSLEY

DRAWING TITLE

EXISTING AND PROPOSED SENSITIVE RECEPTOR LOCATIONS

DRG No.	REV
SH11957-003	B

DRG SIZE	SCALE	DATE
A3	1:5,000	12/02/2019

DRAWN BY	CHECKED BY	APPROVED BY
EF	MW	MTW

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