

## **12 Air Quality**

### **12.1. Introduction**

12.1.1 This Chapter reports the likely significant effects of the Proposed Development in terms of air quality in the context of the Site and surrounding area. In particular it considers the likely significant effects of dust and particulate matter generation during the construction phase, and the impact of emissions from Development-generated traffic in the operational phase on sensitive receptor locations within the area around the Development.

12.1.2 Sensitive locations are those where the public may be exposed to pollutants generated by the construction or operation of the Development. These include locations sensitive to an increase in dust deposition as a result of on-Site construction activities or exposure to gaseous pollutants from exhaust emissions from construction traffic and traffic associated with the Development.

12.1.3 The Development will generate additional traffic and will cause a redistribution of existing traffic on the local road network. There is the potential for adverse effects on local air quality to occur at existing and proposed properties located close to roads where traffic flows are predicted to increase as a result of the operation of the Development.

12.1.4 Wardell Armstrong have undertaken the preparation of the air quality ES chapter and Mariam Weatherley is lead author of the air quality chapter. Mariam is a Chartered Environmental Scientist, with wide experience in the environmental profession predominantly in relation to air quality, gained from 14 years employment in this sector.

12.1.5 This Chapter (and its associated figures and appendices) is not intended to be read as a standalone assessment and reference should be made to the front end of this ES (Chapters 1 – 5).

### **12.2. Legislation, Policy and Guidance**

12.2.1 The relevant legislation, policy and guidance are listed below, with details provided in Appendix 12.1.

#### **Legislative Framework**

12.2.2 The applicable legislative framework is summarised as follows:

- *The Environment Act 1995;*
- *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007;*
- *Directive 2008/50/EC of the European Parliament and of the Council of 21st May 2008 on Ambient Air Quality and Cleaner Air for Europe; and*
- *Air Quality (Standards) Regulations, 2010.*

**Planning Policy**

- 12.2.3 Planning policies in relation to air quality should be in compliance with meeting EU limit values or national objectives for air pollutants, taking into account the presence of Air Quality Management Areas (AQMAs) and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in an AQMA is consistent with the local air quality action plan. Local authorities, therefore, need to set out their policies to achieve good air quality, both within AQMAs and more widely across their districts, and periodically to review them to keep them relevant and up to date.
- 12.2.4 The National Planning Policy Framework (NPPF)<sup>1</sup> introduced in March 2012 and most recently updated in February 2019, requirements of which are detailed in Appendix 12.1.
- 12.2.5 The applicable local policy for Barnsley Metropolitan Borough Council (BMBC), which will be applicable to the Proposed Development site, is the *Barnsley Council Local Plan*, adopted in January 2019. Air quality is addressed in the Local Plan and relevant sections are presented in Appendix 12.1. In addition, BMBC has also produced the *BMBC Air Quality and Emissions Good Practice Planning Guidance (March 2020)*.

**Guidance**

- 12.2.6 The applicable guidance is summarised as follows:
- Planning Practice Guidance: Air Quality, 2019;
  - Institute of Air Quality Management (IAQM), Guidance on the Assessment of Dust from Demolition and Construction, 2014;
  - Environmental Protection UK (EPUK) and IAQM, Land-Use Planning and Development Control: Planning for Air Quality, 2017;
  - Design Manual for Roads and Bridges (DMRB), 2007; and
  - Department for Environment, Food and Rural Affairs (Defra), Local Air Quality Management Technical Guidance (LAQM.TG(16)), 2016.

**12.3. Assessment Methodology and Significance Criteria****Scope of the Assessment**

- 12.3.1 The Environmental Impact Assessment Scoping Report included a description of the scope of works to be considered in the air quality assessment, which comprise the following:
- A qualitative assessment in order to consider the potential effects associated with dust and particulate matter during the construction phase of the Proposed Development; and
  - Air dispersion modelling in order to assess the potential effects associated with the operation of the Proposed Development, concentrating on the potential impact of road vehicle emissions on ambient air quality.

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<sup>1</sup> Ministry of Housing, Communities and Local Government, February 2019, National Planning Policy Framework

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Effects Not Considered within the Scope

12.3.2 There are no designated statutory habitat sites located within 50 m of the Site boundary and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the Site entrance(s). Therefore, it is not necessary to consider them in the construction dust assessment. Similarly, designated statutory habitat sites have not been considered within the scope of the operational phase assessment.

**Extent of the Study Area**

12.3.3 For the construction phase assessment, existing sensitive human receptors located within 350 m of the Site boundary and/or within 50 m of the route that construction vehicles will take (within up to 500 m from the Site entrance) have been identified.

12.3.4 For the operational phase assessment, traffic data has been reviewed against EPUK/IAQM criteria in order to determine the extent of the road network to be included within the air quality study area. Environmentally Sensitive Receptor (ESR) locations have been identified within 200 m of the roads that will be affected by development generated vehicles. The location of the ESR locations are illustrated on Figure 12.1.

12.3.5 These criteria and distances are taken from the relevant guidance detailed in Appendix 12.3 and have been applied using the methodologies also detailed in Appendix 12.3.

**Consultation Undertaken to Date**

12.3.6 Table 12.1 provides a summary of the consultation activities undertaken in support of the preparation of this Chapter. Copies of relevant correspondence are provided in Appendix 12.2. These include correspondence from the Chris Shields (Barnsley Council – Technical Officer – Pollution Control) (29.03.21) confirming he was happy with the scope of the operational phase assessment, and also the response of the environmental Health Officer Paul Denton (19.04.21) confirming he was happy with the scope of the construction phase assessment.

12.3.7 It is noted that Chris Shields also made a request for an assessment of the full scheme, including delivery of the link road at 2026, rather than just phase 1 without the full link road. The proposal is not for the full scheme to be built by 2026 and the full link road would not come forward at that point. This scenario has not therefore been considered on the basis that this is not what is being proposed as it is not a viable manner in which to bring forward the scheme.

**Table 12.1: Summary of Consultation Undertaken to Date**

<b>Organisation</b>	<b>Individual</b>	<b>Meeting Date and other forms of Consultation</b>	<b>Summary of Outcome of Discussion</b>
BMBC	Chris Shields	Email 29/03/2021	Responded to WA email of 24/03/2021 outlining proposed methodology. Requested additional details with regards to:  Short-term NO <sub>2</sub> objectives and

Organisation	Individual	Meeting Date and other forms of Consultation	Summary of Outcome of Discussion
			particulate matter objectives;  Type of Sensitivity Analysis;  Committed developments included;  Model verification for particulate matter;  Receptor locations.  Also requested inclusion of:  Additional 2026 model scenario for early completion of link road; and  Noted requirements for EV charging points.
BMBC	Chris Shields	Email 17/5/21	Confirmed agreement on WA responses to above points and noted requirement for Damage Cost Calculation if development classed as 'Major' in line with BMBC Air Quality and Emissions Good Practice Planning Guidance (March 2020)

**Assessment Methodology**

12.3.8 The method of baseline data collection and assessment has been agreed with BMBC and is in accordance with current guidance and industry best practice. Full details are provided in Appendix 12.3.

Construction Phase Impacts

12.3.9 In order to assess the impacts associated with dust and PM<sub>10</sub> 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)<sup>2</sup>. Further details of the construction assessment methodology are provided in Appendix 12.3.

12.3.10 The closest sensitive human receptor locations to where construction phase activities will take place are detailed in Table 12.2.

<sup>2</sup> Institute of Air Quality Management, Guidance on the Assessment of Dust from Demolition and Construction, February 2014

**Table 12.2: Existing Dust Sensitive Receptors – Human Receptors**

<b>Receptor</b>	<b>Direction from the Site</b>	<b>Approximate Distance from the Site Boundary</b>
Existing residential properties along Barugh Green Road	North	10m at closest point
Existing commercial premises and car parking north of Barugh Green Road	North	20m at closest point
Existing residential properties along Claycliffe Avenue/St Thomas's Road	East	10m at closest point
Redbrook Farm	East	50m at closest point
Existing residential properties along Hermit Lane/Church Street	East	100m at closest point
Gawber Primary School	East	35m at closest point
Existing residential properties along Wharfedale Road/Farmhouse Lane/Harden Close/Mickelden Way/Midhope Way	East	<10m at closest point
Existing commercial premises and car parking at Capitol Park	South	120m at closest point
Lane Head Farm	South	180m at closest point
Existing residential properties along Higham Common Road/Hermit Lane	West	10m at closest point
Existing residential properties along Welland Court/Avon Close/St John's Avenue/Milne Street/Longley Close	West	10m at closest point

12.3.11 The criteria used to assess the impact of the Proposed Development, and the associated significance of effects at existing sensitive receptor locations, are included in Appendix 12.3.

#### Operational Phase Impacts

12.3.12 To assess the impacts associated with road traffic emissions during the operational phase assessment, detailed air dispersion modelling has been

undertaken. The impacts have been assessed in accordance with guidance from Environmental Protection UK (EPUK) and the IAQM<sup>3</sup>.

12.3.13 The air dispersion model ADMS-Roads (CERC, Version 5) has been used to assess the potential impact of development generated traffic on air quality at ESR locations. The air dispersion model has been used to predict NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> concentrations, as these are the pollutants considered most likely to exceed the objectives and limit values. Further details of the modelling and assessment methodology, including model verification, are provided in Appendix 12.3.

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

- Scenario 1: 2018 Verification and Base Year, the most recent year for which traffic flow information, local monitored pollution data and meteorological data are available;
- Scenario 2: 2026 Opening Year, without phase 1 of the proposed development in place;
- Scenario 3: 2026 Opening Year, with phase 1 of the proposed development in place (i.e. Phase 1 of the residential development [which was assessed at a worst-case of 275 dwellings] the primary school, the first part of the Link road running from Barugh Green Road to the northernmost internal roundabout, and the Employment development);
- Scenario 4: 2033 Future Year, without the proposed development in place; and
- Scenario 5: 2033 Future Year, with the full extent of the proposed development in place, with the full link road completed.

12.3.15 Seventeen representative ESR locations (identified as ESR 1 to ESR 17) have been considered in the air quality assessment. These are residential in nature and have been selected as they are locations at which the annual mean Air Quality Objectives (AQOs) apply. Details of the receptors considered are provided in Table 12.3 and their locations and study area are illustrated on Figure 12.1.

**Table 12.3: Existing Sensitive Receptor Locations**

Receptor	Address	Grid Reference		Inside AQMA	Receptor Type
		Easting	Northing		
ESR 1	Residential dwelling on Barugh Green Road	431585	407943	No	Residential
ESR 2	Residential dwelling on Cawthorne Road	431441	407964	No	Residential

<sup>3</sup> Moorcroft and Barrowcliffe et al, Land-Use Planning and Development Control: Planning for Air Quality (v1.2), January 2017

## ENVIRONMENTAL STATEMENT

### Air Quality

Receptor	Address	Grid Reference		Inside AQMA	Receptor Type
		Easting	Northing		
ESR 3	Residential dwelling at junction of Barugh Green Road and Higham Common Road	431037	408053	No	Residential
ESR 4	Residential dwelling on Higham Common Road	431054	408027	No	Residential
ESR 5	Residential dwelling on Higham Common Road	431362	406785	No	Residential
ESR 6	Residential dwelling on Higham Lane	431375	406722	No	Residential
ESR 7	Ibys Hotel on Whinby Road	431457	406329	No	Residential
ESR 8	Residential dwelling on Barnsley Road Road	432070	405944	No	Residential
ESR 9	Residential property on Whinby Road	431960	405790	Yes*	Residential
ESR 10	Residential property on Dodworth Road	432113	405831	No	Residential
ESR 11	Residential property on Dodworth Road	432284	405923	Yes*	Residential
ESR 12	Residential property at junction of Barugh Green Road and Wilthorpe Road	432281	405960	Yes*	Residential
ESR 13	Residential dwelling on Hermit Lane	432013	407862	No	Residential
ESR 14	Residential dwelling on Barugh Green Road	431431	406899	No	Residential
ESR 15	Residential dwelling on Pogmoor Road (north of Pogmoor crossroads)	432650	406162	Yes*	Residential
ESR 16	Residential dwelling on Dodworth Road (west of Pogmoor)	432655	406130	Yes*	Residential

Receptor	Address	Grid Reference		Inside AQMA	Receptor Type
		Easting	Northing		
	crossroads)				
ESR 17	Residential dwelling on Dodworth Road (east of Pogmoor crossroads)	432713	406162	Yes*	Residential
* Inside A628 AQMA					

12.3.16 Six proposed receptor locations have been assessed, based on the Land Use Parameter Plan, and are identified as PSR 1 – PSR 6. These are taken to represent residential locations across the development site, as well as the proposed school site. Worst-case locations along the route of the proposed link road have been selected as this will be the main pollution source within the completed development. Details of the receptors considered are provided in Table 12.4 and their locations and study area are illustrated on Figure 12.1.

**Table 12.4: Proposed Sensitive Receptor Locations**

Receptor	Grid Reference		Inside AQMA	Receptor Type
	Easting	Northing		
PSR 1	431493	407917	No	Residential
PSR 2	431553	407885	No	Residential
PSR 3	431439	407426	No	Residential
PSR 4	431504	407474	No	School
PSR 5	431459	406985	No	Residential
PSR 6	431519	406948	No	Residential

Significance Criteria

12.3.17 The construction phase assessment for ESRs takes into account the significance criteria used in the IAQM guidance and the operational phase assessment for ESRs and PSRs takes into account the significance criteria detailed in the EPUK/IAQM guidance (see Appendix 12.3 for more detail).

Limitations and Uncertainties

12.3.18 At present, there is a degree of uncertainty associated with the prediction of future NO<sub>2</sub> concentrations, and consequently the assessment of impacts relating to development generated road traffic emissions.

- 12.3.19 Air quality assessments make use of official sources of information (i.e. vehicle emission factors and background concentrations) which have historically been considered to be overly optimistic. Monitoring data collected by the UK Government and local authorities over the past few years has shown that annual mean NO<sub>2</sub> concentrations remained higher than previously expected (especially in roadside locations). This was widely thought to be due to the lower than expected decline in NO<sub>x</sub> 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.
- 12.3.20 The vehicle emission factors used in this assessment are from Defra's Emission Factor Toolkit (EFT v10.1)<sup>4</sup>, which is the most up-to-date version available.
- 12.3.21 A position statement was produced by the IAQM in 2018 which dealt specifically with the use of EFT v8.0 and the consideration of uncertainties in predicting future air quality<sup>5</sup>. The statement concluded that the approaches for dealing with this uncertainty should be decided on a case-by-case basis, but may include the use of a sensitivity test (i.e. where it is assumed that NO<sub>x</sub> emissions will not reduce as quickly over time as within the EFT).
- 12.3.22 A later study provided evidence that EFT v9.0 may be relied upon to predict the 'most likely' future emissions reductions, as long as model verification has been undertaken using monitored data from 2016 or later<sup>6</sup>.
- 12.3.23 The IAQM has recently withdrawn their 2018 position statement on the consideration of uncertainties in predicting future air quality<sup>7</sup>. A growing body of evidence suggests that the latest COPERT vehicle emission factors used in EFT v9.0 (and later) reflect real-world NO<sub>x</sub> emissions more accurately. As a result, the IAQM judges that "an exclusively vehicle emissions-based sensitivity test is no longer necessary". This is provided that the assessment has been verified using monitoring data from 2016 or later.
- 12.3.24 In accordance with Defra guidance, the air quality assessment has been carried out using EFT v10.1. As model verification has been undertaken, following the latest guidance from the IAQM, it is not considered necessary to carry out a sensitivity analysis. Further information on the vehicle emission factors used in the assessment are provided in **Appendix 12.3**.

#### 12.4. Baseline Conditions

- 12.4.1 There are currently six Air Quality Management Areas (AQMA) declared by BMBC, the closest two to the application sites being the AQMA No.1 (M1 Motorway), 100 metres either side of the central reservation within the Barnsley Borough, and the AQMA No.2A (A628 Dodworth Road). The southernmost part of the proposed development is within AQMA No. 1, and AQMA No.2 is located approximately 300m south of the proposed development.
- 12.4.2 There is one roadside continuous monitor and ten roadside NO<sub>2</sub> diffusion tubes in the vicinity of the developments, all located within AQMA No.2A. Monitoring data

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<sup>4</sup> Defra Local Air Quality Management webpages (<https://iaqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html>)

<sup>5</sup> Institute of Air Quality Management, Dealing with Uncertainty in Vehicle NO<sub>x</sub> Emissions within Air Quality Assessments v1.1, July 2018

<sup>6</sup> Air Quality Consultants, Performance of Defra's Emission Factor Toolkit 2013 – 2019, February 2020

<sup>7</sup> Available on the Institute of Air Quality Management website ([https://iaqm.co.uk/wp-content/uploads/2013/02/iaqm\\_uncertainty\\_vehicle\\_NOx\\_emission\\_withdrawn-02.pdf](https://iaqm.co.uk/wp-content/uploads/2013/02/iaqm_uncertainty_vehicle_NOx_emission_withdrawn-02.pdf))

for 2018 (presented in BMBCs 2019 Annual Status Report) showed annual mean concentrations ranging from 25.7 µg/m<sup>3</sup> to 45.8 µg/m<sup>3</sup>

12.4.3 BMBC also operates an automatic background monitor for NO<sub>2</sub> at Barnsley Gawber, approximately 1km from the proposed roundabouts, which reported an annual average NO<sub>2</sub> concentration of 16 µg/m<sup>3</sup> in 2018.

12.4.4 BMBC monitors PM<sub>10</sub> at one roadside site, but this is not in the vicinity of the proposed developments. No monitoring has been or is currently being undertaken for PM<sub>2.5</sub>.

12.4.5 The air quality assessment needs to take into account background concentrations upon which the local, traffic derived pollution is superimposed. The data may be derived through long-term ambient measurements at background sites, remote from immediate sources of air pollution or, alternatively, from the default concentration maps that have been provided for use by Defra with the LAQM.TG(16) guidance.

12.4.6 Background monitoring data for NO<sub>2</sub> has been taken from the Barnsley Gawber automatic monitoring station and adjusted for the opening and future years using the 2018-based Defra default concentration maps, for the appropriate grid squares<sup>8</sup>.

12.4.7 As there are currently no representative PM<sub>10</sub> or PM<sub>2.5</sub> monitoring locations in the vicinity of the Proposed Development site, background concentrations have been obtained directly from the 2018-based Defra default concentration maps, for the appropriate grid squares.

12.4.8 The background pollutant concentrations used in this assessment are detailed in Table 12.5.

**Table 12.5: Background Pollutant Concentrations Used in the Air Quality Assessment\***

Receptor	2018 Annual Mean Concentrations (µg/m <sup>3</sup> )			
	NO <sub>x</sub> *	NO <sub>2</sub> *	PM <sub>10</sub> *	PM <sub>2.5</sub> *
ESR 1 – 2, PSR 1 – 4 (431500, 407500)	22.39	15.59	11.54	7.23
ESR 3, ESR 4, (431500, 408500)	22.39	15.59	11.24	7.16
ESR 5 – 7, PSR 5 – 6 (431500, 406500)	22.39	15.59	13.07	8.02
ESR 8, ESR 10 – 12 (432500, 405500)	22.39	15.59	13.39	8.23
ESR 9 (431500, 405500)	22.39	15.59	10.89	7.07
ESR 13 (432500, 407500)	22.39	15.59	10.98	7.21

<sup>8</sup> Accessed through the Defra Local Air Quality Management webpages (<http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html>)

Receptor	2018 Annual Mean Concentrations ( $\mu\text{g}/\text{m}^3$ )			
	NO <sub>x</sub> *	NO <sub>2</sub> *	PM <sub>10</sub> *	PM <sub>2.5</sub> *
ESR 14 (431500, 406500)	22.39	15.59	13.07	8.02
ESR 15 – 17 (432500, 406500)	22.39	15.59	11.75	7.57
2026 Annual Mean Concentrations ( $\mu\text{g}/\text{m}^3$ )				
ESR 1 – 2, PSR 1 – 4 (431500, 407500)	15.82	11.33	10.59	6.50
ESR 3, ESR 4, (431500, 408500)	15.82	11.33	10.30	6.43
ESR 5 – 7, PSR 5 – 6 (431500, 406500)	15.82	11.33	12.12	7.27
ESR 8, ESR 10 – 12 (432500, 405500)	15.82	11.33	12.41	7.46
ESR 9 (431500, 405500)	15.82	11.33	9.94	6.34
ESR 13 (432500, 407500)	15.82	11.33	10.00	6.46
ESR 14 (431500, 406500)	15.82	11.33	12.12	7.27
ESR 15 – 17 (432500, 406500)	15.82	11.33	10.77	6.82
2033 Annual Mean Concentrations ( $\mu\text{g}/\text{m}^3$ )				
ESR 1 – 2, PSR 1 – 4 (431500, 407500)	14.34	10.32	10.55	6.47
ESR 3, ESR 4, (431500, 408500)	14.34	10.32	10.26	6.40
ESR 5 – 7, PSR 5 – 6 (431500, 406500)	14.34	10.32	12.08	7.23
ESR 8, ESR 10 – 12 (432500, 405500)	14.34	10.32	12.36	7.42
ESR 9 (431500, 405500)	14.34	10.32	9.89	6.30
ESR 13 (432500, 407500)	14.34	10.32	9.95	6.42
ESR 14 (431500, 406500)	14.34	10.32	12.08	7.23
ESR 15 – 17 (432500, 406500)	14.34	10.32	10.72	6.79
<i>*Obtained from the Defra 2018-based background maps for the appropriate grid square</i>				

**12.5. Sensitive Receptors**

12.5.1 The baseline assessment (i.e. scenarios 1, 2 and 4) has been carried out for the ESR locations considered. The adjusted NO<sub>2</sub> and unadjusted PM<sub>10</sub> and PM<sub>2.5</sub> concentrations are detailed in Table 12.6 and Appendix 12.4.

**Table 12.6: Predicted Adjusted NO<sub>2</sub> and Unadjusted PM<sub>10</sub> and PM<sub>2.5</sub> Concentrations at Existing Sensitive Receptors for Scenarios 1, 2 and 4**

Receptor	Calculated Annual Mean Concentrations (µg/m <sup>3</sup> )								
	Scenario 1: 2018 Base Year			Scenario 2: 2026 Opening Year, Without Development			Scenario 4: 2033 Future Year, Without Development		
	NO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
ESR 1	22.29	12.69	7.92	14.61	11.77	7.16	12.60	11.82	7.18
ESR 2	21.71	12.54	7.84	14.31	11.62	7.08	12.39	11.66	7.09
ESR 3	31.51	13.46	8.53	19.24	12.52	7.70	16.02	12.64	7.74
ESR 4	29.42	13.13	8.33	18.11	12.18	7.51	15.38	12.34	7.57
ESR 5	31.65	14.89	9.22	19.02	13.86	8.31	15.48	13.90	8.32
ESR 6	38.97	15.70	9.78	22.69	14.61	8.78	17.94	14.66	8.79
ESR 7	25.71	14.56	8.94	16.27	13.61	8.11	13.67	13.65	8.12
ESR 8	32.63	15.55	9.61	19.58	14.53	8.71	16.04	14.62	8.74
ESR 9	27.84	12.63	8.15	17.46	11.70	7.35	14.62	11.78	7.37
ESR 10	36.78	16.34	10.07	21.82	15.36	9.16	17.71	15.50	9.22
ESR 11	<u>52.27</u>	18.83	11.63	30.28	17.87	10.60	23.80	18.12	10.71
ESR 12	<u>47.75</u>	17.98	11.10	27.78	16.97	10.10	22.01	17.17	10.18
ESR 13	25.73	12.54	8.15	16.50	11.61	7.37	13.99	11.67	7.38
ESR 14	22.86	13.85	8.53	14.73	12.86	7.71	12.59	12.85	7.70
ESR 15	34.42	14.36	9.18	20.54	13.38	8.31	16.85	13.49	8.35
ESR 16	<u>41.76</u>	15.52	9.89	24.92	14.70	9.06	20.07	14.90	9.13
ESR 17	35.99	14.68	9.37	22.23	13.99	8.65	18.07	14.13	8.70

*NO<sub>2</sub> concentrations obtained by inputting predicted NO<sub>x</sub> concentrations into the NO<sub>x</sub> to NO<sub>2</sub> calculator<sup>9</sup> in accordance with LAQM.TG(16)*

<sup>9</sup> Defra Local Air Quality Management webpages (<http://laqm.defra.gov.uk/tools-monitoring-data/no-calculator.html>)

Receptor	Calculated Annual Mean Concentrations ( $\mu\text{g}/\text{m}^3$ )								
	Scenario 1: 2018 Base Year			Scenario 2: 2026 Opening Year, Without Development			Scenario 4: 2033 Future Year, Without Development		
	NO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
<i>Underlined concentrations represent an exceedance of the relevant AQO.</i>									

12.5.2 The results show that predicted NO<sub>2</sub> concentrations exceed the AQO at ESR 11, ESR 12 and ESR 16 in the 2018 Base Year only. Concentrations are predicted to be below the AQO at all other ESR locations considered.

12.5.3 The results show that all predicted PM<sub>10</sub> and PM<sub>2.5</sub> concentrations are below the relevant objectives and limit values.

**Limitations**

12.5.4 A quantitative assessment of the effect of emissions of construction phase vehicles upon air quality at ESR locations has not been undertaken, as there is not sufficient information regarding numbers and routing. It is anticipated, however, that HGV numbers will be lower during construction than during operation of the Proposed Development. Therefore the impact of construction phase vehicles is considered to be less than the operational phase of development and therefore the construction impact has not been assessed.

**12.6. Assessment of Effects**

**Design Solutions and Assumptions**

Construction Phase

12.6.1 In accordance with the methodology detailed in the IAQM guidance, the construction phase assessment assumes that no mitigation measures are applied, except those required by legislation. Further site-specific measures (e.g. best practice Dust Mitigation Plan) are recommended where the risk of dust impacts is not classed as negligible.

Operational Phase

12.6.2 The assessment of operational phase road traffic emissions assumes that no mitigation is applied. Mitigation measures are recommended based upon the significance of the effect.

**Assessment of Effects**

Construction Phase Assessment – Dust and Particulate Matter Emissions

*Step 1*

12.6.3 Step 1 is to screen the requirement for further detailed assessment, which on this occasion was deemed necessary. Further details of this are set out in Appendix 12.3.

12.6.4 The main activities involved with the construction phase of works are as follows:

- **Demolition** of existing buildings within the Proposed Development area. No demolition activities are proposed and so no further consideration is required.
- **Earthworks** that may be required prior to the construction phase of works. The main sources of dust can include:
  - Cleaning the Site;
  - Stripping and stockpiling of topsoil and subsoil;
  - Ground excavation;
  - Bringing in, tipping and spreading materials on site;
  - Stockpiling materials;
  - Levelling ground;
  - Trenching;
  - Road construction; and
  - Vehicle movements on Site roads.
- **Construction** that will involve the construction of individual building access roads, the car parking areas and the buildings themselves; and
- **Trackout** which 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*

12.6.5 Step 2A of the construction phase dust assessment has defined the potential dust emission magnitude from earthworks, construction and trackout in the absence of site-specific mitigation. Examples of the criteria for the dust emission classes are detailed in the IAQM guidance.

#### *Step 2B*

12.6.6 Step 2B of the construction phase dust assessment has defined the sensitivity of the area, taking into account the significance criteria detailed in Tables 12.3 to 12.7 in Appendix 12.3, for earthworks, construction and trackout. The sensitivity of the area to each activity is assessed for potential dust soiling, human health and ecological impacts.

12.6.7 For demolition, earthworks and construction, there are currently more than 10 and 100 receptors (residential) within 20m of where these activities may take place, which is assumed to be the red-line boundary for the purposes of this assessment.

12.6.8 The routing of construction vehicles is unknown at this stage. Therefore, for the purposes of this assessment, worst case routing scenarios have been assumed for

assessment of potential trackout impacts at nearby receptors. As a result, for trackout, there are more than 100 receptors (residential and commercial) within 50m of where trackout may occur for a distance of up to 500m from the site entrance.

*Step 2C*

12.6.9 Step 2C of the construction phase dust assessment has defined the risk of impacts from each activity. The dust emission magnitude is combined with the sensitivity of the surrounding area. The risk of dust impacts from each activity, with no mitigation in place has been assessed in accordance with the criteria detailed in Tables 12.8 to 12.10 within Appendix 12.3.

Summary

12.6.10 Table 13.7 details the results of Step 2 of the construction phase assessment for human receptors.

**Table 12.7: Construction Phase Dust Assessment for Human Receptors**

	Activity			
	Demolition	Earthworks	Construction	Trackout
<b>Step 2A</b>				
Dust Emission Magnitude	N/A	Large <sup>a</sup>	Large <sup>b</sup>	Large <sup>c</sup>
<b>Step 2B</b>				
Sensitivity of Closest Receptors	N/A	High	High	High
Sensitivity of Area to Dust Soiling Effects	N/A	High	High	High
Sensitivity of Area to Human Health Effects	N/A	Low <sup>d</sup>	Low <sup>d</sup>	Low <sup>d</sup>
<b>Step 2C</b>				
Dust Risk: Dust Soiling	N/A	High Risk	High Risk	High Risk
Dust Risk: Human Health	N/A	Low Risk	Low Risk	Low Risk
<p><i>a. Total site area estimated to be more than 10,000m<sup>2</sup></i></p> <p><i>b. Total building volume estimated to be more than 100,000m<sup>3</sup>, with potentially dusty construction materials. For the purposes of the assessment a robust approach has been adopted.</i></p> <p><i>c. Number of construction phase vehicles estimated to be greater than 50 movements per day. For the purposes of the assessment a robust approach has been adopted.</i></p>				

	Activity			
	Demolition	Earthworks	Construction	Trackout
<i>d. Background annual mean PM<sub>10</sub> concentration is taken from the LAQM Defra default concentration maps, for the appropriate grid square for 2018</i>				

**Operational Phase Assessment**

Existing Sensitive Human Receptors

12.6.11 The impact assessment has been carried out for the representative ESR considered (i.e. ESR 1 to ESR 17).

**Table 12.8: Predicted Adjusted NO<sub>2</sub> Concentrations at Existing Sensitive Receptors for Scenarios 2 and 3 (2026 Opening Year)**

Receptor	Calculated Annual Mean NO <sub>2</sub> Concentrations (µg/m <sup>3</sup> ) <sup>a</sup>				
	Without Development Concentration	With Development		Concentration Change as Percentage of AQAL	Impact <sup>b</sup>
		Concentration	Percentage in Relation to AQAL		
ESR 1	14.61	17.21	<75	6 – 10%	Slight
ESR 2	14.31	15.35	<75	2 – 5%	Negligible
ESR 3	19.24	19.87	<75	2 – 5%	Negligible
ESR 4	18.11	19.30	<75	2 – 5%	Negligible
ESR 5	19.02	19.21	<75	<0.5%	Negligible
ESR 6	22.69	22.82	<75	<0.5%	Negligible
ESR 7	16.27	16.44	<75	<0.5%	Negligible
ESR 8	19.58	19.80	<75	1%	Negligible
ESR 9	17.46	17.63	<75	<0.5%	Negligible
ESR 10	21.82	22.16	<75	1%	Negligible
ESR 11	30.28	30.60	76 – 94%	1%	Negligible
ESR 12	27.78	28.07	<75	1%	Negligible
ESR 13	16.50	16.86	<75	1%	Negligible
ESR 14	14.73	15.06	<75	1%	Negligible
ESR 15	20.54	20.73	<75	<0.5%	Negligible
ESR 16	24.92	25.19	<75	1%	Negligible
ESR 17	22.23	22.48	<75	1%	Negligible

Receptor	Calculated Annual Mean NO <sub>2</sub> Concentrations (µg/m <sup>3</sup> ) <sup>a</sup>				
	Without Development Concentration	With Development		Concentration Change as Percentage of AQAL	Impact <sup>b</sup>
		Concentration	Percentage in Relation to AQAL		
<p>a. NO<sub>2</sub> concentrations obtained by inputting predicted NO<sub>x</sub> concentrations into the NO<sub>x</sub> to NO<sub>2</sub> calculator, in accordance with LAQM.TG(16)</p> <p>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</p> <p><u>Underlined</u> concentrations represent an exceedance of the AQO.</p>					

**Table 12.9: Predicted Adjusted PM<sub>10</sub> Concentrations at Existing Sensitive Receptors for Scenarios 2 and 3 (2026 Opening Year)**

Receptor	Calculated Annual Mean PM <sub>10</sub> Concentrations (µg/m <sup>3</sup> ) <sup>a</sup>				
	Without Development Concentration	With Development		Concentration Change as Percentage of AQAL	Impact <sup>b</sup>
		Concentration	Percentage in Relation to AQAL		
ESR 1	11.77	12.41	<75	1%	Negligible
ESR 2	11.62	11.95	<75	1%	Negligible
ESR 3	12.52	12.71	<75	<0.5%	Negligible
ESR 4	12.18	12.53	<75	1%	Negligible
ESR 5	13.86	13.86	<75	<0.5%	Negligible
ESR 6	14.61	14.63	<75	<0.5%	Negligible
ESR 7	13.61	13.67	<75	<0.5%	Negligible
ESR 8	14.53	14.61	<75	<0.5%	Negligible
ESR 9	11.70	11.76	<75	<0.5%	Negligible
ESR 10	15.36	15.47	<75	<0.5%	Negligible
ESR 11	17.87	17.97	<75	<0.5%	Negligible
ESR 12	16.97	17.06	<75	<0.5%	Negligible
ESR 13	11.61	11.72	<75	<0.5%	Negligible
ESR 14	12.86	12.97	<75	<0.5%	Negligible
ESR 15	13.38	13.44	<75	<0.5%	Negligible
ESR 16	14.70	14.79	<75	<0.5%	Negligible
ESR 17	13.99	14.07	<75	<0.5%	Negligible
<p>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.</p>					

**Table 12.10: Predicted Adjusted PM<sub>2.5</sub> Concentrations at Existing Sensitive Receptors for Scenarios 2 and 3 (2026 Opening Year)**

Receptor	Calculated Annual Mean PM <sub>2.5</sub> Concentrations (µg/m <sup>3</sup> ) <sup>a</sup>				
	Without Development Concentration	With Development		Concentration Change as Percentage of AQAL	Impact <sup>b</sup>
		Concentration	Percentage in Relation to AQAL		
ESR 1	7.16	7.53	<75	1%	Negligible
ESR 2	7.08	7.27	<75	1%	Negligible
ESR 3	7.70	7.80	<75	<0.5%	Negligible
ESR 4	7.51	7.70	<75	1%	Negligible
ESR 5	8.31	8.31	<75	<0.5%	Negligible
ESR 6	8.78	8.79	<75	<0.5%	Negligible
ESR 7	8.11	8.15	<75	<0.5%	Negligible
ESR 8	8.71	8.75	<75	<0.5%	Negligible
ESR 9	7.35	7.38	<75	<0.5%	Negligible
ESR 10	9.16	9.23	<75	<0.5%	Negligible
ESR 11	10.60	10.66	<75	<0.5%	Negligible
ESR 12	10.10	10.15	<75	<0.5%	Negligible
ESR 13	7.37	7.43	<75	<0.5%	Negligible
ESR 14	7.71	7.77	<75	<0.5%	Negligible
ESR 15	8.31	8.34	<75	<0.5%	Negligible
ESR 16	9.06	9.10	<75	<0.5%	Negligible
ESR 17	8.65	8.69	<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*

**Table 12.11: Predicted Adjusted NO<sub>2</sub> Concentrations at Existing Sensitive Receptors for Scenarios 4 and 5 (2033 Future Year)**

Receptor	Calculated Annual Mean NO <sub>2</sub> Concentrations (µg/m <sup>3</sup> ) <sup>a</sup>				
	Without Development Concentration	With Development		Concentration Change as Percentage of AQAL	Impact <sup>b</sup>
		Concentration	Percentage in Relation to AQAL		
ESR 1	12.60	16.41	<75	>10%	Moderate
ESR 2	12.39	12.87	<75	<0.5%	Negligible

Receptor	Calculated Annual Mean NO <sub>2</sub> Concentrations (µg/m <sup>3</sup> ) <sup>a</sup>				
	Without Development Concentration	With Development		Concentration Change as Percentage of AQAL	Impact <sup>b</sup>
		Concentration	Percentage in Relation to AQAL		
ESR 3	16.02	15.06	<75	-2 - 5%	Negligible
ESR 4	15.38	14.24	<75	-2 - 5%	Negligible
ESR 5	15.48	15.47	<75	<0.5%	Negligible
ESR 6	17.94	17.88	<75	<0.5%	Negligible
ESR 7	13.67	13.13	<75	-2 - 5%	Negligible
ESR 8	16.04	16.41	<75	1%	Negligible
ESR 9	14.62	15.39	<75	2 - 5%	Negligible
ESR 10	17.71	18.28	<75	1%	Negligible
ESR 11	23.80	24.04	<75	1%	Negligible
ESR 12	22.01	22.22	<75	1%	Negligible
ESR 13	13.99	14.64	<75	2 - 5%	Negligible
ESR 14	12.59	13.37	<75	2 - 5%	Negligible
ESR 15	16.85	16.94	<75	<0.5%	Negligible
ESR 16	20.07	20.19	<75	<0.5%	Negligible
ESR 17	18.07	18.16	<75	<0.5%	Negligible
<p>a. NO<sub>2</sub> concentrations obtained by inputting predicted NO<sub>x</sub> concentrations into the NO<sub>x</sub> to NO<sub>2</sub> calculator, in accordance with LAQM.TG(16)</p> <p>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</p> <p><u>Underlined</u> concentrations represent an exceedance of the AQO.</p>					

**Table 12.12: Predicted Adjusted PM<sub>10</sub> Concentrations at Existing Sensitive Receptors for Scenarios 4 and 5 (2033 Future Year)**

Receptor	Calculated Annual Mean PM <sub>10</sub> Concentrations (µg/m <sup>3</sup> ) <sup>a</sup>				
	Without Development Concentration	With Development		Concentration Change as Percentage of AQAL	Impact <sup>b</sup>
		Concentration	Percentage in Relation to AQAL		
ESR 1	11.82	13.44	<75	2 - 5%	Negligible
ESR 2	11.66	11.82	<75	<0.5%	Negligible
ESR 3	12.64	12.21	<75	-1%	Negligible

Receptor	Calculated Annual Mean PM <sub>10</sub> Concentrations (µg/m <sup>3</sup> ) <sup>a</sup>				
	Without Development Concentration	With Development		Concentration Change as Percentage of AQAL	Impact <sup>b</sup>
		Concentration	Percentage in Relation to AQAL		
ESR 4	12.34	11.84	<75	-1%	Negligible
ESR 5	13.90	13.80	<75	<0.5%	Negligible
ESR 6	14.66	14.57	<75	<0.5%	Negligible
ESR 7	13.65	13.34	<75	-1%	Negligible
ESR 8	14.62	14.79	<75	<0.5%	Negligible
ESR 9	11.78	12.14	<75	1%	Negligible
ESR 10	15.50	15.78	<75	1%	Negligible
ESR 11	18.12	18.24	<75	<0.5%	Negligible
ESR 12	17.17	17.27	<75	<0.5%	Negligible
ESR 13	11.67	12.00	<75	1%	Negligible
ESR 14	12.85	13.28	<75	1%	Negligible
ESR 15	13.49	13.53	<75	<0.5%	Negligible
ESR 16	14.90	14.94	<75	<0.5%	Negligible
ESR 17	14.13	14.17	<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

**Table 12.13: Predicted Adjusted PM<sub>2.5</sub> Concentrations at Existing Sensitive Receptors for Scenarios 4 and 5 (2033 Future Year)**

Receptor	Calculated Annual Mean PM <sub>2.5</sub> Concentrations (µg/m <sup>3</sup> ) <sup>a</sup>				
	Without Development Concentration	With Development		Concentration Change as Percentage of AQAL	Impact <sup>b</sup>
		Concentration	Percentage in Relation to AQAL		
ESR 1	7.18	8.08	<75	2 – 5%	Negligible
ESR 2	7.09	7.18	<75	<0.5%	Negligible
ESR 3	7.74	7.50	<75	-1%	Negligible
ESR 4	7.57	7.30	<75	-1%	Negligible
ESR 5	8.32	8.26	<75	<0.5%	Negligible
ESR 6	8.79	8.74	<75	<0.5%	Negligible

Receptor	Calculated Annual Mean PM <sub>2.5</sub> Concentrations (µg/m <sup>3</sup> ) <sup>a</sup>				
	Without Development Concentration	With Development		Concentration Change as Percentage of AQAL	Impact <sup>b</sup>
		Concentration	Percentage in Relation to AQAL		
ESR 7	8.12	7.95	<75	-1%	Negligible
ESR 8	8.74	8.84	<75	<0.5%	Negligible
ESR 9	7.37	7.57	<75	<0.5%	Negligible
ESR 10	9.22	9.37	<75	<0.5%	Negligible
ESR 11	10.71	10.78	<75	<0.5%	Negligible
ESR 12	10.18	10.23	<75	<0.5%	Negligible
ESR 13	7.38	7.57	<75	<0.5%	Negligible
ESR 14	7.70	7.93	<75	<0.5%	Negligible
ESR 15	8.35	8.37	<75	<0.5%	Negligible
ESR 16	9.13	9.17	<75	<0.5%	Negligible
ESR 17	8.70	8.72	<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*

12.6.12 The results of the assessment show that all predicted NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> concentrations are below the relevant objectives and limit values and furthermore that the Development will have negligible effects on the assessed existing sensitive receptors in the Opening and Future Years, except at ESR 1. At this location a 'slight adverse' impact is predicted in the opening year and a 'moderate adverse' impact in the future year, for NO<sub>2</sub> concentrations only. It is considered that these impacts can be tolerated, as the concentrations predicted are well below the objective level for NO<sub>2</sub>. As such, the overall effect of the proposed development is considered to be '**not significant**' on concentrations of NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> at all ESR locations assessed.

Proposed Sensitive Human Receptors

12.6.13 Pollutant concentrations have been modelled for proposed sensitive receptors for the 2026 and 2033 'With Development' scenarios, as detailed in Table 12.14.

**Table 12.14: Predicted Adjusted NO<sub>2</sub>, and Unadjusted PM<sub>10</sub> and PM<sub>2.5</sub> Concentrations at Proposed Sensitive Receptors for Scenarios 3 and 5**

Proposed Receptor	Calculated Annual Mean Concentrations (µg/m <sup>3</sup> )					
	2026 Opening Year			2033 Future Year		
	NO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
PSR 1	13.96	11.36	6.94	12.73	11.65	7.09
PSR 2	13.46	11.20	6.85	13.02	11.84	7.19
PSR 3	13.13	11.02	6.76	13.13	11.79	7.17
PSR 4	12.89	10.97	6.72	12.24	11.41	6.96
PSR 5	14.01	12.71	7.62	12.86	13.15	7.85
PSR 6	13.94	12.70	7.61	12.72	13.08	7.81

12.6.14 The results of the assessment show that all predicted NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> concentrations, in all scenarios considered, are below the relevant objectives and limit values.

Predicted Exceedances of 24-hr PM<sub>10</sub> Objective

12.6.15 At the request of the EHO, a calculation is presented below to ascertain if the development will lead to a breach of the 35 maximum annual permitted exceedances of the 50µg/m<sup>3</sup> 24-hr objective for PM<sub>10</sub>, using the method outlined in the LAQM.TG(16) guidance, section 7.92:

***"As for NO<sub>2</sub>, using a dispersion model to predict exceedances of the PM<sub>10</sub> short-term (24 hour mean) objective may be challenging. Therefore, to estimate potential exceedances of the PM<sub>10</sub> 24-hour mean objective, local authorities should use the following relationship, provided in previous Technical Guidance, but still considered adequate:***

***No. 24-hour mean exceedances = -18.5 + 0.00145 × annual mean<sup>3</sup> + (206/annual mean)."***

12.6.16 This formula has been applied to ESR 11, which is predicted to experience the highest PM<sub>10</sub> annual mean concentrations, i.e. 17.97 µg/m<sup>3</sup> in 2026 and 18.27 µg/m<sup>3</sup> in 2033. The resulting numbers of predicted exceedances of the 50 µg/m<sup>3</sup> objective are 1.38 in 2026 and 1.76 in 2033; as such there is no risk of receptors in the study area experiencing 35 exceedances of this objective per year.

**12.7. Mitigation**

**Construction Phase Assessment – Dust and Fine Particulate Matter Emissions**

*Step 3*

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

12.7.2 The construction phase assessment identified that:

- The risk of dust soiling effects is classed as high for earthworks and construction, and medium for trackout; and
- The risk of human health effects is classed as low for earthworks, construction and trackout.

12.7.3 This assumes that no mitigation measures are applied, except those required by legislation. Site-specific mitigation measures do not need to be recommended if the risk category is 'negligible'.

12.7.4 The risk of dust soiling and human health effects are not negligible for all activities. Therefore, site-specific mitigation will be implemented to ensure dust effects from these activities will be 'not significant'.

12.7.5 A best practice dust mitigation plan will be written and implemented for the Site. This will set out the practical measures to be incorporated as part of a best working practice scheme. This will take into account the recommendations included within the IAQM guidance, which may include but are not limited to the following:

- Revegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable;
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;
- 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;
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever possible;
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the Site where reasonably practicable);
- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of Site. This may require the sweeper being continuously in use; and
- Ensure vehicles entering and leaving the Site are covered to prevent escape of materials during transport.

12.7.6 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 that cause dust and/or emissions, and the action taken to resolve the situation, should be recorded in a log book and made available to the appropriate local authorities on request.

12.7.7 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 successful contractor.

### *Step 4*

12.7.8 Step 4 of the construction phase dust assessment has been undertaken to determine the significance of the dust effects arising from demolition, earthworks, construction and trackout associated with the Proposed Development.

12.7.9 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'.

### **Operational Phase Assessment – Road Traffic Emissions**

12.7.10 The air quality assessment has been undertaken to consider the potential effect of development-generated vehicle pollutants on air quality at 17 ESR locations. In addition, pollutant concentrations have been predicted at six PSR locations that are considered to be representative of future residential (and school) uses within the Site. The air quality assessment predicts that the effect on concentrations of NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> at all of the ESR locations assessed in the 2026 Opening Year and 2031 Future Year in all scenarios will be 'Not Significant' with the Proposed Development in place.

12.7.11 It is noted that during consultation the EHO requested that ***following the adoption of the Sustainable Travel Supplementary Planning Document, installation of electric vehicle charge points are recommended in accordance with the requirements of this document.***

12.7.12 This requirement is ***1 charging point per unit (dwelling with dedicated parking), or 1 charging point per 10 spaces (unallocated parking)*** for residential development. There is also a requirement for ***1 charging point per 10 spaces (unallocated parking)*** for the Employment area of the development.

12.7.13 It is our understanding that the client is amenable to this requirement. The *BMBC Air Quality and Emissions Good Practice Planning Guidance (March 2020)* recommends that charging points should be ***"mode 3", minimum 7 kW (32 AMP) in order to meet future electric vehicle charge point requirements.*** It is anticipated that provision is likely to form a Planning Condition and will therefore be discussed and agreed between the Developer and the LPA at a later stage.

### **Damage Cost Calculation**

12.7.14 In accordance with the *BMBC Air Quality and Emissions Good Practice Planning Guidance (March 2020)*, which requires a Damage Cost Calculation to be carried out for any development classed as 'Major' in terms of scale, a Damage Cost Calculation has been carried out.

12.7.15 The Damage Cost assessment provides a basis for quantifying a financial commitment required to offset potential development-generated emissions and is suggested for use within the 2017 IAQM/EPUK guidance. The air pollution damage cost assessment utilises the current DEFRA Emission Factor Toolkit (version 10.1), available on the Defra website, to estimate the annual link emissions associated with the additional development generated vehicles over a 5-year period.

12.7.16 The damage cost calculation has been undertaken using the most recent guidance available from Defra<sup>10</sup> (May, 2020), which includes updated damage cost values for both NO<sub>x</sub> and PM<sub>2.5</sub>. The total number of trips in a 24-hour period, generated by the proposed development, are included within the damage cost assessment to determine the transport related emissions. The damage cost calculation uses central damage cost values provided by Defra and applies these to the opening year of the proposed development. Full occupation of the development is assumed in the opening year, which is considered to be an overly robust approach as the development is likely to be only partially occupied at this stage.

12.7.17 The total trip generation for the proposed development in a 24-hour period is 13,252 vehicles (data provided by traffic consultant). The average trip length is assumed to be 10km and the average speed is 50kph. The calculation was undertaken for both NO<sub>x</sub> and particulate matter (PM) emissions, as these are the major pollutants associated with road traffic emissions. The Defra guidance gives a road transport sector estimated cost (2019) of £81,518/tonne for PM<sub>2.5</sub>. For NO<sub>x</sub>, the Defra guidance gives a road transport sector cost (2019) of £9,066/tonne.

12.7.18 In accordance with guidance, an uplift factor of 2% per year is applied to these costs. The EFT output (tonnes/annum) for each of the five assessed years is detailed in Table 12.15 below.

**Table 12.15 EFT Output (tonnes/annum)**

<b>Year</b>	<b>NO<sub>x</sub></b>	<b>PM<sub>2.5</sub></b>
<b>2026</b>	7.961788	0.966936
<b>2027</b>	7.127194	0.962489
<b>2028</b>	6.403991	0.95932
<b>2029</b>	5.795424	0.956747
<b>2030</b>	5.292461	0.954535

12.7.19 The emissions from Table 12.15 are then multiplied by the uplifted estimated sector costs. Table 12.16 details the central transport sector cost for each assessed year, beginning with the estimated development opening year of 2026. This is considered to be an overly robust approach, as the proposed development will only be partially occupied at this time. The proposed development is not anticipated to be fully operational until 2033.

<sup>10</sup> Defra Air Quality Appraisal: Damage Cost Guidance, available at <https://www.gov.uk/government/publications/assess-the-impact-of-air-quality/air-quality-appraisal-damage-cost-guidance>

Table 12.16: Calculated Cost for Each Year (£)

Year	NO <sub>x</sub>	PM <sub>2.5</sub>
2026	84572.21	92353.37
2027	77221.07	93767.17
2028	70773.09	95327.57
2029	65328.52	96973.41
2030	60852.08	98684.15

12.7.20 The total damage cost of both NO<sub>x</sub> and PM<sub>2.5</sub> for the proposed development over a five-year period is £835,852.64. This figure will be used as a starting for discussions with the Council regarding any necessary payments to address air quality impacts. However, it should be noted that inherent mitigation to address air quality impacts already provided as part of the scheme (e.g. as set out in the Travel Plan and indeed the delivery of the link road which itself will help to alleviate air quality impacts elsewhere on the existing network) will also be factored into the consideration of any sum which may be required.

12.7.21 The input data for the assessed year of 2026 for the damage cost calculation is provided in Table 12.17.

Table 12.17. Damage Cost Calculation Input Data

<b>Select Pollutants</b> <input checked="" type="checkbox"/> NO <sub>x</sub> <input type="checkbox"/> CO <sub>2</sub> <input checked="" type="checkbox"/> PM <sub>10</sub> <input checked="" type="checkbox"/> PM <sub>2.5</sub>	<b>Select Outputs</b> <input type="checkbox"/> Air Quality Modelling (g/km/s) <input type="checkbox"/> Breakdown by Vehicle <input type="checkbox"/> Emissions Rates (g/km) <input type="checkbox"/> Source Apportionment <input checked="" type="checkbox"/> Annual Link Emissions <input type="checkbox"/> PM by Source	<b>Additional Outputs</b> <input type="checkbox"/> Euro Compositions <input type="checkbox"/> Simple Entry Euro Compositions <input type="checkbox"/> Output % Contributions from Euro Classes <input type="checkbox"/> Primary NO <sub>2</sub> Fraction	<b>Advanced Options</b> <input type="checkbox"/> NO <sub>x</sub> Annual Emissions Euro Split <input type="checkbox"/> PM <sub>10</sub> Annual Emissions Euro Split <input type="checkbox"/> PM <sub>2.5</sub> Annual Emissions Euro Split <input type="checkbox"/> Fleet Projection Tool	<b>Click the button to:</b> <input type="button" value="Run EFT"/> <input type="button" value="Clear Input Data"/>				
<b>Please Select from the Following Options:</b> Area: England (not London) Year: 2026 Traffic Format: Basic Split Select 'Basic Split' or 'Detailed Option 1 to 3' or 'Alternative Technologies' above		<b>Export Outputs</b> <input type="checkbox"/> Save Output to New Workbook File Name: <input type="text"/>						
SourceID	Road Type	Traffic Flow	HDV%	Speed(kph)	No of Hours	Link Length (km)	% Gradient	Flow Direction
MU1	Urban (not London)	13252	5.5	50	24	10		

12.8. Residual Effects

12.8.1 It is considered that, with the application of mitigation measures during the construction phase as outlined in Section 12.6, the generation of nuisance dust and particulate matter will be greatly reduced, and any residual effect will be '**Not Significant**'.

12.8.2 Taking into account that there are no predicted new exceedances of relevant air quality objectives and target levels, and mainly negligible impacts on ESR locations, the residual effect of the Proposed Development on human receptors during the operational phase is considered to be '**Not Significant**'.

**12.9. Assessment of Cumulative Effects**

- 12.9.1 As regards inter-cumulative effects, the presented results incorporate committed developments within the baseline traffic for the Opening and Future Year Scenarios, such that the cumulative impact of the Proposed Development scheme along with other developments has been assessed.
- 12.9.2 Regarding intra-cumulative effects, the online Multi-Agency Geographic Information for the Countryside (MAGIC) resource shows that there are no potentially sensitive designated habitat sites within close proximity to the Proposed Development, or affected by development-generated traffic in line with the relevant thresholds in guidance from Natural England and the IAQM. Therefore, from an air quality perspective, ecological effects do not need to be considered for either the construction or operational phase of the Proposed Development.

**12.10. Summary****Construction Phase**

- 12.10.1 During the construction phase, site-specific mitigation (e.g. best practice Dust Mitigation Plan) will be implemented at the Site. With this in place, the residual effect on receptors locations is considered to be direct, temporary, medium-term and **Not Significant**.

**Operational Phase**

- 12.10.2 The effect of road traffic during the operational phase of the Proposed Development at ESR locations is direct, permanent, long-term and 'Not Significant'. Whilst this effect may be reduced further via the implementation of mitigation strategies as required under the *BMBC Air Quality and Emissions Good Practice Planning Guidance (March 2020)* and outlined in section 13.6, the residual effect will remain **Not Significant**.