

MILLER GOODALL
ACOUSTICS - AIR QUALITY - LIGHTING

AIR QUALITY ASSESSMENT

on behalf of

HARWORTH ESTATES INVESTMENTS LTD

for

ERLAS PARK, WREXHAM (PARC ERLAS, WRECSAM)

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Summary

This air quality report has been prepared to accompany a planning application for a proposed mixed-use development located on the land at Cefn Road, Erlas Park, Wrexham, LL13 9TT. It assesses the potential changes in air quality due to the construction and operation of the proposed development and whether these potential changes would significantly alter air quality.

The assessment of dust soiling and human health impacts during the construction phase of the development results in the proposal of dust mitigation measures. The implementation of these will ensure that residual dust impacts during the construction phase are not significant.

Concentrations of NO_2 and PM_{10} are likely to be below their respective long and short-term objectives at the proposed development site which is therefore considered suitable for its intended use with regards to air quality. Concentrations of $PM_{2.5}$ are expected to be below the annual mean target.

The proposed development is not expected to have a significant impact on local air quality.

There is, therefore, no reason for this application to be refused on the grounds of air quality.

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Signed	pp. 	Signed	
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1 Introduction

1.1 Miller Goodall Ltd has been instructed to prepare an air quality assessment to accompany a planning application for a proposed mixed-use development at Erlas Park, Wrexham (Parc Erlas, Wrecsam). The site lies within the administrative boundary of Wrexham County Borough Council (WCBC).

1.2 The report provides a review of the existing air quality in proximity to the proposed development site and assesses the potential impact of the proposed development on local air quality following Local Air Quality Management Technical Guidance[1] and EPUK and IAQM guidance[2].

1.3 The report provides an assessment of the potential air quality impacts associated with the construction and operational phases of the proposed development. The potential air quality changes at existing sensitive receptors adjacent to the site and roads subject to increased vehicle generation from the development are assessed. The suitability of the site for the intended use is also assessed.

1.4 The main pollutants of health concern from road traffic exhaust releases are nitrogen dioxide (NO_2) and fine particulates, normally assessed as the fraction of airborne particles of mean aerodynamic diameter less than ten micrometres (PM_{10}) and 2.5 micrometres ($PM_{2.5}$) since these pollutants are most likely to approach their respective air quality objectives in proximity to major roads and congested areas. This assessment has therefore focused on the impact of the proposed development on concentrations of NO_2, PM_{10} and $PM_{2.5}$.

2 Site Description

2.1 The site is located approximately 1.6 km to the east of Wrexham centre. The proposed development site is not located in an Air Quality Management Area (AQMA).

2.2 Bryn Estyn Road and Wrexham Rugby Club are located to the north of the proposed development site. There are residential dwellings located beyond Estyn Road. Agricultural land is located to the east and south of the proposed development site, there are also commercial premises to the south

[1] Department for the Environment Food and Rural Affairs (2022). Local Air Quality Management Technical Guidance Document LAQM.TG(22)

[2] EPUK and IAQM (January 2017) Land Use Planning and Development Control: Planning for Air Quality (v1.2)

of the proposed development site. Cefn Road runs along the western site boundary, there are residential dwellings located beyond Cefn Road. Adjacent to the western site boundary there are also residential dwellings and Fairpark Care - Hullah Farm Residential Care Home. The site location is shown in **Appendix A**.

3 Proposed Development

3.1 Proposed phased residential development for the construction of up to 900 residential dwellings with associated infrastructure (primary school, playing fields, open space and SUDs attenuation) with all matters reserved except for detailed means of primary highway access.

4 Policy Context

4.1 Air Quality Objectives

4.1.1 The United Kingdom left the European Union on 31st January 2020 and is no longer a member state. However, the current framework of air quality legislation was converted into domestic law through the European Union (Withdrawal) Act 2018[3].

4.1.2 The air quality standards and objectives have been prescribed through the Air Quality Standards (Wales) Regulations 2010 (as amended). The relevant air quality standards and objectives are presented in **Table 1**. Pollutant standards relate to ambient pollutant concentrations in air, set on the basis of medical and scientific evidence of how each pollutant affects human health.

Table 1: Air Quality Strategy Objectives (Wales) for the Purposes of Local Air Quality Management

Pollutant	Air Quality Objective*	
	Concentration	Measured As
Nitrogen dioxide (NO_2)	200 µg/m^3	1-hour mean not to be exceeded more than 18 times per year
	40 µg/m^3	Annual mean

[3] UK Parliament (2018): http://www.legislation.gov.uk/ukpga/2018/16/contents/enacted

Particles (PM_{10})	50 µg/m^3	24-hour mean not to be exceeded more than 35 per year
	40 µg/m^3	Annual mean
Particles ($PM_{2.5}$)	25 µg/m^3	Annual mean (target)

Note:*how the objectives are to be measured is set out in the Air Quality (Wales) Regulations 2010.

4.1.3 Where an air quality objective is unlikely to be met by the relevant deadline, local authorities must designate those areas as AQMAs and take action to work towards meeting the objectives. Following the designation of an AQMA, local authorities are required to develop an Air Quality Action Plan (AQAP) to work towards meeting the objectives and to improve air quality locally.

4.1.4 Possible exceedances of air quality objectives are generally assessed in relation to those locations where members of the public are likely to be regularly present and are likely to be exposed for a period of time appropriate to the averaging period of the objective.

4.2 Planning Policy Wales

4.2.1 Planning Policy Wales[4] sets out the land use planning policies of the Welsh Government. Section '6.7 Air Quality and Soundscape' discusses the importance of local air quality and emphasises the importance of air quality objectives advising that "*it is desirable to keep levels of pollution as low as possible*". The document also provides a framework for addressing air quality and advises at 6.7.6 that in proposing new development, planning authorities and developers must:

- "*address any implication arising as a result of its association with, or location within, air quality management areas, noise action planning priority areas or areas where there are sensitive receptors;*
- *not create areas of poor air quality or inappropriate soundscape; and*
- *seek to incorporate measures which reduce overall exposure to air and noise pollution and create appropriate soundscapes*."

4.2.2 Mitigation measures are considered at 6.7.8 and the document advises that developments should have "*good design, for example setting back buildings from roads to avoid canyon effects*" and that "*mitigation measures must be capable of being effectively implemented for their intended purpose, and could include those related to*:

[4] Welsh Government (February 2024) Planning Policy Wales Edition 12

- *traffic management and road safety;*
- *ensuring progress towards a shift to low or zero emissions means of road transport, such as electrical charging points;*
- *supporting low or zero emissions public transport;*
- *providing active travel infrastructure; and*
- *incorporating green infrastructure, where it can improve air quality by removing air pollution and aiding its dispersal, reduce real or perceived noise levels by absorbing and scattering noise and introducing natural sounds to soften man-made noise, provide areas of relative tranquillity, and reduce exposure by putting a buffer between sources of pollution and receptors.*"

4.3 Wrexham County Borough Local Development Plan 2013 – 2028

4.3.1 The WCBC (2023) Wrexham County Borough Local Development Plan 2013 – 2028 has been reviewed and relevant policies have been quoted below.

4.3.2 Policy SP14: Natural Environment states:

"*Development will only be permitted where it seeks to protect, conserve and enhance the natural environment including*:

… The quality of natural services including water, soundscape, air and soils…"

4.3.3 Policy DM1: Development Management Considerations states:

"*Development proposals, where relevant, must*:

… Safeguard the environment from the adverse effects of pollution of water, land, noise, light or air, or land instability, arising from development…"

5 Methodology

5.1 Data Sources

5.1.1 The air quality assessment has been undertaken and prepared with reference to information from several sources, as detailed in **Table 2**.

Table 2: Key Information Sources

Data Source	Reference
Wrexham County Borough Council (WCBC)	WCBC (2023) *North Wales Authorities Collaborative Project 2023 Air Quality Progress Report*
Institute of Air Quality Management (IAQM)	IAQM "Guidance on the assessment of dust from demolition and construction" v2.2 2024
Department for Environment Food and Rural Affairs (Defra)	Defra *Local Air Quality Management Technical Guidance TG(22), updated 2022*
Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM)	EPUK and IAQM (January 2017) *Land Use Planning and Development Control: Planning for Air Quality (v1.2)*
Defra's LAQM Support Tools	Local Air Quality Management 1 km x 1 km grid background pollutant maps NOx to NO_2 Calculator
SLR Consulting Limited	Traffic Data
Air Pollution Services	Meteorological data from Hawarden for the year 2022

5.2 Consultation

5.2.1 The proposed air quality assessment methodology was sent to Paul Campini of WCBC[5]. At the time of submitting this report, no response had been received.

[5] Email Miller Goodall Ltd. to Paul Campini (WCBC), 2nd January 2024 and 18th January 2024.

5.3 IAQM Construction Dust Assessment

5.3.1 The IAQM has produced guidance[6] on the assessment of air quality impacts arising from dust associated with construction and demolition activities and provides a methodology by which to complete such assessments. The IAQM methodology provides a risk assessment structure to determine the likely impact of the development on nearby receptor locations and recommends mitigation measures that should be implemented to reduce any such impact. The methodology for the assessment is shown in **Appendix B**. The study area in relation to dust and the zones of interest used within the assessment (<20 m, 20 m – 50 m and 50 – 100 m from the site) are shown in **Appendix C**. The dust assessment informed the recommended mitigation outlined in **Appendix D**.

5.4 Road Traffic Emissions Assessment

Air Dispersion Model

5.4.1 The validated Atmospheric Dispersion Modelling System for Roads (ADMS-Roads) v5.0.1.3 was used to assess the local air quality impact of development-generated vehicle exhaust emissions on concentrations of NO_2, PM_{10} and $PM_{2.5}$ at existing receptors located adjacent to the assessed road network and along the site boundary to assess site suitability.

Assessment Scenarios

5.4.2 The assessment considered the following scenarios:

- Scenario 1: 2022 - base year;
- Scenario 2: 2026 - opening year 'without development'; and
- Scenario 3: 2026 - opening year 'with development'.

Traffic Data

5.4.3 The spatial scope for the assessment focused on those routes affected by the proposed development. The traffic data used in the assessment is provided in **Appendix E** and a map of the road network is provided in **Appendix A**. Details on the committed development considered within the traffic data are also provided in **Appendix E**.

[6] Institution of Air Quality Management, 2024. Guidance on the assessment of dust from demolition and construction" v2.2

5.4.4 Vehicles within the study area have been modelled at posted speed limits apart from the approach to junctions where queuing traffic sections are included in the model at 5 to 20 kph where appropriate following Defra guidance.

5.4.5 LAQM.TG(22) recommends temporal variations to be considered within air quality modelling. Therefore, a 7-day profile based on the Department for Transport's statistics was used within the model.

Meteorological Data

5.4.6 Meteorological data for 2022 from the Hawarden recording station was used in the ADMS-Roads model. This is the most representative recording station for the development site.

5.4.7 The wind rose for 2022 from the Hawarden recording station is provided in **Appendix E**. Dispersion values for the site and meteorological station have been used. The factors applied for surface roughness (m) and the minimum monin-obukhov length (m) are outlined in **Appendix E**.

Sensitive Receptors

5.4.8 Ten existing sensitive receptor locations were selected based on their proximity to road links affected by the proposed development, where the potential effect of development-related traffic emissions on local air pollution would be most significant.

5.4.9 Predicted changes in NO_2, PM_{10} and $PM_{2.5}$ concentrations, as a result of development-generated traffic, were calculated at these locations. The ESR receptor locations are detailed in **Table 3** and shown in **Appendix A**.

Table 3: Existing Sensitive Receptor Locations

Receptor	Grid Ref	
ESR 1	335829	351856
ESR 2	335155	351241
ESR 3	335160	351307
ESR 4	335113	351258
ESR 5	334535	350863
ESR 6	334419	350851
ESR 7	335241	350910

Receptor	Grid Ref	
ESR 8	335312	350683
ESR 9	335300	350648
ESR 10	335374	350433

5.4.10 Five proposed sensitive receptor locations were considered within the assessment. NO_2, PM_{10} and $PM_{2.5}$ concentrations were calculated at these locations to determine whether future site users may be exposed to elevated pollutant levels. PSRs were selected at worst-case positions closest to the main sources of pollution affecting the site. The PSR locations are presented in **Table 4** and **Appendix A**.

Table 4: **Proposed Sensitive Receptor Locations**

Receptor	Grid Ref	
PSR 1	335232	350996
PSR 2	335278	350845
PSR 3	335347	350594
PSR 4	335409	350411
PSR 5	335404	351227

Conversion of NOx to NO_2

5.4.11 Oxides of nitrogen (NO_x) concentrations were predicted using the ADMS-Roads model. The modelled road contribution of NO_x at the identified receptor locations was then converted to NO_2 using the NO_x to NO_2 calculator (v8.1, 2020)[7] following Defra guidance.

Emission Factors

5.4.12 Defra's Emission Factor Toolkit (EFT)[8] (V12.0.1, 2023) was used within the ADMS-Roads model to predict emissions from road vehicles for all scenarios.

Background Concentrations

5.4.13 The ADMS model requires the derivation of background pollutant concentration data that are factored to the year of assessment, to which the contributions from the assessed roads are added.

[7] Background maps. Tools. Local Air Quality Management Support - Defra, UK

[8] Emissions Factors Toolkit (defra.gov.uk)

5.4.14 There are no background monitoring locations in the vicinity of the proposed development and receptor locations, therefore background NO_x, NO_2, PM_{10} and $PM_{2.5}$ concentrations were obtained from the Defra LAQM support tools for the 1 km x 1 km grid squares covering the proposed development site and receptor locations for the years of assessment (2022 and 2026).

Model Verification

5.4.15 Model verification is the process of adjusting model outputs to improve the consistency of modelling results with respect to available monitored data.

5.4.16 Verification has been undertaken for NO_2. The verification procedure considers diffusion tube WBC-042 which is located within the study area. The location of WBC-042 is shown in **Appendix A** and the results are provided in **Section 6.2**.

5.4.17 The verification procedure and associated calculations are shown in **Appendix E**. A single verification factor has been derived and applied to all sensitive receptors assessed. All modelled road NO_x concentrations have been adjusted by a factor of 1.3135.

5.4.18 There is no PM_{10} or $PM_{2.5}$ monitoring undertaken within the study area, therefore it was not possible to undertake verification for particulate matter concentrations.

Relevant Objectives

5.4.19 As the development includes residential use, both the annual mean and the short-term objectives apply.

5.4.20 The annual mean and short-term objectives apply to the ESR.

5.4.21 LAQM.TG(22) provides a qualitative screening approach to determine whether there is a risk of exceedance of the one-hour NO_2 air quality objective. If the ambient NO_2 annual mean concentration is above 60 µg/m^3 there is a risk that the one-hour objective (200 µg/m^3) may be exceeded. A qualitative comparison to this screening method has been undertaken for this assessment.

Assessment Significance Criteria

5.4.22 Guidance is provided by EPUK and IAQM[2] on criteria for determining the significance of a development's impact on local air quality. **Table 5** details the impact descriptors used for individual receptors in relation to annual mean pollutant concentrations. The overall significance

of impacts was determined using professional judgement. Changes of 0%, i.e. less than 0.5%, will be described as Negligible.

Table 5: Impact descriptors for individual receptors

Long term average Concentration at receptor in assessment year	% 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

*AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'

6 Baseline Air Quality

6.1 Local Air Quality

6.1.1 Baseline air quality at the proposed development has been established by examining monitoring data produced by WCBC (provided in the 2023 Annual Status Report) and background concentration maps provided by Defra for the grid squares covering the proposed development.

6.1.2 Currently, WCBC does not have any declared AQMAs.

6.2 Air Quality Monitoring

Nitrogen Dioxide (NO_2)

6.2.1 WCBC monitors NO_2 using diffusion tubes at 26 locations, including one diffusion tube triplicate site which is co-located with an automatic monitoring station, Automatic Urban and Rural Network (AURN). There are two other automatic monitoring stations, WCBC2 and WCBC3.

6.2.2 AURN is located approximately 2.5 km southwest of the proposed development site. Therefore, it is

not representative of the conditions at the proposed development site. WCBC2 and WCBC3 are located in Chirk approximately 14 km southwest of the proposed development site. Therefore, there are no automatic monitoring stations representative of the conditions at the proposed development site.

6.2.3 There are four NO_2 diffusion tube monitoring locations within 2 km of the proposed development site. The results from the diffusion tubes are shown in **Table 6** and the monitor locations are shown in **Appendix A**.

Table 6: Annual Mean NO_2 Concentrations Monitored by WCBC within the Study Area

Site ID (classification)	Location		Annual Mean NO_2 Concentrations (µg/m³)				
			2018	2019	2020	2021	2022
WBC-021 (roadside)	334100	350700	18.8	NA	NA	NA	NA
WBC-033 (roadside)	333981	350171	18.5	15.6	19.3	21.0	17.4
WBC-042 (roadside)	335359	352178	23.2	20.6	17.1	19.6	18.3
WBC-043 (roadside)	333966	349691	19.3	17.0	14.4	16.5	17.5
Annual Mean NO_2 air quality objective			40 µg/m³				

6.2.4 The monitoring results in **Table 6** indicate that annual mean concentrations of NO_2 were below the NO_2 annual mean objective at the identified monitoring sites during the period shown.

6.2.5 The results indicate that the short-term objective for NO_2 was unlikely to be exceeded at the identified monitoring sites as monitored annual mean concentrations were well below the indicative screening concentration of 60 µ/gm³ during the period shown.

Particulate Matter (PM_{10} & $PM_{2.5}$)

6.2.6 WCBC has PM_{10} and $PM_{2.5}$ monitoring via its automatic stations. However, as discussed, this AURN is not representative of the conditions at the development site

6.3 Background Concentrations

6.3.1 Background concentrations of NO_2, PM_{10} and $PM_{2.5}$ obtained from the background concentration maps provided by Defra for the grid squares covering the proposed development and receptor

locations[9] are shown in **Table 7**.

Table 7: Background Pollutant Concentrations Obtained for the 1km x 1km Grid Squares Covering the Site and Receptor Locations*

Grid Square	Pollutant	2022 (µg/m³)	2026 (µg/m³)
334500, 350500 (ESR5 and ESR6)	NO_2	8.14	7.61
	PM_{10}	11.21	10.98
	$PM_{2.5}$	7.65	7.47
335500, 350500 (ESR7 – ESR10 and PSR1 – PSR4)	NO_2	7.16	6.72
	PM_{10}	10.77	10.55
	$PM_{2.5}$	7.06	6.88
335500, 351500 (ESR1 – ESR4 and PSR5)	NO_2	7.81	7.28
	PM_{10}	11.53	11.31
	$PM_{2.5}$	7.40	7.22
335500, 352500 (WBC-042)	NO_2	7.59	7.04
	PM_{10}	10.77	10.54
	$PM_{2.5}$	6.95	6.77

** Background concentrations obtained from the latest 2018 based background maps*

7 Construction Dust Impact Assessment

7.1 Step 1 – Requirement for a Detailed Assessment

7.1.1 There are sensitive receptors located within 250m of the site boundary, therefore, a detailed assessment of the construction phase of the development has been undertaken. There are no ecological designations within 50m of the site boundary or 50 m of the route(s) used by construction vehicles on the public highway, up to 250 m from the site entrance(s) which require assessment.

7.2 Step 2 – Assess the Risk of Dust Impacts

Step 2A Dust Emission Magnitude

7.2.1 The potential dust emission magnitude in relation to the development has been determined using

[9] http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018

the criteria detailed in **Table B1** in **Appendix B**. The scale and nature of works onsite were considered to determine the potential dust emission magnitude for earthwork activities, construction and trackout activities. No demolition is required at the development site.

7.2.2 Information to determine the classification has been estimated from the site plans, Google Earth and information provided by the Applicant. The dust emission magnitude is outlined in **Table 8.**

Table 8: Dust Emission Magnitudes for Each Activity

Activity	Dust Emission Magnitudes	Justification for Sensitivity Classification
Earthworks	Large	• the site area is greater than 110,000 m^2.
Construction	Large	• total building volume estimated to be constructed is greater than 75,000 m^3.
Trackout	Large	• there are likely to be more than 50 HDV outward movements in any one day

Step 2B Sensitivity of the Receptors to Dust Soiling and Health Effects

7.2.3 Dwellings and care homes are located within a distance of 20 m from earthworks and construction, and 20 m of road edges used by traffic associated with the site construction. In accordance with the criteria in **Table B2** in **Appendix B** and the IAQM guidance, the sensitivity of human receptors is **high**.

Step 2B Sensitivity of the Area to Dust Soiling and Human Health Effects of PM_{10}

7.2.4 The sensitivity of the area for dust soiling and human health effects has been determined using the criteria detailed in **Table B3 and Table B4** respectively in **Appendix B.**

7.2.5 The sensitivity of the area to dust soiling and human health for each activity is summarised in **Table 9**.

Table 9: Outcome of Defining the Sensitivity of the Area

Pollution	Activity	Sensitivity of the Surrounding Area	Justification for Sensitivity Classification
Dust Soiling	Earthworks	High	There are more than 100 highly sensitive receptors within 20 m of the site boundary.
	Construction	High	There are more than 100 highly sensitive receptors within 20 m of construction activity.
	Trackout	High	There are more than 100 highly sensitive receptors within 20 m of the trackout route, up to 50 m of the site exit.
Human Health	Earthworks	Medium	There are more than 100 highly sensitive residential receptors within 20 m of the site boundary. Background PM_{10} pollutant concentrations are below 24 µg/m^3.
	Construction	Medium	There are more than 100 highly sensitive receptors within 20 m of construction activity. Background PM_{10} pollutant concentrations are below 24 µg/m^3.
	Trackout	Medium	There are more than 100 highly sensitive receptors within 20 m of the trackout route, up to 50 m of the site exit. Background PM_{10} pollutant concentrations are below 24 µg/m^3.

Step 2C Risk of Impacts

7.2.6 The dust emission magnitude and sensitivity of the area were combined and the risk of impacts have been determined using the criteria detailed in **Table B5** to **Table B8** in **Appendix B.**

7.2.7 A summary of the risks, before mitigation measures are applied, for dust soiling and human health are shown in **Table 10**.

Table 10: Risk of Dust Impacts

Potential Impact	Dust Risk		
	Earthworks	Construction	Trackout
Dust Soiling	High	High	High
Human Health	Medium	Medium	Medium

7.3 Step 3 – Site-Specific Mitigation

7.3.1 Step 3 of the IAQM guidance identifies appropriate site-specific mitigation. These measures are related to the site risk for each activity. Mitigation measures specific to earthworks, construction and trackout are proposed based on the risk classifications in **Table 10**. Recommended mitigation measures are shown in **Appendix D.**

7.3.2 The general mitigation measures (for site management, preparing and maintaining the site, operating vehicle/machinery, operations and waste management), are appropriate for a site with a 'high risk' classification (in this instance the site is classified as "high" risk due to earthworks, construction and trackout)[10].

7.4 Step 4 – Determine Significant Effects

7.4.1 The characteristics of the site and the surrounding area suggest that mitigation would not be impracticable or ineffective. With the implementation of the mitigation measures, therefore, the residual impacts from the construction are considered to be not significant when considered following IAQM guidance.

8 Road Traffic Assessment

8.1 Baseline Assessment

8.1.1 The ADMS-Roads model was used to estimate contributions of vehicle exhaust emissions to annual NO_2, PM_{10} and $PM_{2.5}$ concentrations for the '*baseline*' and '*without development*' scenarios considered in the assessment.

8.1.2 The 24-hour AADT flows used in the assessment are detailed in **Appendix E**. **Table 11** details the results of the baseline assessment.

[10] For those mitigation measures that are general, the highest risk category should be applied. For example, if the site is medium risk for earthworks and construction, but a high risk for demolition and track-out, the general measures applicable to a high risk site should be applied.

Table 11: Predicted Baseline NO_2, PM_{10} and $PM_{2.5}$ Annual Mean Concentrations (µg/m³) at Existing Sensitive Receptor Locations

Receptor	Receptor Height above Ground Level (m)	Scenario 1: Base Year (2022)			Scenario 2: Without Development (2026)		
		NO_2 (µg/m³)	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	NO_2 (µg/m³)	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)
ESR 1	1.5	11.60	12.02	7.66	9.92	11.79	7.48
ESR 2	1.5	15.85	12.42	7.88	12.43	12.11	7.64
ESR 3	1.5	15.17	12.30	7.82	12.09	12.00	7.59
ESR 4	1.5	16.36	12.45	7.90	12.86	12.16	7.67
ESR 5	1.5	9.93	11.47	7.79	8.76	11.22	7.60
ESR 6	1.5	10.46	11.63	7.88	9.04	11.37	7.68
ESR 7	1.5	9.57	11.21	7.29	8.19	10.95	7.08
ESR 8	1.5	10.39	11.36	7.37	8.67	11.08	7.15
ESR 9	1.5	9.12	11.07	7.21	7.95	10.82	7.02
ESR 10	1.5	8.19	10.96	7.16	7.37	10.73	6.97
		Annual Mean NO_2 & PM_{10} Air Quality Objective				**40 (µg/m³)**	
		Annual Mean $PM_{2.5}$ Target Level Objective				**25 (µg/m³)**	

8.1.3 The baseline air quality assessment for the base year (2022) and opening year *'without development'* (2026) scenarios indicate that concentrations of NO_2, and PM_{10} are below the respective annual mean air quality objectives and the $PM_{2.5}$ annual mean target at all sensitive receptors assessed.

8.2 Impact Assessment

Existing Receptors

8.2.1 Predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations for the opening year (2026) *'with development'* scenario at xx ESR locations are detailed in **Table 12**, **Table 13** and **Table 14**. The predicted change in NO_2, PM_{10} and $PM_{2.5}$ concentrations at existing sensitive receptors between the *'without development'* and *'with development'* scenarios were compared to the significance criteria detailed in EPUK and IAQM guidance[2] and contained within **Table 5**.

Table 12: NO_2 Dispersion Modelling Results and Significance of Development for the Opening Year (2026) Scenario at Existing Receptor Locations

Receptor	Without Development µg/m³	Concentration with Development µg/m³	Impact µg/m³	% of AQAL with Development	% Change relative to AQAL	Impact Descriptor
ESR 1	9.92	10.08	0.16	25.20%	0.40%	Negligible
ESR 2	12.43	13.45	1.02	33.63%	2.55%	Negligible
ESR 3	12.09	12.76	0.67	31.90%	1.68%	Negligible
ESR 4	12.86	13.57	0.71	33.93%	1.78%	Negligible
ESR 5	8.76	8.8	0.04	22.00%	0.10%	Negligible
ESR 6	9.04	9.2	0.16	23.00%	0.40%	Negligible
ESR 7	8.19	8.61	0.42	21.53%	1.05%	Negligible
ESR 8	8.67	9.35	0.68	23.38%	1.70%	Negligible
ESR 9	7.95	8.14	0.19	20.35%	0.48%	Negligible
ESR 10	7.37	7.58	0.21	18.95%	0.53%	Negligible
			Annual Mean NO_2 Air Quality Objective		**40 (µg/m³)**	

Table 13: PM_{10} Dispersion Modelling Results and Significance of Development for the Opening Year (2026) Scenario at Existing Receptor Locations

Receptor	Without Development µg/m³	Concentration with Development µg/m³	Impact µg/m³	% of AQAL with Development	% Change relative to AQAL	Impact Descriptor
ESR 1	11.79	11.82	0.03	29.56%	0.08%	Negligible
ESR 2	12.11	12.29	0.18	30.71%	0.45%	Negligible
ESR 3	12.00	12.12	0.12	30.30%	0.30%	Negligible
ESR 4	12.16	12.28	0.12	30.69%	0.30%	Negligible
ESR 5	11.22	11.24	0.02	28.09%	0.05%	Negligible
ESR 6	11.37	11.42	0.05	28.54%	0.13%	Negligible
ESR 7	10.95	11.06	0.11	27.65%	0.28%	Negligible

ESR 8	11.08	11.27	0.19	28.16%	0.47%	Negligible
ESR 9	10.82	10.89	0.07	27.21%	0.18%	Negligible
ESR 10	10.73	10.78	0.05	26.96%	0.12%	Negligible
			Annual Mean PM_{10} Air Quality Objective		**40 (µg/m³)**	

Table 14: $PM_{2.5}$ Dispersion Modelling Results and Significance of Development for the Opening Year (2026) Scenario at Existing Receptor Locations

Receptor	Without Development µg/m³	Concentration with Development µg/m³	Impact µg/m³	% of AQAL with Development	% Change relative to AQAL	Impact Descriptor
ESR 1	7.48	7.49	0.01	29.97%	0.04%	Negligible
ESR 2	7.64	7.73	0.09	30.94%	0.36%	Negligible
ESR 3	7.59	7.65	0.06	30.59%	0.24%	Negligible
ESR 4	7.67	7.73	0.06	30.92%	0.24%	Negligible
ESR 5	7.60	7.61	0.01	30.43%	0.04%	Negligible
ESR 6	7.68	7.70	0.02	30.80%	0.08%	Negligible
ESR 7	7.08	7.14	0.06	28.58%	0.24%	Negligible
ESR 8	7.15	7.25	0.10	29.01%	0.40%	Negligible
ESR 9	7.02	7.05	0.03	28.21%	0.12%	Negligible
ESR 10	6.97	7.00	0.03	28.00%	0.12%	Negligible
			Annual Mean $PM_{2.5}$ Target Level Objective		**25 (µg/m³)**	

8.2.2 The results of the ADMS-Roads modelling assessment for 2026 indicate that annual mean concentrations of NO_2 and PM_{10} would be below the respective annual objectives as well as the $PM_{2.5}$ annual mean target in 2026, at all existing sensitive receptor locations within the study area, for both '*with*' and '*without*' the development.

8.2.3 The predicted NO_2 concentrations are all well below 60 µg/m³, for both '*with*' and '*without*' the development; therefore, when considered in light of guidance in LAQM.TG(22), the 1-hour mean objective is unlikely to be exceeded.

8.2.4 The short term PM_{10} objective is predicted to be met at the existing sensitive receptor location with

no exceedances of the daily mean objective of 50 μg/m^3, for both '*with*' and '*without*' the development.

8.2.5 Predicted annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ are expected to have an increase of less than 2.55% at all existing sensitive receptors assessed. It is likely that concentrations predicted at individual receptor locations are also representative of worst-case exposure as they are close to the main junctions used by development traffic. The proposed development is therefore predicted to have a ***negligible*** impact on concentrations of NO_2, PM_{10} and $PM_{2.5}$ in 2026.

Proposed Receptors

8.2.6 NO_2, PM_{10}, and $PM_{2.5}$ concentrations have been predicted at five PSR locations. The results of the air quality assessment are shown in **Table 15**. PSR locations are shown in **Appendix A**.

Table 15: Air Quality Concentrations at Proposed Sensitive Receptors

Proposed Sensitive Receptor	2026 With Development – Pollutant Concentrations		
	NO_2 Concentration with Development μg/m^3	PM_{10} Concentration with Development μg/m^3	$PM_{2.5}$ Concentration with Development μg/m^3
PSR 1	12.16	12.06	7.67
PSR 2	9.76	11.39	7.32
PSR 3	9.37	11.28	7.26
PSR 4	9.18	11.23	7.23
PSR 5	7.78	11.42	7.29

8.2.7 The results of the dispersion modelling assessment indicate that annual mean concentrations of NO_2 and PM_{10} would be below the annual mean objectives at PSR locations in 2026 once the development is operational. The $PM_{2.5}$ concentrations are expected to be below the $PM_{2.5}$ annual mean target in 2026 at the PSR locations.

8.2.8 The predicted NO_2 concentrations are all well below 60 μg/m^3; therefore, when considered in light of guidance in LAQM.TG (22), the 1-hour mean objective is unlikely to be exceeded. The short term PM_{10} objective is predicted to be met at the PSR location with no exceedances of the daily mean objective of 50 μg/m^3.

8.2.9 The site is therefore considered suitable for its intended use with regard to air quality.

9 Summary of Impacts and Conclusion

9.1 This air quality report assesses the potential changes in air quality due to the construction and operation of the proposed development and whether these potential changes would significantly alter air quality.

9.2 The assessment of dust soiling and human health impacts during the construction phase of the development results in the proposal of dust mitigation measures. The implementation of these will ensure that residual dust impacts during the construction phase are not significant.

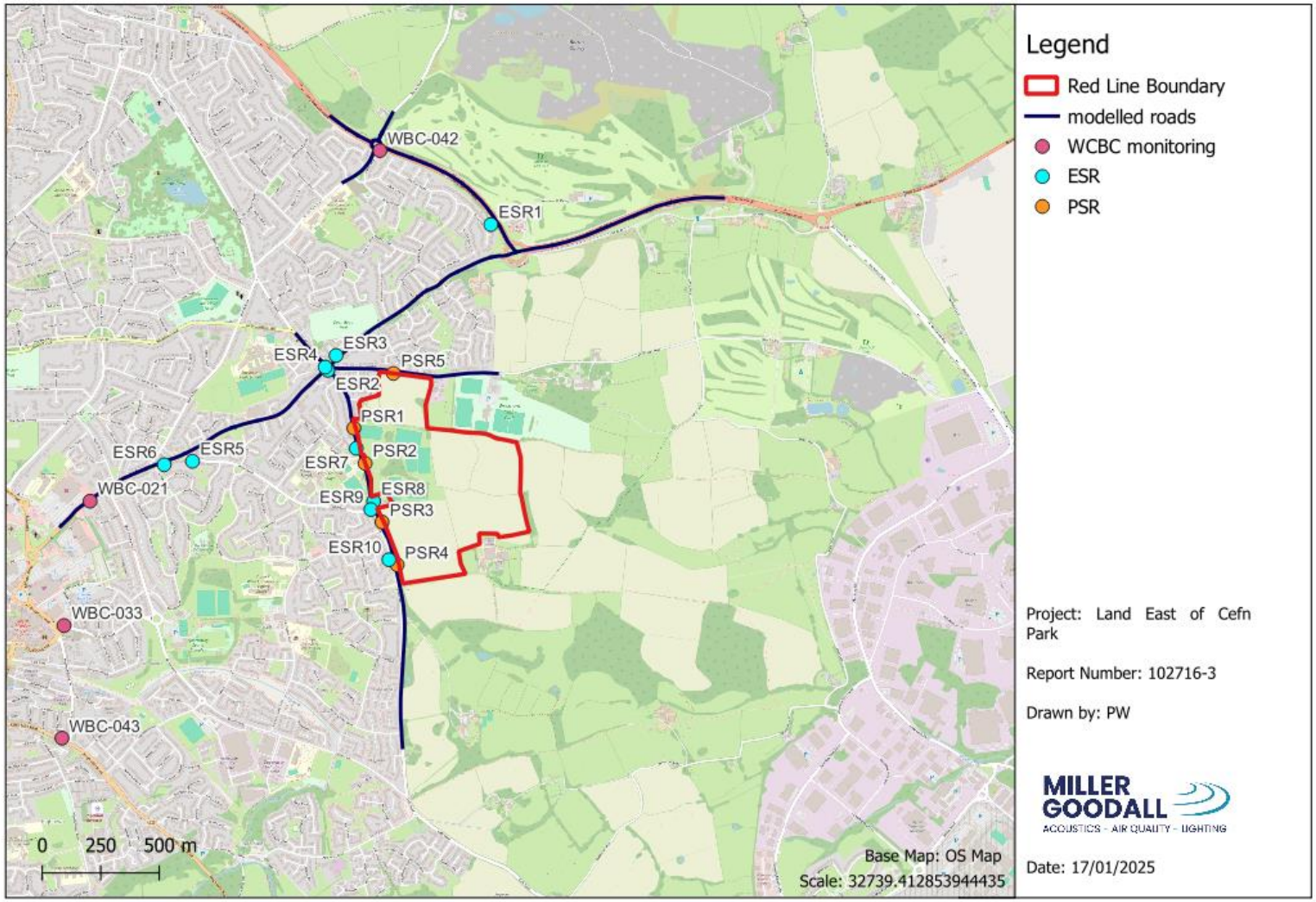
9.3 Concentrations of NO_2 and PM_{10} are likely to be below their respective long and short-term objectives at the proposed development site which is therefore considered suitable for its intended use with regards to air quality. Concentrations of $PM_{2.5}$ are expected to be below the annual mean target.

9.4 The proposed development is not expected to have a significant impact on local air quality.

9.5 There is, therefore, no reason for this application to be refused on the grounds of air quality.

APPENDICES

Appendix A: Location of site, modelled roads, WCBC monitoring and receptors



Appendix B: IAQM Dust Risk Assessment Methodology

The following section outlines criteria developed by the IAQM for the assessment of air quality impacts arising from construction and demolition activities[6]. The assessment procedure is divided into four steps and is summarised below:

Step 1: Screen the Need for a Detailed Assessment

An assessment will normally be required where there are human receptors within 250 m of the site boundary and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 250 m from the site entrance(s). Ecological receptors within 50 m of the site boundary or within 50 m of the route(s) used by construction vehicles on the public highway, up to 200 m from the site entrance(s), are also identified at this stage. An ecological receptor refers to any sensitive habitat affected by dust soiling. For locations with a statutory designation, such as a Site of Specific Scientific Interest (SSSI), Special Area of Conservation (SACs) and Special Protection Areas (SPAs), consideration should be given as to whether the particular site is sensitive to dust. Some non-statutory sites may also be considered if appropriate.

Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is 'negligible' and any effects will not be significant.

Step 2: Assess the Risk of Dust Impacts

In step two, a site is allocated to a risk category on the basis of the scale and nature of the works (Step 2A) and the sensitivity of the area to dust impacts (Step 2B). These two factors are combined in Step 2C to determine the risk of dust impacts before the implementation of mitigation measures. The assigned risk categories may be different for each of the construction activities outlined by the IAQM (construction, demolition, earthworks and trackout). A site can be divided into zones, for example on a large site where there are differing distances to the nearest receptors.

Step 2A: Define the Potential Dust Emission Magnitude

Dust emission magnitude is based on the scale of the anticipated works and is classified as Small, Medium or Large. The IAQM guidance recommends that the dust emission magnitude is determined separately for demolition, earthworks, construction and trackout. **Table B1** describes the potential dust emission class criteria for each outlined activity.

Table B1: Criteria Used in the Determination of Dust Emission Magnitude

Activity	Criteria used to Determine Dust Emission Magnitude		
	Small	Medium	Large
Demolition	Total building volume <12,000 m^3, construction materials with low potential for dust release.	Total building volume 12,000 m^3 – 75,000 m^3, potential dusty construction material.	Total building volume >75,000 m^3, potentially dusty construction material.
Earthworks	Total site area <18,000 m^2, soil type with large grain	Total site area 18,000 – 110,000 m^2, moderately dusty soil type	Total site area >110,000 m^2, potentially dusty soil type
Construction	Total building volume <12,000 m^3.	Total building volume 12,000 – 75,000 m^3.	Total building volume >75,000 m^3.
Trackout	<20 outward HDV trips in any one day. Unpaved road length <50 m.	20-50 outward HDV trips in any one day. Unpaved road length 50-100 m.	>50 outward HDV trips in any one day. Unpaved road length >100 m.

Step 2B: Define the Sensitivity of the Area

The sensitivity of the area takes into account the following factors:

- the specific sensitivities of receptors in the area;
- the proximity and number of receptors;
- the local background PM_{10} concentration; and
- site-specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of windblown dust.

The criteria detailed in **Table B2** is used to determine the sensitivity of the receptor in relation to dust soiling, health effects and ecological effects.

Table B2: Criteria for Determining Sensitivity of Receptors

Sensitivity of Receptor	Criteria for Determining Sensitivity		
	Dust Soiling Effects	Health Effects of PM_{10}	Ecological Sites
High	Dwellings, museums and other culturally important collections, medium and long-term car parks and car showrooms	Residential properties, hospitals, schools and residential care homes	International or national designation *and* the features may be affected by dust soiling; or locations where there is a community of a particularly dust sensitive species such as vascular species included in the

Sensitivity of Receptor	Criteria for Determining Sensitivity		
	Dust Soiling Effects	Health Effects of PM_{10}	Ecological Sites
			Red Data List For Great Britain
Medium	Parks, places of work	Office and shop workers not occupationally exposed to PM_{10}	Presence of an important plant species where dust sensitivity is uncertain or locations with a national designation with features that may be affected by dust deposition
Low	Playing fields, farmland, footpaths, short-term car parks and roads	Public footpaths, playing fields, parks and shopping streets	Local designation where features may be affected by dust deposition

Table B3 and **Table B4** are then used to define the sensitivity of the area to dust soiling and human health effects. **Table B5** is used to define the sensitivity of the area to ecological impacts. This should be derived for each of construction, demolition, earthworks and trackout.

Table B3: Sensitivity of the Area to Dust Soiling Effects on People and Property.

Receptor Sensitivity	Number of Receptors	Distance from Source (m)*			
		<20	<50	<100	<250
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

*distances considered are to the dust source

Table B4: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentrations	Number of Receptors	Distance from the Source (m)			
			<20	<50	<100	<250
High	>32 µg/m^{-}	>100	High	High	High	Medium
		10-100	High	High	Medium	Low
		1-10	High	Medium	Low	Low
	28-32 µg/m^3	>100	High	High	Medium	Low
		10-100	High	Medium	Low	Low

		1-10	High	Medium	Low	Low
	24-28 µg/m³	>100	High	Medium	Low	Low
		10-100	High	Medium	Low	Low
		1-10	Medium	Low	Low	Low
	<24 µg/m³	>100	Medium	Low	Low	Low
		10-100	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Medium	>32 µg/m⁻	>10	High	Medium	Low	Low
		1-10	Medium	Low	Low	Low
	28-32 µg/m³	>10	Medium	Low	Low	Low
		1-10	Low	Low	Low	Low
	24-28 µg/m³	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
	<24 µg/m³	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low

Table B5: Sensitivity of the Area to Ecological Impacts[a, b, c]

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

[a] *The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout and for each designated site. See STEP 2B, Box 8 and Box 9 of IAQM guidance.*

[b] *Only the highest level of area sensitivity from the table needs to be considered.*

[c] *For trackout, the distances should be measured from the side of the roads used by construction traffic. The impact declines with distance from the site.*

The sensitivity of the area is then summarised.

Step 2C Define the Risks of Impacts

The dust emission magnitude from **Table B1** and sensitivity of the area and receptors from **Table B2**, **Table B3**, **Table B4** and **Table B5** are combined, and the risk of impacts from each activity (demolition, earthworks, construction and trackout) before mitigation is applied, is determined using the criteria detailed in **Table B6** to **Table B9**.

Table B6: Risk of Dust Impacts - Demolition

Potential Impact Sensitivity of the 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

Table B7: Risk of Dust Impacts- Earthworks

Potential Impact Sensitivity of the 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

Table B8: Risk of Dust Impacts- Construction

Potential Impact Sensitivity of the 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

Table B9: Risk of Dust Impacts- Trackout

Potential Impact Sensitivity of the 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

Step 3 Determine Site Specific Mitigation

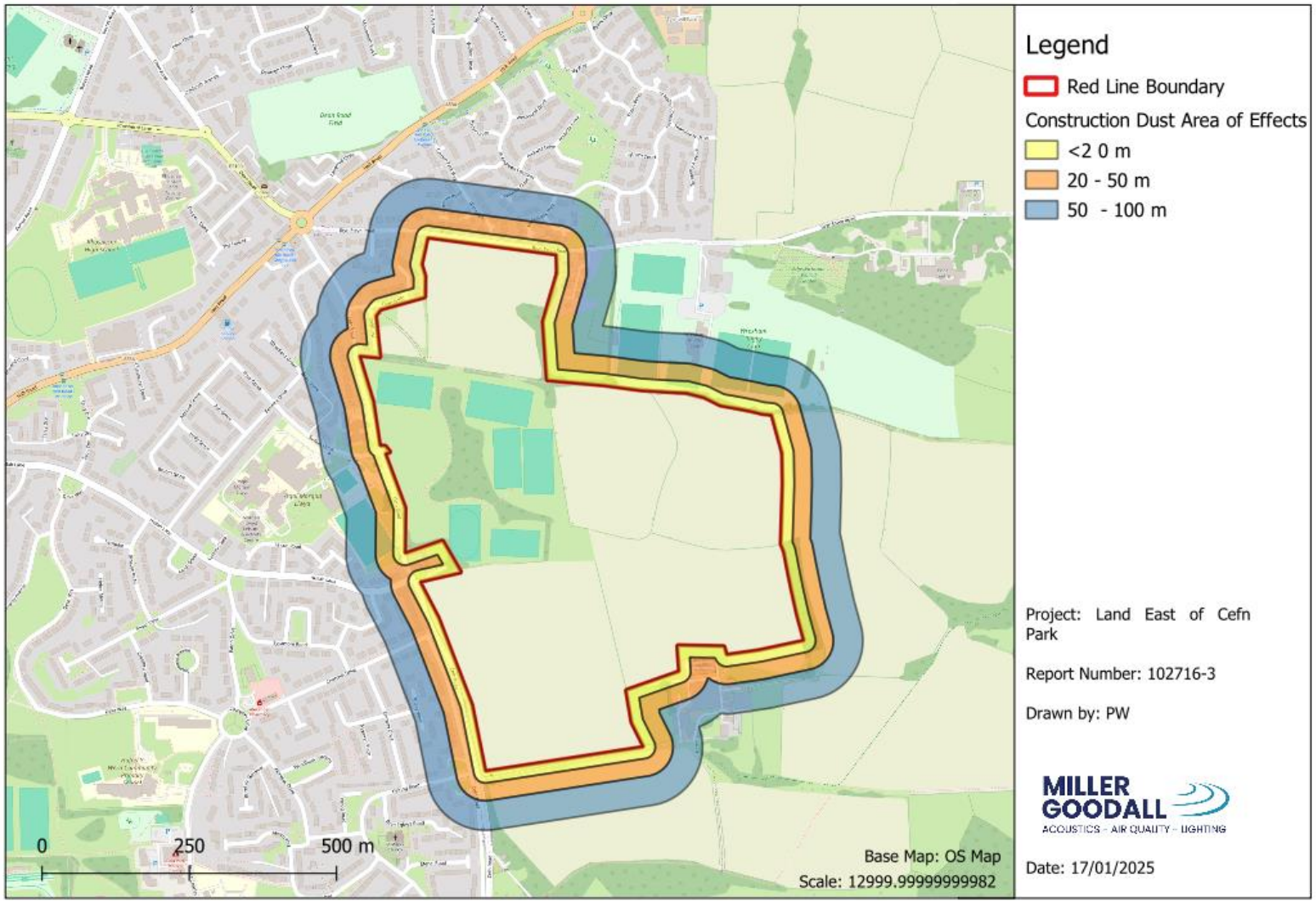
Step three of the IAQM guidance identifies appropriate site-specific mitigation. These measures are related to whether the site is a low, medium or high risk site.

Step 4 Determine Significance of Residual Effects

At step four the significance of residual effects is assessed. For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'.

There may be cases where, for example, there is inadequate access to water for dust suppression to be effective, and even with other mitigation measures in place there may be a significant effect. Therefore, it is important to consider the specific characteristics of the site and the surrounding area to ensure that a conclusion of no significant effect is robust.

Appendix C: Construction Dust Buffer Zones



Appendix D: IAQM Dust Assessment Mitigation

xx Highly Recommended **x Desirable**

Measures relevant for earthworks, construction and trackout

Mitigation Measure	High Risk
Communications	
Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	xx
Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.	xx
Display the head or regional office contact information.	xx
Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. In London additional measures may be required to ensure compliance with the Mayor of London's guidance. The DMP may include monitoring of dust deposition, dust flux, realtime PM_{10} continuous monitoring and/or visual inspections.	xx
Site management	
Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.	xx
Make the complaints log available to the local authority when asked.	xx
Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.	xx
Hold regular liaison meetings with other high risk construction sites within 250 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/ deliveries which might be using the same strategic road network routes.	xx
Monitoring	
Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of site boundary, with cleaning to be provided if necessary.	xx
Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.	xx

Mitigation Measure	High Risk
Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.	xx
Agree dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.	xx
Preparing and maintaining the site	
Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	xx
Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.	xx
Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period.	xx
Avoid site runoff of water or mud.	xx
Keep site fencing, barriers and scaffolding clean using wet methods.	xx
Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.	xx
Cover, seed or fence stockpiles to prevent wind whipping.	xx
Operating vehicle/machinery and sustainable travel	
Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone and the London NRMM standards, where applicable.	xx
Ensure all vehicles switch off engines when stationary - no idling vehicles.	xx
Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable.	xx
Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).	xx
Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.	xx
Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).	xx
Operations	
Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.	xx

Mitigation Measure	High Risk
Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.	xx
Use enclosed chutes and conveyors and covered skips.	xx
Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	xx
Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.	xx
Waste management	
Avoid bonfires and burning of waste materials.	xx

Measures specific to earthworks

Mitigation Measure	High Risk
Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.	xx
Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.	xx
Only remove the cover in small areas during work and not all at once.	xx

Measures specific to construction

Mitigation Measure	High Risk
Avoid scabbling (roughening of concrete surfaces) if possible.	xx
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.	xx
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.	xx
For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.	x

Measures specific to trackout

Mitigation Measure	High Risk
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.	xx
Avoid dry sweeping of large areas.	xx
Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	xx
Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	xx
Record all inspections of haul routes and any subsequent action in a site log book.	xx
Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.	xx
Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	xx
Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.	xx
Access gates to be located at least 10 m from receptors where possible.	xx

Appendix E: Assessment and Model Inputs

This appendix outlines the inputs used in the road traffic emissions assessment.

Traffic Data

The ADMS-Roads model requires the inclusion of detailed road traffic data for the routes to be affected by the proposed development.

Traffic data has been provided as 24-hour Annual Average Daily Traffic (AADT) and heavy-duty vehicle percentages (HGV%). No average speed traffic survey information was available, therefore, posted speed limits have been utilised in the model. Areas of congestion, queuing and junction locations have been modelled at reduced speeds of 5 to 20 km/h.

The study network includes committed development traffic flows from P/2021/0436 (original application reference) currently subject to a pending appeal (P/2021/0436). P/2021/0436 is an 'Outline application for construction of up to 600 dwellings, with social landscaping, public open space and on-site establishment, with all matters retained except for north site access'.

Following review of aerial imagery and Street View© of the study area, it was concluded that additional modelling for street canyons and gradients above 2.5% [1] were not necessary.

The traffic data used in the assessment is detailed in **Table E1** and presented in **Appendix A**.

Table E1: Traffic Data used in the Assessment

Link Number	Road	2022 Base Year/Verification		2026 Base Year		2026 With Development	
		AADT	HDV%	AADT	HDV%	AADT	HDV%
1	Holt Road (South of Hullah)	12,656	1.04%	12,493	0.76%	13,835	0.87%
2	Holt Road (Hullah - Cefn (at Hullah))	10,383	1.21%	10,316	1.06%	11,623	1.02%
3	Holt Road (Hullah - Cefn (at Cefn))	10,518	1.17%	10,523	1.04%	11,724	1.03%
4	Holt Road (A534 (at Cefn))	13,745	1.28%	13,324	1.35%	15,614	1.17%
5	Holt Road West (Cefn - A534 (at A5156))	12,914	1.33%	12,740	1.41%	15,204	1.24%
6	A534 (East of A5156)	26,940	1.63%	29,454	1.61%	31,547	1.53%
7	Cefn Road (Holt - Hullah (at Holt))	10,523	0.46%	10,114	0.49%	13,077	0.40%
8	Cefn Road (Holt - Hullah (at Hullah))	8,183	0.59%	7,661	0.70%	10,675	0.52%
9	Cefn Road (Hullah - Access)	7,897	0.65%	7,925	0.73%	11,191	0.48%
10	Cefn Road (South of site)	7,897	0.65%	7,930	0.73%	8,576	0.63%
11	Hullah Lane (at holt Rd)	3,906	0.14%	4,052	0.14%	4,041	0.04%
12	Hullah Lane (at Cefn Rd)	1,577	0.36%	1,521	0.47%	1,409	0.20%
13	Dean Road	9,552	0.39%	9,900	0.51%	10,490	0.61%
14	Bryn Estyn Road	1,021	2.22%	1,016	2.09%	1,016	1.95%
15	A5156 North of Site Access	26,362	1.26%	28,292	1.32%	29,810	1.23%
16	A5156 (West of Borras)	28,376	0.95%	30,487	0.95%	32,642	0.88%
17	Borras Road	1,442	6.09%	1,482	5.92%	1,510	6.00%
18	Borras Park Road	6,460	0.42%	7,044	0.52%	6,909	0.39%
19	Roundabout Circling for A5156, Borras Park Road and Borras Road roundabout	15,660	1.14%	16,826	1.17%	17,718	1.09%

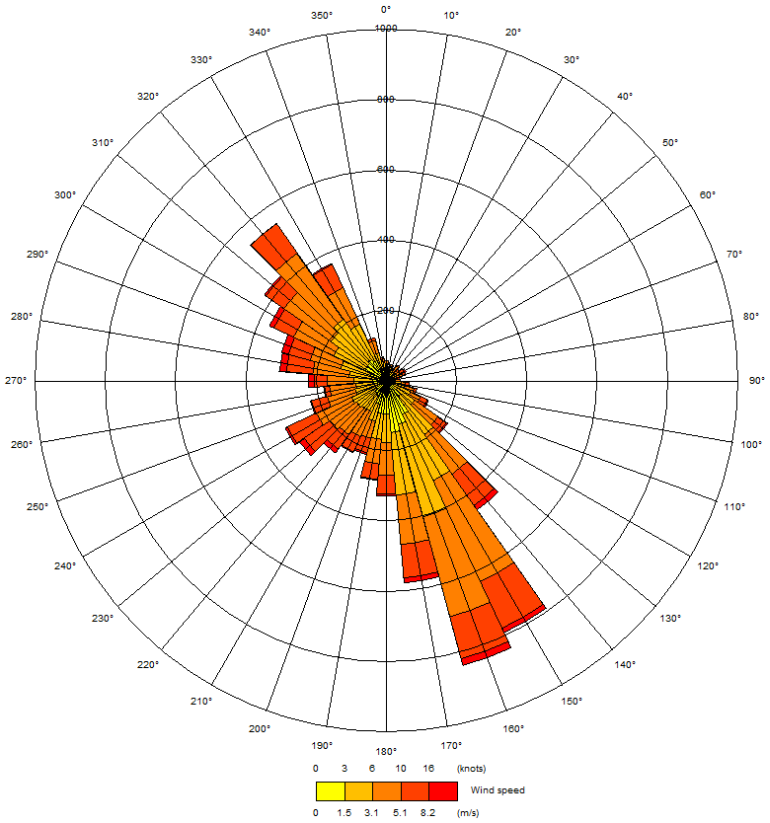
Meteorological Data

The air quality assessment includes the use of the 2022 Hawarden meteorological recording station.

The Hawarden recording station is located approximately 13.8 km to the north of the proposed development site and is considered to be the most representative of the site conditions in terms of altitude and distance.

The 2022 wind rose for the Hawarden recording station is provided in **Figure E1**.

Figure E1: Wind Rose



Dispersion and Meteorological Site Characteristics

The air dispersion characteristics for the site and meteorological recording station differ, therefore, these have been adjusted accordingly within ADMS-Roads. **Table E2** details the adjustments made.

Table E2: Dispersion and Meteorological Site Characteristics

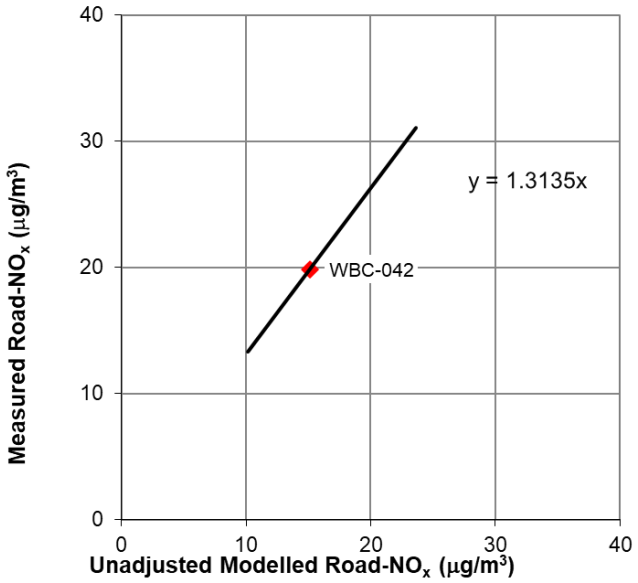
Parameter	Dispersion Site	Meteorological Site
Surface Roughness	0.5 m	0.5 m
Surface Albedo	0.23	0.23
Minimum Monin-Obukhov Length	30 m	30 m
Priestley-Taylor Parameter	1	1

Model Verification

Model verification has been completed for NO_2. There are no representative PM_{10} or $PM_{2.5}$ air quality monitors available for model verification. The verification procedure for the selected air quality monitor of this assessment is detailed in **Table E3.** The air quality monitor position can be seen on the drawing in **Appendix A.**

Table E4: NO_2 Model Verification Procedure

Monitor	2022 Monitored Total NO_2	Monitored Road NO_x	2022 Background NO_2	2022 Background NO_x	Monitored Road Contribution NO_2 (total – background)	Modelled Road Contribution NO_x (excludes	Ratio of Monitored Road Contribution NO_x / Modelled Road	Adjustment Factor	Adjusted Road Contribution NO_x	Adjusted Modelled Total Nox (including background NO_x)	Modelled Total NO_2 (based on empirical NO_x / NO_2	% Difference [(modelled – monitored) / monitored] x 100
WBC-042	18.30	19.88	7.59	9.72	10.71	15.13	1.3135	1.3135	19.88	29.60	18.30	0.00



Glossary of Terms

AADT Annual Average Daily Traffic flow

Air Quality Standard Pollutant standards relate to ambient pollutant concentrations in air, set on the basis of medical and scientific evidence of how each pollutant affects human health and the environment

Air Quality Objective Pollutant Objectives incorporate future dates by which a standard is to be achieved, taking into account economic considerations, practicability and technical feasibility

Annual Mean A mean pollutant concentration value in air which is calculated on a yearly basis, yielding one annual mean per calendar year. In the UK air quality regulations, the annual mean for a particular substance at a particular location for a particular calendar year is:

(a) in the case of lead, the mean of the daily levels for that year;

(b) in the case of nitrogen dioxide, the mean of the hourly means for that year;

(c) in the case of PM_{10}, the mean of the 24-hour means for that year.

Annoyance (Dust) Loss of amenity due to dust deposition or visible dust plumes, often related to people making complaints, but not necessarily sufficient to be a legal nuisance.

AQAP Air Quality Action Plan

AQMA Air Quality Management Area

AQMP Air Quality Management Plan

AQO Air Quality Objective

AQS Air Quality Strategy for England, Scotland, Wales and Northern Ireland

Background Concentrations The term used to describe pollutant concentrations which exist in the ambient atmosphere, excluding local pollution sources such as roads and stacks

Construction Any activity involved with the provision of a new structure (or structures), its modification or refurbishment. A structure will include a residential dwelling, office building, retail outlet, road, etc.

Construction Impact Assessment An assessment of the impacts of demolition, earthworks, construction and trackout. In this Guidance, specifically the air quality impacts.

Defra Department for Environment, Food and Rural Affairs

Demolition Any activity involved with the removal of an existing structure (or structures). This may also be referred to as de-construction, specifically when a building is to be removed a small part at a time.

Deposited Dust that is no longer in the air and which has settled onto a surface. Deposited dust is also sometimes called amenity dust or nuisance dust, with the term nuisance applied in the general sense rather than the specific legal definition.

DMP Dust Management Plan; a document that describes the site-specific methods to be used to control dust emissions.

Dust Solid particles that are suspended in air, or have settled out onto a surface after having been suspended in air. The terms dust and particulate matter (PM) are often used interchangeably, although in some contexts one term tends to be used in preference to the other. In this guidance the term 'dust' has been used to include the particles that give rise to soiling, and to other human health and ecological effects. Note: this is different to the definition given in BS 6069, where dust refers to particles up to 75 µm in diameter.

Earthworks Covers the processes of soil-stripping, ground-levelling, excavation and landscaping.

Effects The consequences of the changes in airborne concentration and/or dust deposition for a receptor. These might manifest as annoyance due to soiling, increased morbidity or morality due to exposure to PM_{10} or $PM_{2.5}$ or plant dieback due to reduced photosynthesis. The term 'significant effect' has a specific meaning in EIA regulations. The opposite is an insignificant effect. In the context of construction impacts any effect will usually be adverse, however, professional judgement is required to determine whether this adverse effect is significant based in the evidence presented.

EPUK Environmental Protection UK

HDV Heavy Duty Vehicle

Impacts The changes in airborne concentrations and/or dust deposition. A scheme can have an 'impact' on airborne dust without having any 'effects', for instance if there are no receptors to experience the impact.

LAQM Local Air Quality Management

LDV Light Duty Vehicle

$\mu g/m^3$ Microgrammes (of pollutant) per cubic metre of air. A measure of concentration in terms of mass per unit volume. A concentration of 1 $\mu g/m^3$ means that one cubic metre of air contains one microgramme (millionth of a gramme) of pollutant

NO_2 Nitrogen Dioxide

NOx A collective term used to represent the mixture of nitrogen oxides in the atmosphere, as nitric oxide (NO) and nitrogen dioxide (NO_2)

Nuisance The term nuisance dust is often used in a general sense when describing amenity dust. However, this term also has specific meanings in environmental law:

Statutory nuisance, as defined in S79(1) of the Environmental Protection Act 1990 (as amended from time to time).

Private nuisance, arising from substantial interference with a person's enjoyment and us of his land.

Public nuisance, arising from and act or omission that obstructs, damages or inconveniences the right of the community.

Each of these applying in so far as the nuisance relates to the unacceptable effects of emissions. It is recognised that a significant loss of amenity may occur at lower levels of emission than would constitute a statutory nuisance.

Note: as nuisance has a specific meaning in environmental law, and to avoid confusion, it is recommended that the term is not used in a more general sense.

$PM_{2.5}$ The fraction of particles with a mean aerodynamic diameter equal to, or less than, 2.5 μm. More strictly, particulate matter which passes through a size selective inlet as defined in the reference method for the sampling and measurement of $PM_{2.5}$, EN 14907, with a 50% efficiency cut-off at 2.5 μm aerodynamic diameter

PM_{10} The fraction of particles with a mean aerodynamic diameter equal to, or less than, 10 μm. More strictly, particulate matter which passes through a size selective inlet as defined in the reference method for the sampling and measurement of PM_{10}, EN 12341, with a 50% efficiency cut-off at 10 μm aerodynamic diameter

Running Annual Mean A mean pollutant concentration value in air which is calculated on an hourly basis, yielding one running annual mean per hour. The running annual mean for a particular substance at a particular location for a particular hour is the mean of the hourly levels for that substance at that location for that hour and the preceding 8759 hours

Trackout The transport of dust and dirt from the construction/demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when heavy duty vehicles (HDVs) leave the construction/demolition site with dusty materials, which may then spill onto the road, and/or when HDVs transfer dust and dirt onto the road having travelled over muddy ground on site.


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