



AIR QUALITY ASSESSMENT

FOR

CHAPEL LANE, WIDNES

AQ77862

29/07/2022

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TABLE OF CONTENTS

EXECUTIVE SUMMARY	4
1.0 INTRODUCTION	5
1.1 Background	5
1.2 Site Location and Context	5
1.3 Limitations	5
2.0 LEGISLATION, GUIDANCE AND POLICY	6
2.1 UK Legislation and Guidance	6
2.2 Local Planning Policy	7
3.0 METHODOLOGY	8
3.1 Construction Phase Assessment	8
3.2 Operational Phase Assessment	8
4.0 BASELINE	11
4.1 Local Air Quality Management	11
4.2 Air Quality Monitoring	11
4.3 Background Pollutant Concentrations	12
4.4 Sensitive Receptors	13
5.0 ASSESSMENT	16
5.1 Construction Phase Assessment	16
5.2 Operational Phase Assessment	21
6.0 CONCLUSION	24
7.0 ABBREVIATIONS	25
APPENDIX A - FIGURES	26
APPENDIX B – ASSESSMENT INPUTS	36
APPENDIX C – OPERATIONAL IMPACT ASSESSMENT RESULTS	48
APPENDIX D – SENSITIVITY ANALYSIS RESULTS	57
APPENDIX E – CONSTRUCTION PHASE ASSESSMENT CRITERIA	66
APPENDIX F – ASSESSOR CURRICULUM VITAE	72

EXECUTIVE SUMMARY

Ensafe Consultants were commissioned by Taylor Wimpey Strategic Land to undertake an Air Quality Assessment in support of a proposed residential development at Chapel Lane, Widnes.

The proposal comprises the development of up to 432 residential units alongside associated infrastructure and parking.

Due to the scale of the development, there is potential for the proposals to cause impacts at sensitive receptors during the construction and operational phases. Additionally, given the proximity to Chapel Lane and Queensbury Way there is potential to expose future site users to elevated pollutant concentrations. An Air Quality Assessment is therefore required in order to determine baseline conditions at the site, assess site suitability for the proposed end-use and assess the potential impacts as a result of the proposed development.

Potential construction phase air quality impacts from fugitive dust emissions were assessed as a result of demolition, earthworks, construction and trackout activities. It is considered that the use of good practice control measures would provide suitable mitigation for a development of this size and nature and reduce potential impacts to an acceptable level.

Dispersion modelling was undertaken in order to predict annual mean pollutant concentrations across the application site and to predict impacts as a result of additional road vehicle exhaust emissions associated with the proposed development. Results were subsequently verified using local monitoring results provided by Halton Borough Council (HBC).

The dispersion modelling results indicated that annual mean pollutant concentrations across the application site were below the relevant air quality objectives at proposed sensitive locations. The site is therefore considered suitable for proposed end use without the implementation of protective mitigation techniques.

Additionally, the assessment concluded that impacts on pollutant levels as a result of operational phase pollutant emissions were predicted to be **not significant** at all sensitive locations in the vicinity of the site, as a result of **negligible** at discrete sensitive receptor locations. The use of robust assumptions, where necessary, was considered to provide sufficient results confidence for an assessment of this nature.

Based on the assessment results the site is considered suitable for the proposed end use and complies with the Halton Borough Council Local Plan and National Planning Policy Framework.

1.0 INTRODUCTION

1.1 Background

Ensafe Consultants has been commissioned by Taylor Wimpey Strategic Land, hereafter referred to as “the Client” to undertake an Air Quality Assessment in support of a proposed development, comprising of the development of up to 432 residential units, herein after referred to as the “Proposed Development”.

1.2 Site Location and Context

The application site is located Chapel Lane, Widnes at approximate National Grid Reference (NGR) 350040, 387770. Reference should be made to Figure 1 within Appendix A for a location plan.

Due to the scale of the Proposed Development, there is potential to cause impacts upon existing NO₂ and particulate matter (PM₁₀ and PM_{2.5}) concentrations as a result of additional road vehicle exhaust emission generated during operation. Fugitive dust impacts may also arise as a result of emission generated during construction.

An Air Quality Assessment has therefore been produced to assess potential impacts as a result of the Proposed Development and to quantify annual mean NO₂, PM₁₀ and PM_{2.5} concentrations across the site in order to consider suitability for the proposed end-use. The assessment will be undertaken in accordance with the requirements of the National Planning Policy Framework (NPPF) and the Halton Borough Council (HBC) Local Planning Policy.

1.3 Limitations

This report has been produced in accordance with Ensaf Consultants standard terms of engagement. Ensaf Consultants has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from Ensaf Consultants; a charge may be levied against such approval.

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2.0 LEGISLATION, GUIDANCE AND POLICY

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

- European Union (EU) Directive 2008/50/EC;
- The NPPF, updated on 20th July 2021;
- The National Planning Practice Guidance (NPPG), relevant chapters produced on 1st November 2019;
- Section 82 of the Environment Act (Part IV), updated 9th November 2021;
- The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Department for Environment, Food and Rural Affairs (DEFRA), 2007¹;
- The Air Quality Standards (Amendment) Regulations (2016);
- Local Air Quality Management Technical Guidance 2016 LAQM.TG(16), DEFRA, April 2021²;
- Guidance on the Assessment of Dust from Demolition and Construction, Institute of Air Quality Management (IAQM), v1.1, June 2016³;
- Land-Use Planning and Development Control: Planning for Air Quality, Environmental Protection UK (EPUK) and IAQM, January 2017⁴; and
- Halton Delivery and Allocations Local Plan, HBC, March 2022⁵

2.1 UK Legislation and Guidance

The Air Quality Standards (Amendment) Regulations (2016) came into force on 31st December 2016. These Regulations amend the Air Quality Standards Regulations 2010 and transpose the EU Directive 2008/50/EC into UK law. Air Quality Limit Values (AQLVs) were published in these regulations for 7 pollutants, as well as Target Values for an additional 6 pollutants.

Part IV of the Environment Act (2021) requires UK government to produce a national Air Quality Strategy (AQS) which contains standards, objectives and measures for improving ambient air quality. The most recent AQS was produced by DEFRA and published in July 2007¹. The AQS sets out Air Quality Objectives (AQOs) that are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedances over a specified timescale. These are generally in line with the AQLVs, although the requirements for compliance vary slightly.

Table 1 presents the AQOs for pollutants considered within this assessment.

Table 1: Air Quality Objectives

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

Table 2 summarises the advice provided in DEFRA guidance LAQM.TG(16)² on where the AQOs for pollutants considered within this report apply.

1 The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, DEFRA, 2007

2 Local Air Quality Management Technical Guidance 2016 LAQM.TG(16), DEFRA, 2021

3 Guidance on the Assessment of Dust from Demolition and Construction, Institute of Air Quality Management, 2016

4 Land-Use Planning and Development Control: Planning for Air Quality, EPUK and IAQM, 2017

5 Halton Delivery and Allocations Local Plan, HBC, 2022

Table 2: Examples of Where the Air Quality Objectives Apply

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

The results of the dispersion modelling assessment will also be compared against the relevant AQOs detailed in Table 1 to determine significance.

2.2 Local Planning Policy

HBC Local Plan⁵ is the main document used for determining planning applications. The Local Plan was adopted in 2022 and sets out the spatial vision, objectives, development strategy and a series of key policies that will guide development within the borough until 2037.

- **Policy CS23: Managing Pollution and Risk**
- **Policy HE7: Pollution and Nuisance**

Reference has been made to these policies during the undertaking of this Air Quality Assessment by assessing the impacts of road vehicle exhaust emissions on future site users and on nearby existing sensitive locations.

3.0 METHODOLOGY

There is the potential for the Proposed Development to expose future site users to elevated NO₂, PM₁₀ and PM_{2.5} concentrations, as well as to cause impacts at sensitive locations during the construction and operational phases.

This has been assessed in accordance with the following methodology, as agreed with the Lead Environmental Health Officer at HBC on 31/05/2022.

3.1 Construction Phase Assessment

There is the potential for fugitive dust emissions to occur as a result of construction phase activities. These have been assessed in accordance with the methodology outlined within the IAQM document 'Guidance on the Assessment of Dust from Demolition and Construction'³.

Reference should be made to Appendix E for details of the relevant IAQM construction phase assessment criteria, which were utilised in conjunction with site specific information.

Activities on the proposed construction site have been divided into four types to reflect their different potential impacts. These are:

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

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

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

A desk top survey will be undertaken to identify human and ecological receptors within the relevant assessment buffers specified by the IAQM guidance³. Should sensitive receptors not be present within the relevant distances then negligible impacts would be expected and further assessment is not necessary.

Following the identification of sensitive receptors, a site is then allocated a risk category which is assigned to each activity, based on the scale and nature of the works, as well as the sensitivity of the area to dust impacts.

The assigned magnitude and sensitivity will then determine the overall risk and appropriate mitigation measures to be employed during construction phase activities.

The IAQM guidance³ is provided in Appendix E, with the details of the assessor's qualifications and experience. provided in Appendix F.

3.2 Operational Phase Assessment

3.2.1 Road Vehicle Exhaust Impact Assessment

The Proposed Development has potential to cause impacts upon existing pollution levels at nearby sensitive receptors as a result of additional road vehicle exhaust emissions (NO₂, PM₁₀ and PM_{2.5}) generated during the operational phase.

Impacts have been defined by predicting pollutant concentrations at sensitive locations with and without the Proposed Development in place using dispersion modelling and the following assessment scenarios:

- 2019 as baseline year for verification against latest ratified data;
- Opening year do-minimum (DM) (predicted traffic flows in 2024 should the proposals not proceed); and
- Opening year do-something (DS) (predicted traffic flows in 2024 should the proposals be completed, with the addition of traffic generated by the Proposed Development).

In light of expected emission improvements to the national vehicle fleet guided by government policy, it would be unrealistic not to assume a reduction to vehicle emission factors in future years, given the anticipated development year of 2024.

The 2024 scenario assumes an emission drop off based on assumptions provided by the Emission Factor Tool Kit (Eft v11.0) supported by the uptake of low emission vehicles and government incentives and targets concerning fleet proportions by 2030. The results of this scenario will form the basis of this report.

Sensitivity analysis has also been undertaken to assess associated road vehicle exhaust emissions impacts based on the use of 2024 traffic data with 2019 and emission factors obtained from the Eft v11.0 produced by DEFRA.

The sensitivity analysis assumes that vehicle emission factors will not improve in line with current predictions and future emission factors will remain consistent with those predicted for the baseline year of 2019. This has been undertaken to consider a worst-case scenario and does not form the basis of impact significance.

Reference should be made to Appendix B for full assessment input details, Appendix C for details of the full assessment results and Appendix D for sensitivity analysis.

3.2.2 EPUK and IAQM Impact Significant Criteria

Receptors potentially sensitive to changes in pollutant concentrations were identified within the assessment extents. LAQM.TG(16)² provides the following examples of where annual mean AQOs should apply:

- Residential properties;
- Schools;
- Hospitals; and
- Care homes.

The sensitivity impact significance of each receptor was defined in accordance with the criteria shown in Table 3. These are based upon the guidance provided within the EPUK and IAQM guidance⁴.

Table 3: EPUK and IAQM Assessment Significance Criteria

Long Term Average Concentration	% Change in Concentration Relative to AQO			
	1	2-5	6-10	>10
75% or less of AQO	Negligible	Negligible	Slight	Moderate
76 - 94% of AQO	Negligible	Slight	Moderate	Moderate
95 - 102% of AQO	Slight	Moderate	Moderate	Substantial
103 - 109% of AQO	Moderate	Moderate	Substantial	Substantial

The criteria shown in Table 3 is adapted from the EPUK and IAQM guidance⁴ with sensitivity descriptors included to allow comparisons of various air quality impacts. It should be noted that changes of 0%, i.e. less than 0.5%, will be described as negligible in accordance with the EPUK and IAQM guidance⁴.

Following the prediction of impacts at discrete receptor locations utilising the criteria in Table 3 the EPUK and IAQM guidance⁴ states that this framework is to be used as a starting point to make a judgement on significance of effect but other influences might need to be accounted for. Whilst impacts might be determined as 'slight', 'moderate' or 'substantial' at individual receptors, overall effect might not necessarily be deemed as significant in some circumstances. The following factors may provide some assistance in determining the overall significance of a development:

- Number of properties affected by significant air quality impacts and a judgement on the overall balance;
- Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective will be relevant;
- The percentage change in concentration relative to the objective and the descriptions of the impacts at the receptors;
- Whether or not an exceedance of an objective is predicted to arise or be removed in the study area due to a substantial increase or decrease; and
- The extent to which an objective is exceeded e.g. an annual mean NO₂ concentration of 41µg/m³ should attract less significance than an annual mean of 51µg/m³.

These factors were considered and an overall significance determined for the impact of operational phase road traffic emissions. It should be noted that the determination of significance relies on professional judgement and reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts.

Full details of data used for the modelling assessment are presented in Appendix B of this report.

3.2.3 Future Exposure

The Proposed Development is located within close proximity to Chapel Lane and Queensberry Way. Subsequently, the proposals have potential to introduce new receptors into an area of elevated NO₂, PM₁₀ and PM_{2.5} concentrations.

Detailed dispersion modelling was therefore undertaken to quantify annual mean pollutant concentrations across the site and determine suitability for the proposed use. The following modelling scenarios were utilised during the future exposure assessment:

- Opening year do-something (DS) (predicted traffic flows in 2024 should the proposals be completed, with the addition of traffic generated by the Proposed Development)

The results of the dispersion modelling assessment will also be compared against the relevant AQOs detailed in Table 1 to determine significance. Full details of data used for the modelling assessment are presented in Appendix B of this report.

4.0 BASELINE

Existing air quality conditions in the vicinity of the application site were identified in order to provide a baseline for assessment. These are detailed in the following sections.

4.1 Local Air Quality Management

As required by the Environment Act (2021), HBC has undertaken review and assessment of air quality within their area of administration. This process has indicated that annual mean concentrations of NO₂ are above the AQO within their administration. As such, 2 AQMAs have been declared, the closest being described as:

- Halton AQMA No 1 - Deacon Road from the junction at Sayce Street, Albert Road from the Bradley public house to 150 Albert Road, Robert Street, Peelhouse Lane from the junction with Albert Road to the junction with Belvoir Road.

The application site is located 2.4km north west of the AQMA. As such there is potential for the Proposed Development to introduce future site users into an area of elevated annual mean NO₂ concentrations, and to cause air quality impacts within this sensitive area during the construction and operational phases. This has been considered within this report.

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

4.2 Air Quality Monitoring

Monitoring of pollutant concentrations is undertaken by HBC using continuous and passive methods throughout their areas of administration. A review of HBC's most recent Air Quality Monitoring Data⁶ indicated that there are currently 2 automatic analysers operated by HBC within the vicinity of the Proposed Development. Recent monitoring results from this location are shown in Table 4.

Table 4: Automatic Monitoring Results

ID	Site Name	Type	NGR (m)		Distance to Site (m)	Pollutant	Annual Mean Concentration (µg/m ³)		
			X	Y			2017	2018	2019
HBC 2	Marzahn Way	Kerbside	352042	386285	2,529	NO ₂	35.0	29.0	27.0
						PM ₁₀	28.0	22.0	22.0
HBC 1	Milton Road	Kerbside	351358	385621	2,537	NO ₂	-	-	34.0
						PM ₁₀	21.0	23.0	18.0

As indicated in Table 4, there were no exceedances of annual mean AQOs for NO₂, or PM₁₀ at the monitoring locations in recent years.

HBC also monitor NO₂ concentrations across the borough using passive diffusion tubes. A review of the most recent air quality monitoring data indicated 7 diffusion tubes located within the vicinity of the application site, presented in Table 5.

Table 5: Diffusion Tube Monitoring Results

ID	Site Name	Type	NGR (m)		Dist' to Site (m)	Annual Mean Concentration ($\mu\text{g}/\text{m}^3$)		
			X	Y		2017	2018	2019
9	Peel House Lane	Roadside	352078	386306	2,547	33.0	31.0	30.0
10	Peel House Lane	Kerbside	352044	386290	2,528	38.0	41.0	37.5
12	Deacon Road	Roadside	351726	386125	2,385	34.0	30.0	27.9
13	Deacon Road	Roadside	351748	386112	2,410	32.0	30.0	27.2
15	Deacon Road	Roadside	351767	386088	2,441	-	-	28.1

As indicated in Table 5, there were no exceedances of annual mean AQOs for NO_2 , or PM_{10} at the monitoring locations in recent years.

Reference should be made to Figure 2 within Appendix A for a graphical representation of the monitoring locations.

4.3 Background Pollutant Concentrations

The total concentration of a pollutant is comprised of explicit local emission sources (such as roads and industrial sources) and the background component. The background component consists of indeterminate sources which are transported into an area from further away by meteorological conditions. Background pollutant concentrations are therefore the ambient level of pollution that is not affected by local sources of pollution.

In reality, it is not usually practical to obtain a true representation of background levels in urban areas due to corruption by local sources; background levels used in assessments may contain a mixture of both sources.

Predictions of background pollutant concentrations on a 1km by 1km grid basis have been produced by DEFRA for the entire of the UK to assist LAs in their Review and Assessment of air quality. The Proposed Development site is located across two grid square:

- NGR: 349500, 387500; and
- NGR: 350500, 387500

Data for this location was downloaded from the DEFRA website⁷. For the purpose of this assessment, an average concentration was taken for the background concentrations and are summarised in Table 6 for the verification year (2019) and the predicted development opening year (2024).

Table 6: Predicted Background Pollutant Concentrations

Pollutant	Predicted Background Concentration ($\mu\text{g}/\text{m}^3$)	
	2019	2024
NO_x	17.46	14.38
NO_2	12.96	10.85
PM_{10}	12.32	11.64
$\text{PM}_{2.5}$	8.27	7.75

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

As indicated in Table 6, background pollutant concentrations of NO₂, PM₁₀ and PM_{2.5} are below the relevant AQOs detailed in Table 1.

4.4 Sensitive Receptors

A sensitive receptor is defined as any location which may be affected by changes in air quality as a result of a development. These have been defined for construction dust impacts in the following Sections.

4.4.1 Construction Phase Sensitive Receptors

There are no nationally or European designated ecological receptors within 50m of the Site boundary, or within 50m from a route used by construction vehicles on the public highway (up to 500m from the Site entrance). Therefore, the risk of dust effects at a nationally or European designated ecological receptor site from construction impacts have not been considered further in this assessment.

Human receptors sensitive to potential dust impacts during, demolition, earthworks and construction were identified from a desk-top study of the area up to 350m from the Proposed Development boundary. These are summarised in Table 7.

Table 7: Demolition, Earthworks and Construction Dust Sensitive Receptors

Distance from Site Boundary (m)	Approximate Number of Human Receptors
Less than 20	10 - 100
20 – 50	More than 100
50 – 100	More than 100
100 – 350	More than 100

Reference should be made to Figure 3 within Appendix A for a graphical representation of demolition, earthworks, and construction dust buffer zones.

Receptors sensitive to potential dust impacts from trackout were identified from a desk-top study of the area up to 50m from the road network within 500m of the site access route. These are summarised in Table 8. The exact construction vehicle access routes were not available for the purpose of this assessment as they will depend on sourcing of materials. This is likely to be decided by the contractor. However, it was assumed that construction traffic would egress the Proposed Development via Chapel Lane, to ensure a worst case trackout assessment is undertaken.

Table 8: Trackout Dust Sensitive Receptors

Distance from Trackout Routes (m)	Approximate Number of Human Receptors
Less than 20	More than 100
20 – 50	More than 100

Reference should be made to Figure 4 within Appendix A for a graphical representation of trackout dust buffer zones.

A number of additional factors have been considered when determining the sensitivity of the surrounding area. These are summarised in Table 9.

Table 9: Additional Area Sensitivity Factors

Guidance	Comment
Whether there is any history of dust generating activities in the area	The site is located in a residential area. There is likely to have been a history of dust generating activities due to commuting and redevelopment processes in the locality.
The likelihood of concurrent dust generating activity on nearby sites.	A review of the HBC planning portal indicated that there are no large-scale planning applications within the vicinity of the site.
Pre-existing screening between the source and the receptors	There is no dense vegetation present along the development boundaries. Hence, there is no level of natural protective screening in any directions.
Conclusions drawn from analysing local meteorological data which accurately represent the area: and if relevant the season during which works will take place	The wind direction is predominantly from the south and west of the development. As such, properties to the north and east of the site would be most affected by dust emissions
Conclusions drawn from local topography	The topography of the area appears to be predominantly flat. As such, there are no constraints to dust dispersion.
Duration of the potential impact, as a receptor may become more sensitive over time	Currently the duration of the construction phase is unknown.
Any known specific receptor sensitivities which go beyond the classifications given in the document.	No specific receptor sensitivities identified during the baseline.

4.4.2 Operational Phase Sensitive Receptors

A desk-top study was undertaken in order to identify any sensitive receptor locations in the vicinity of the site that require specific consideration during the assessment and are summarised Table 10.

Table 10: Existing Sensitive Human Receptors

Potential Impact		NGR (m)		Height (m)
		X	Y	
R1	5 Chapel Lane	349407.5	388249.7	1.5
R2	2 Chapel Lane	349390.0	388227.9	1.5
R3	91 Chapel Lane	349496.4	387840.3	1.5
R4	6 Chapel Lane	349523.2	387757.6	1.5
R5	26 Chapel Lane	349718.9	387577.6	1.5
R6	1 Ash Priors	349677.5	387360.5	1.5
R7	74 Prescott Road	349672.2	387156.9	1.5
R8	44 Poleacre Drive	349663.5	386971.3	1.5
R9	413 Cronton Road	349346.1	388254.5	1.5
R10	377 Cronton Road	349236.6	388222.3	1.5
R11	433-435 Cronton Road	349502.8	388317.4	1.5

Potential Impact		NGR (m)		Height (m)
		X	Y	
R12	432 Cronton Road	349421.4	388270.9	1.5
R13	1 Hall Lane	349738.4	388365.4	1.5
R14	Cronton Sixth Form College	350378.3	388322.9	1.5
R15	87 Cronton Lane	350557.2	388379.3	1.5
R16	25 Cronton Road	350897.8	388379.8	1.5
R17	14 Cronton Road	350878.7	388356.1	1.5
R18	166 Lunts Heath Road	351131.1	388388.7	1.5
R19	267 Lunts Heath Road	351235.5	388391.7	1.5
R20	46 Lunts Heath Road	351884.9	388308.8	1.5
R21	5 Prescott Road	349789.3	386343.7	1.5
R22	2 Prescot Road	349812.6	386354.0	1.5
R23	8 Hale Road	349754.4	386162.0	1.5
R24	3 Hale Road	349769.9	386122.7	1.5
R25	17 Liverpool Road	350046.3	386342.1	1.5
R26	147 Liverpool Road	350189.6	386314.3	1.5
R27	108 Liverpool Road	350381.7	386292.9	1.5
R28	49 Three Crowns Close	350510.4	386225.1	1.5
R29	110 Leigh Avenue	351050.8	386238.8	1.5
R30	101 Leigh Avenue	351049.5	386204.3	1.5
R31	St Bede's Catholic Infant School	351430.6	386193.0	1.5
R32	27 Leigh Avenue	351495.5	386160.7	1.5
R33	26 Deacon Road	351749.6	386089.1	1.5
R34	13 Deacon Road	351713.8	386130.9	1.5

Receptors modelled at 1.5m to represent the average UK “breathing height” above ground level. Reference should be made to Figure 6 within Appendix A for a graphical representation of operational phase emission sensitive human receptor locations.

5.0 ASSESSMENT

5.1 Construction Phase Assessment

5.1.1 Step 1 – Screening

The desk-study detailed in Section 4.4.1 identified a number of receptors with a high classification of sensitivity within 350m of the site boundary, and within 50m of the anticipated trackout routes. As such, a detailed assessment of potential dust impacts was required, and summarised in the below sections.

5.1.2 Step 2A – Magnitude

The scale and nature of the works was determined to assess the magnitude of dust arising from each construction phase activity. The determination of magnitude was based upon the criteria detailed in Appendix E, with the outcome of Step 2A is summarised below in Table 11.

Demolition

Demolition will involve the removal of existing onsite buildings. The volume of buildings to be demolished is therefore likely to be less than 20,000m³. With this considered the magnitude of potential dust emissions related to demolition activities is considered small.

Earthworks

The Proposed Development site is estimated to cover an area of greater than 200,000m². The magnitude of potential dust emissions related to earthwork activities is therefore considered large.

Construction

The proposals comprise the construction of up to 432 residential units. Given the scale of the Proposed Development the total building and infrastructure volume is greater than 100,000m³. The magnitude of potential dust emissions related to construction activities is therefore considered large.

Trackout

Information on the number of HDV trips to be generated during the construction phase of the Proposed Development was not available at the time of assessment. Similarly, the surface material and unpaved road length was not known at this stage of the project. Based on the site area, it is anticipated that the unpaved road length is likely to be greater than 100m. The magnitude of potential dust emissions from trackout is therefore considered large.

Table 11: Dust Emission Magnitude

Magnitude of Activities			
Demolition	Earthworks	Construction	Trackout
Small	Large	Large	Large

5.1.3 Step 2B – Sensitivity

The next step (Step 2B) is to determine the sensitivity of the surrounding area, based on general principles such as amenity and aesthetics, as well as human exposure sensitivity.

Dust Soiling

As shown in Section 4.4.1, the desk top study indicated are approximately more than 100 sensitive receptors within 350m of the Proposed Development boundary and more than 100 within 50m of the anticipated trackout routes.

Based on the assessment criteria detailed in Appendix E, the sensitivity of the receiving environment to potential dust soiling impacts was considered to be high for all construction phase activities. This is because the site is situated in a predominantly residential area and the people or property would reasonably be expected to be present here for extended periods of time.

Human Health

The annual mean concentration of PM₁₀ is 12.50µg/m³ as detailed in Section 4. Based on the receptor counts provided above, the area is considered to be of low sensitivity for all construction phase activities.

The sensitivity of the receiving environment to specific potential dust impacts, based on the criteria detailed in Appendix E is summarised in Table 12.

Table 12: Sensitivity of the Surrounding Area

Potential Impact	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High	High	High	High
Human Health	Low	Low	Low	Medium

5.1.4 Step 2C – Risk

Both the magnitude and sensitivity factors are combined in Step 2C to determine the risk of dust impacts without the application of best practice mitigation measures.

It should be noted that the potential for impacts depends significantly on the distance between the dust generating activity and receptor location. Risk was predicted based on a worst-case scenario of works being undertaken at the site boundary closest to each sensitive area. Therefore, actual risk is likely to be lower than that predicted during the majority of the construction phase. A summary of the risk from each dust generating activity is provided in Table 13.

Table 13: Summary of Potential Unmitigated Dust Risks

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

5.1.5 Step 3 – Mitigation

The IAQM guidance³ provides a number of potential mitigation measures to reduce impacts during the construction phase. These measures have been adapted for the Proposed Development site as summarised in Table 14.

Table 14: Fugitive Dust Mitigation Measures

Issue	Control Measure
Communications	- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site. - 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. - Display the head or regional office contact information - Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority.
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. - Make the complaints log available to the local authority when asked - Record any exceptional incidents that cause dust and/or air emissions, either on- or off- site, and the action taken to resolve the situation in the log book. - Hold regular liaison meetings with other high-risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes.
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. - 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 - 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. - Agree dust deposition, dust flux, or real-time PM10 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.
Preparing & Maintaining Site	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.

Issue	Control Measure
	- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site. - Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive time period - Avoid site runoff of water or mud - Keep site fencing, barriers and scaffolding clean using wet methods. - 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. - Cover, seed or fence stockpiles to prevent wind whipping.
Operating Vehicle/Machinery & Sustainable Travel	- Ensure all vehicles switch off engines when stationary - no idling vehicles. - Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable. - Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on un-surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate) - Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials - Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)
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. - Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate. - Use enclosed chutes and conveyors and covered skips. - Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate. - 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.
Waste Management	Avoid bonfires and burning of waste materials
Demolition	- Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust). - Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where

Issue	Control Measure
	it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground. • Avoid explosive blasting, using appropriate manual or mechanical alternatives. • Bag and remove any biological debris or damp down such material before demolition
Earthworks & Construction	• Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable. • Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable • Only remove the cover in small areas during work and not all at once • Avoid scabbling (roughening of concrete surfaces) if possible • 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. • For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.
Trackout	• 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. • Avoid dry sweeping of large areas. • Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport. • Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable. • Record all inspections of haul routes and any subsequent action in a site log book. • Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowzers and regularly cleaned. • Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable). • 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. • Access gates to be located at least 10 m from receptors where possible.

5.1.6 Step 4 – Residual Impacts

Assuming the relevant mitigation measures outlined in Table 14 are implemented, the residual effect from all dust generating activities is predicted to be negligible and therefore **not significant** in accordance with the IAQM guidance³.

5.2 Operational Phase Assessment

The assessment was undertaken in accordance with the methodology detailed in Section 3.2.

5.2.1 Future Exposure

Annual mean NO₂, PM₁₀ and PM_{2.5} concentrations were predicted across the Proposed Development for the 2024 DS scenario at a height of 1.5m to represent exposure across the ground floor level, as shown in Figures 7 to 9 within Appendix A.

Background NO₂ PM₁₀ and PM_{2.5} levels are likely to be lower at elevated heights due to increased distance from emission sources, such as roads. Therefore, predicted concentrations at heights above ground floor level are considered acceptable in regards to future exposure and have not been assessed further.

Nitrogen Dioxide (NO₂)

Predicted annual mean NO₂ concentrations across the Proposed Development site during the DS scenario are summarised in Table 15.

Table 15: Modelling Results - Annual Mean NO₂ at Proposed Development

Floor Level	Predicted 2024 Annual Mean NO ₂ Concentration (µg/m ³)
Ground (1.5m)	11.3 – 19.4

The predicted concentrations shown in Table 15 indicate that there were no exceedances of the AQO across the Proposed Development. As such, it is considered that annual mean NO₂ levels at the Proposed Development site should not be viewed as a constraint to development.

Predictions of 1-hour NO₂ concentrations were not produced as part of the dispersion modelling assessment. LAQM.(TG16)² states if annual mean NO₂ concentrations are below 60µg/m³ then it is unlikely that the 1-hour AQO will be exceeded. As such, based on the results in Table 15, it is not predicted that on-site concentrations will exceed the 1-hour mean AQO for NO₂.

Based on the results of the dispersion modelling assessment, the site is considered to be suitable for residential use without the implementation of mitigation techniques to protect future site users from elevated NO₂ concentrations.

Particulate Matter (PM₁₀ & PM_{2.5})

Predicted annual mean PM₁₀ and PM_{2.5} concentrations across the Proposed Development site during the DS scenario are summarised in Table 16.

Table 16: Modelling Results - Annual Mean PM₁₀ and PM_{2.5} at Proposed Development

Floor Level	Predicted 2024 Annual Mean Concentration (µg/m ³)	
	PM ₁₀	PM _{2.5}
Ground (1.5m)	11.8 – 13.5	8.5 – 8.9

The predicted concentrations shown in Table 16 indicate that there were no exceedances of the annual mean AQOs for PM₁₀ or PM_{2.5} throughout the modelling area. As such, it is considered that annual mean PM₁₀ or PM_{2.5} levels at the Proposed Development site should not be viewed as a constraint to development.

Based on the results of the dispersion modelling assessment, the site is considered to be suitable for proposed end use without the implementation of mitigation techniques to protect future site users from elevated PM₁₀ and PM_{2.5} concentrations.

5.2.2 Impact Assessment - Predicted Concentrations at Existing Sensitive Use

Based on data from the appointed traffic consultant, Vectos, it is expected that there will be 2,770 Annual Average Daily Traffic (AADT) trips generated by the Proposed Development. Based on the anticipated AADT trip generation a dispersion modelling assessment was undertaken in order to quantify potential changes in pollutant concentrations at sensitive locations in the vicinity of the site.

Predicted impacts on annual mean NO₂, PM₁₀ and PM_{2.5} concentrations as a result of operational phase exhaust emissions were predicted to be **negligible** at 34 sensitive receptor locations within the vicinity of the site.

The overall significance of potential impacts was determined to be **not significant** in accordance with the EPUK and IAQM guidance. The use of robust assumptions, in the form of worse-case road vehicle emission factors, was considered to provide sufficient results confidence for an assessment of this nature.

Full assessment results and commentary can be found in Appendix C, further discussion on the overall impact significance is provided in Table 17.

It should be noted that predicted impacts on annual mean NO₂, PM₁₀ and PM_{2.5} concentrations using 2019 emission factors were also predicted to be **negligible** at 34 sensitive receptor locations within the vicinity of the site. Full assessment results on the sensitivity analysis can be found in Appendix D.

5.2.3 Impact Significance

The overall significance of operational phase road traffic emission impacts for 2024 was determined as not significant. This was based on the predicted impacts at discrete receptor locations and the considerations outlined in Section 5.2. Further justifications are provided in Table 17.

Table 17: Overall Road Emissions Impact Significance

Guidance	Comment
Number of properties affected by slight, moderate or substantial air quality impacts and a judgement on the overall balance	Impacts on annual mean NO ₂ , PM ₁₀ and PM _{2.5} concentrations were predicted to be negligible at all 34 sensitive receptors considered.
Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective or limit value will be relevant	The Proposed Development will not result in any new exposure to pollutant concentrations above the AQOs at sensitive locations on or off the application site and as such no new exposure has been introduced.
The percentage change in concentration relative to the objective and the descriptions of the impacts at the receptors	The change in concentration relative to the AQO was predicted to range from: • 0.23% to 2.80% for NO₂; • 0.07% to 0.83% for PM₁₀; and • 0.04% to 0.72% for PM_{2.5} Resultant impacts were subsequently predicted to be negligible at all receptor locations considered.
Whether or not an exceedance of an objective is predicted to arise or be removed in the study area due to a substantial increase or decrease	There were no exceedances of the annual mean AQOs for NO ₂ , PM ₁₀ and PM _{2.5} at any location within the modelling extent.
The extent to which an objective is exceeded e.g. an annual mean NO ₂ concentration of 41µg/m ³ should attract less significance than an annual mean of 51µg/m ³	As stated above, there were no exceedances of the annual mean AQOs for NO ₂ , PM ₁₀ and PM _{2.5} at any location within the modelling extent.

The assessment was undertaken in accordance with the methodology detailed in Section 3.2 and full impact assessment results can be found in Appendix C.

6.0 CONCLUSION

Ensafe Consultants were commissioned by the Client to undertake an Air Quality Assessment in support of a proposed residential development at Chapel Lane, Widnes.

During the construction phase of the Proposed Development there is the potential for air quality impacts as a result of fugitive dust emissions from the site. These were assessed in accordance with the IAQM methodology. Assuming good practice dust control measures are implemented, the residual potential air quality impacts from dust generated by construction, earthworks and trackout activities was predicted to be **not significant**.

Dispersion modelling was undertaken to quantify annual mean NO₂, PM₁₀ and PM_{2.5} concentrations across the application to assess suitability for proposed use. Modelling results were subsequently verified using HBC local monitoring data.

The dispersion modelling results indicated that annual mean NO₂, PM₁₀ and PM_{2.5} concentrations across the application site were below the relevant AQOs at the proposed sensitive use.

The site is therefore considered suitable for the proposed end-use without the implementation of protective mitigation techniques to protect future amenity.

Predicted impacts on annual mean NO₂, PM₁₀ and PM_{2.5} concentrations as a result of operational phase exhaust emissions were predicted to be **negligible** at 34 sensitive receptor locations within the vicinity of the site.

The overall significance of potential impacts was determined to be **negligible** in accordance with the EPUK and IAQM guidance. The use of robust assumptions, in the form of worse-case road vehicle emission factors, was considered to provide sufficient results confidence for an assessment of this nature.

Based on the assessment results the site is considered suitable for the proposed end use and complies with the HBC Local Plan and NPPF.

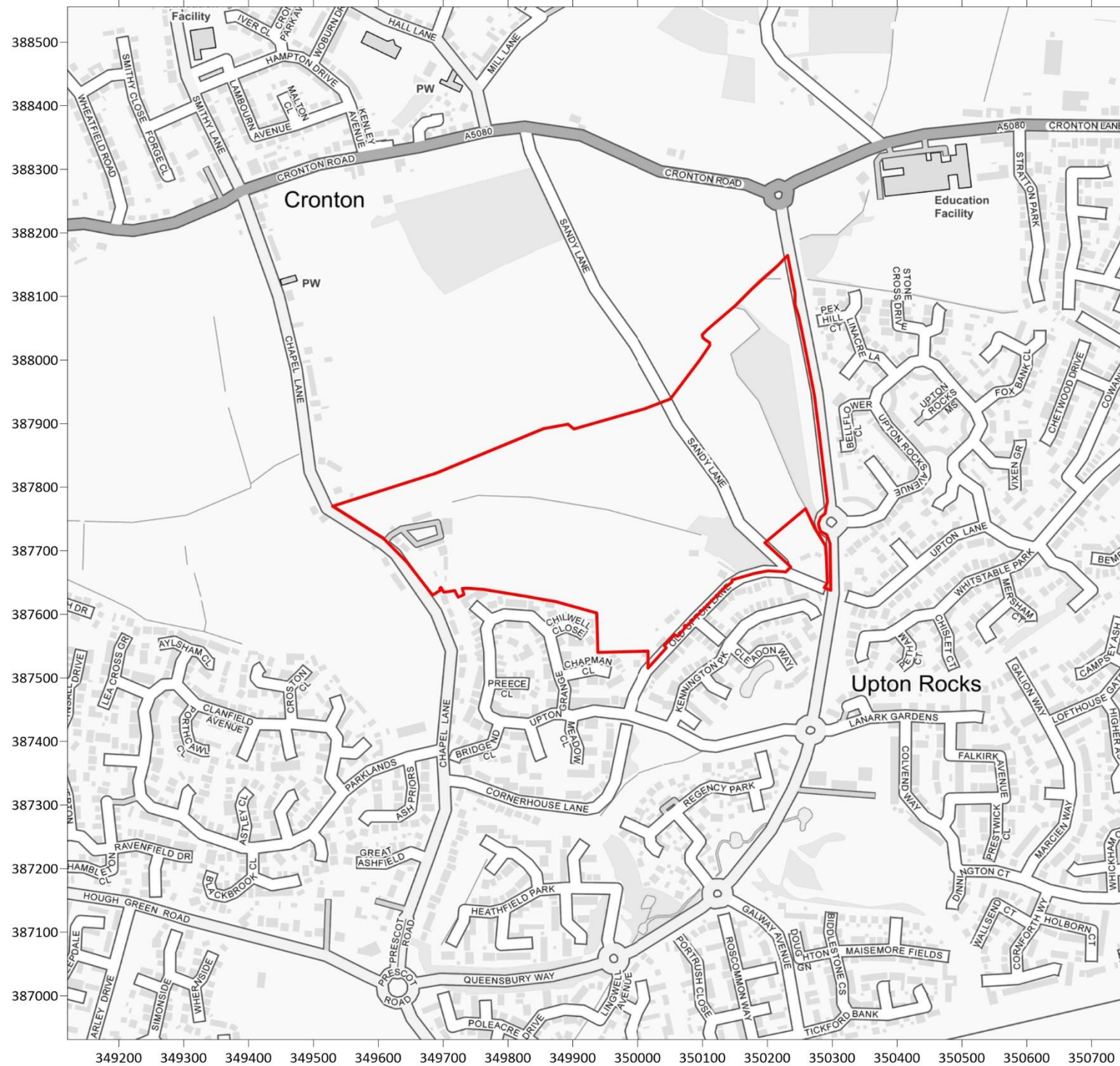
7.0 ABBREVIATIONS

AADT	Annual Average Daily Traffic
ADM	Atmospheric Dispersion Modelling
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objectives
AQS	Air Quality Strategy
CERC	Cambridge Environmental Research Consultants
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DM	Do Minimum
DS	Do Something
DMP	Dust Management Plan
EPUK	Environmental Protection UK
EU	European Union
HBC	Halton Borough Council
HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
LA	Local Authority
LDV	Light Duty Vehicle
NGR	National Grid Reference
NO ₂	Nitrogen dioxide
NO _x	Oxides of nitrogen
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
PM _{2.5}	Particulate matter with an aerodynamic diameter of less than 2.5µm
PM ₁₀	Particulate matter with an aerodynamic diameter of less than 10µm
TEMPRO	Trip End Model Presentation Program
z ₀	Roughness Length

END OF REPORT

APPENDIX A - FIGURES

DRAFT



Legend



Site Boundary

Title

Figure 1

Site Location

Project

Chapel Lane, Widnes

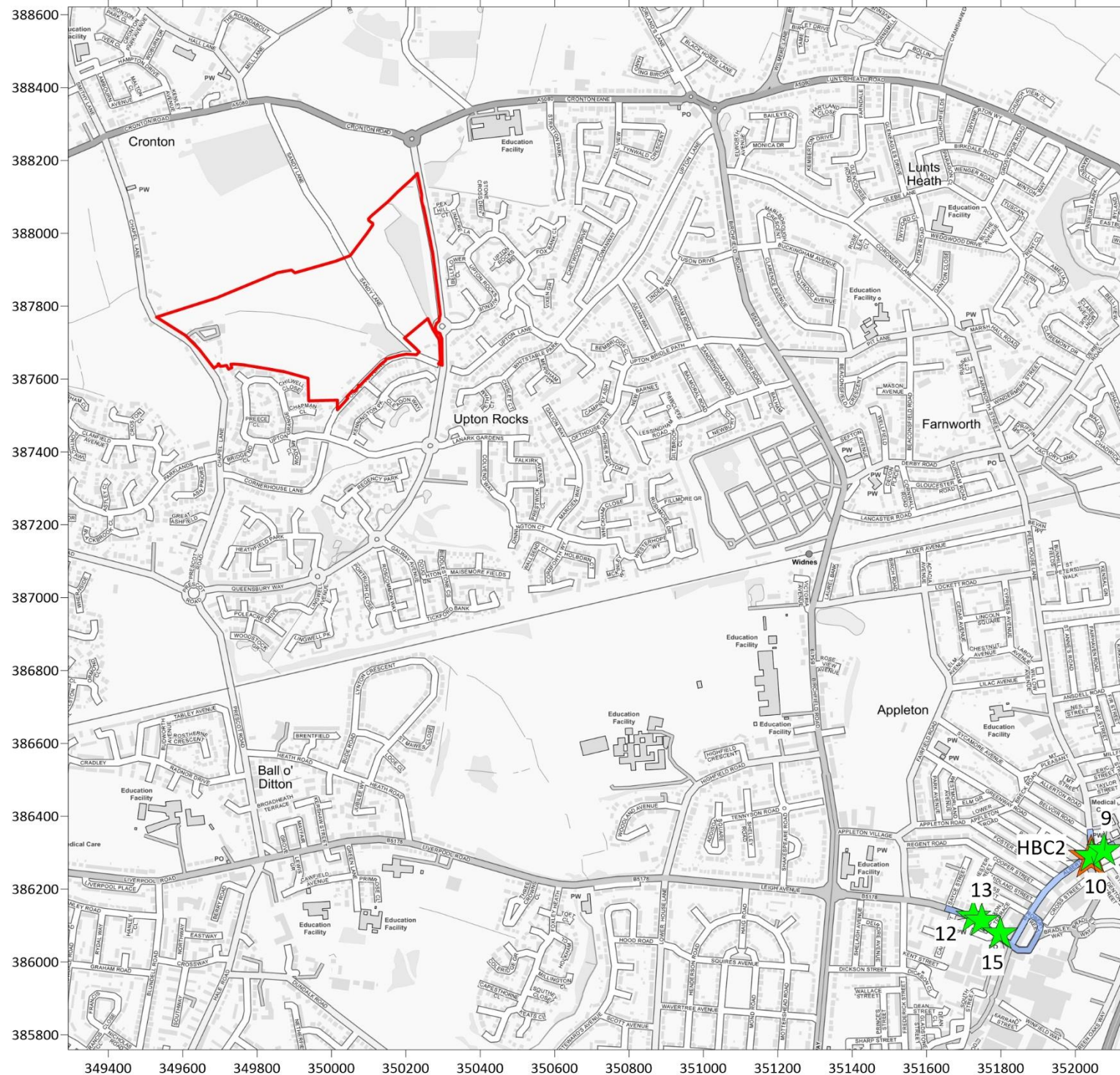
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Legend

-  Site Boundary
-  Diffusion Tube Monitoring Locations
-  Automatic Analyser Monitoring Location
-  Air Quality Management Area

Title

Figure 2
Diffusion Tube Monitoring Locations

Project

Chapel Lane, Widnes

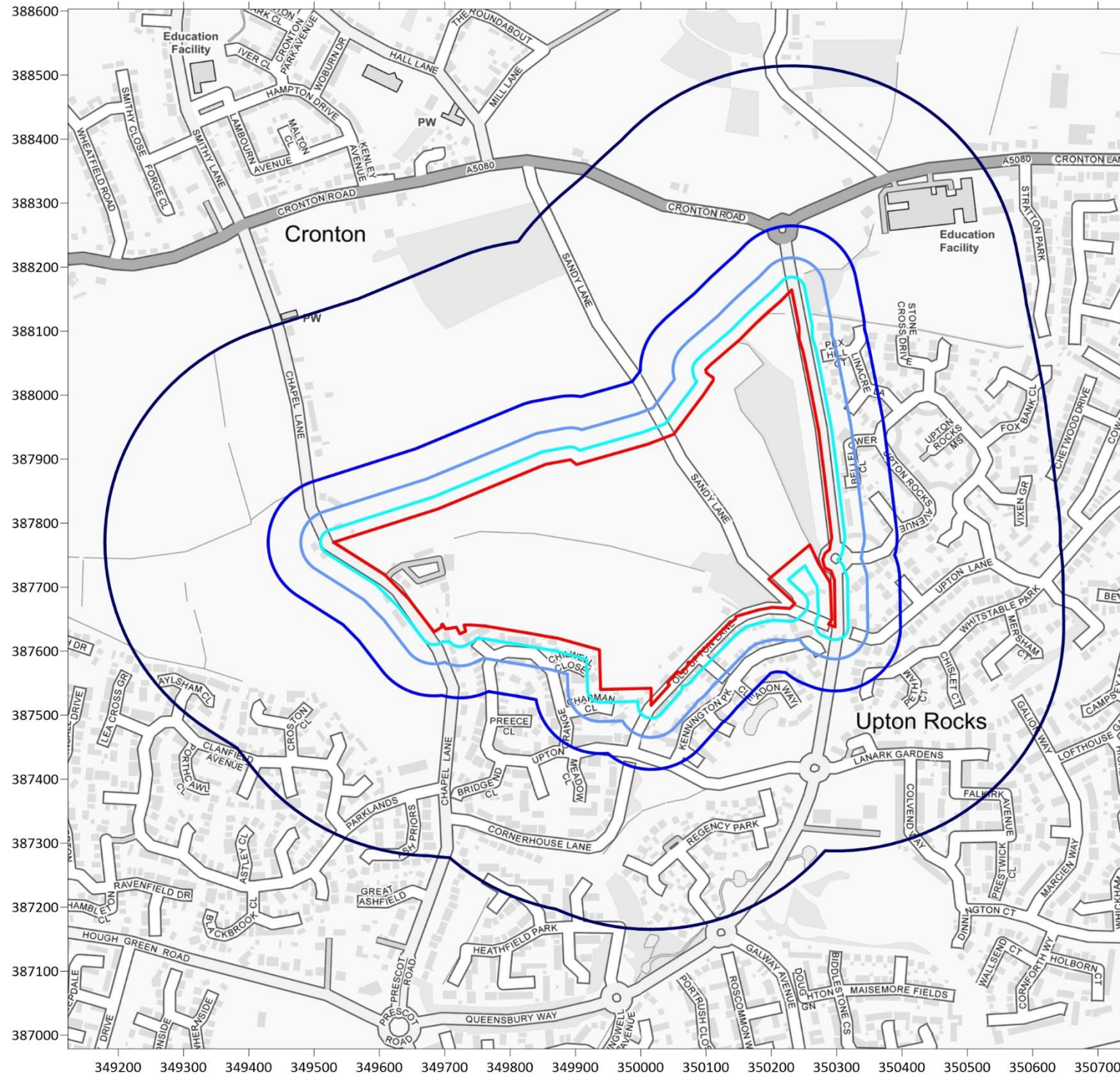
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Legend

- Site Boundary
- 20m from Site Boundary
- 50m from Site Boundary
- 100m from Site Boundary
- 350m from Site Boundary

Title

Figure 3
Demolition, Earthworks and Construction
Dust Buffer Zones

Project

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Legend

- Site Boundary
- 20m from Site Access Route
- 50m from Site Access Route

Title

Figure 4
Trackout Dust Buffer Zones

Project

Chapel Lane, Widnes

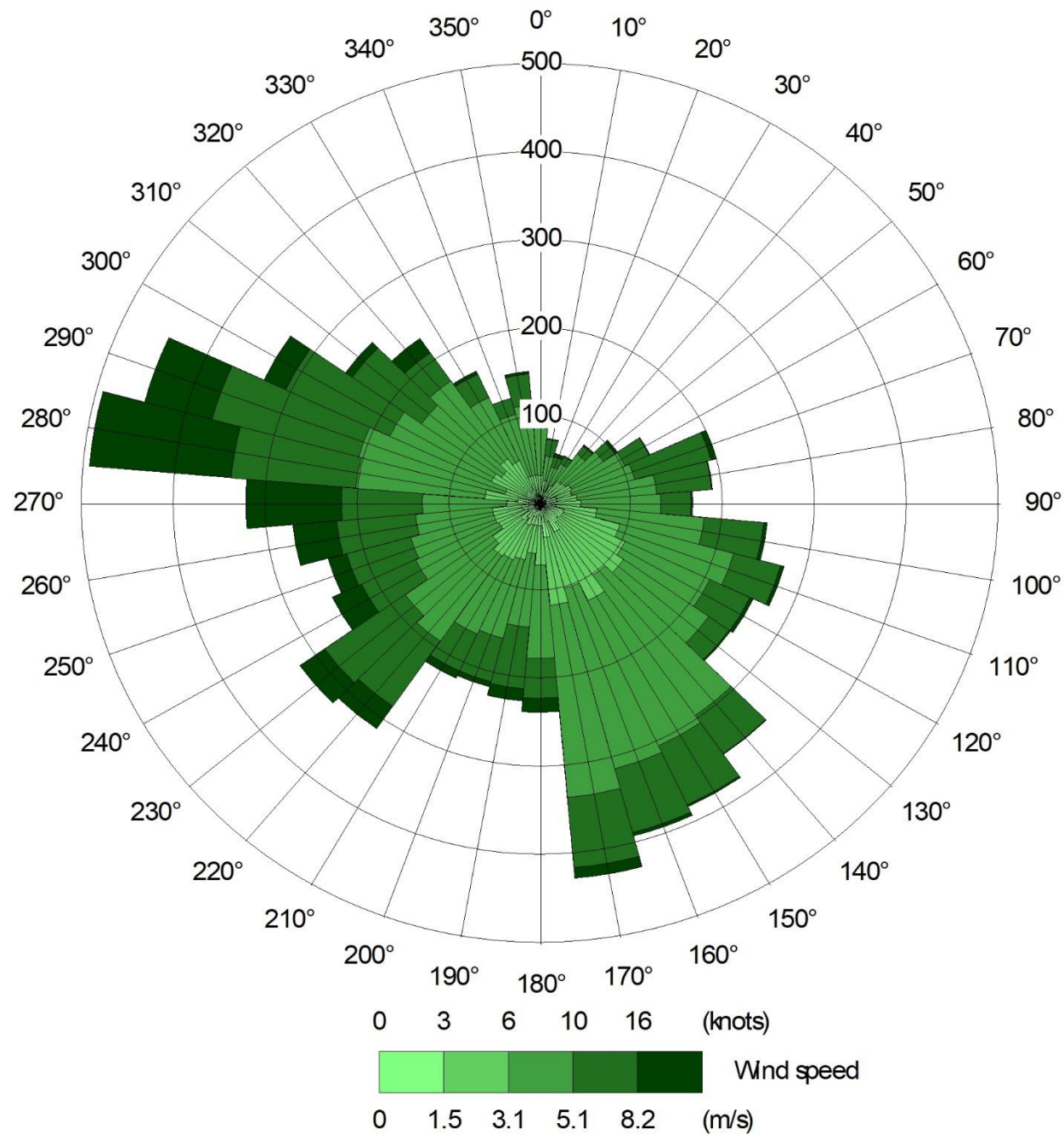
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Title

Figure 5

Wind Rose 2019 Liverpool Airport
Meteorological Station

Project

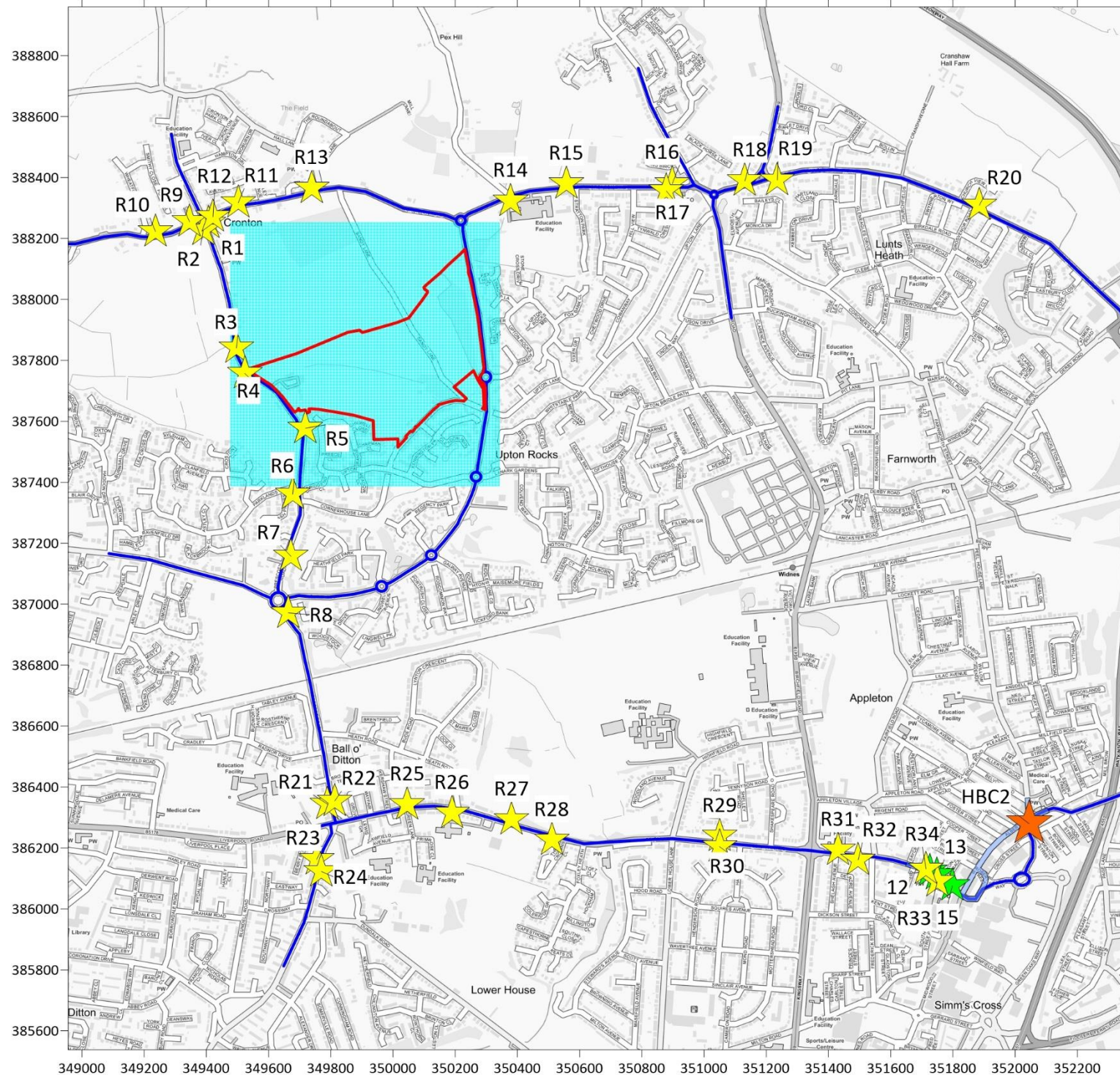
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Legend

-  Site Boundary
-  Modelled Road Link
-  Cartesian Grid
-  Diffusion Tube Monitoring
-  Automatic Monitoring Analyzers
-  Sensitive Receptor Locations
-  HBC AQMA

Title

Figure 6
ADMS-Roads Input

Project

Chapel Lane, Widnes

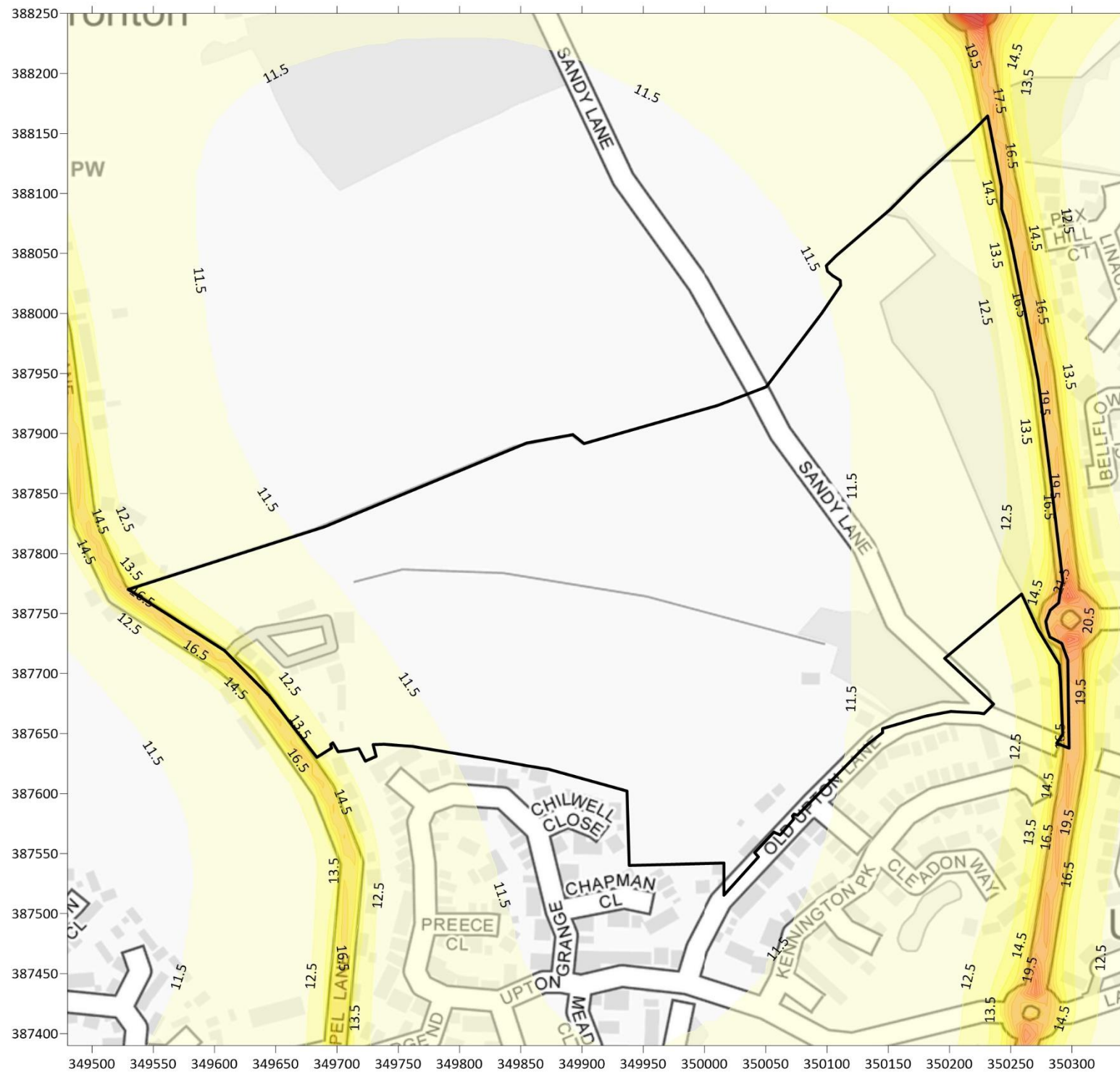
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Site Boundary

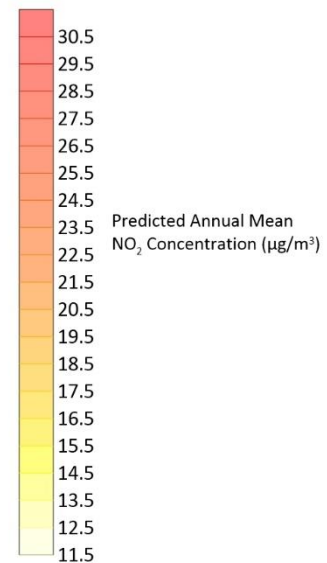


Figure 7
Predicted Annual Mean NO₂
Concentrations (µg/m³)

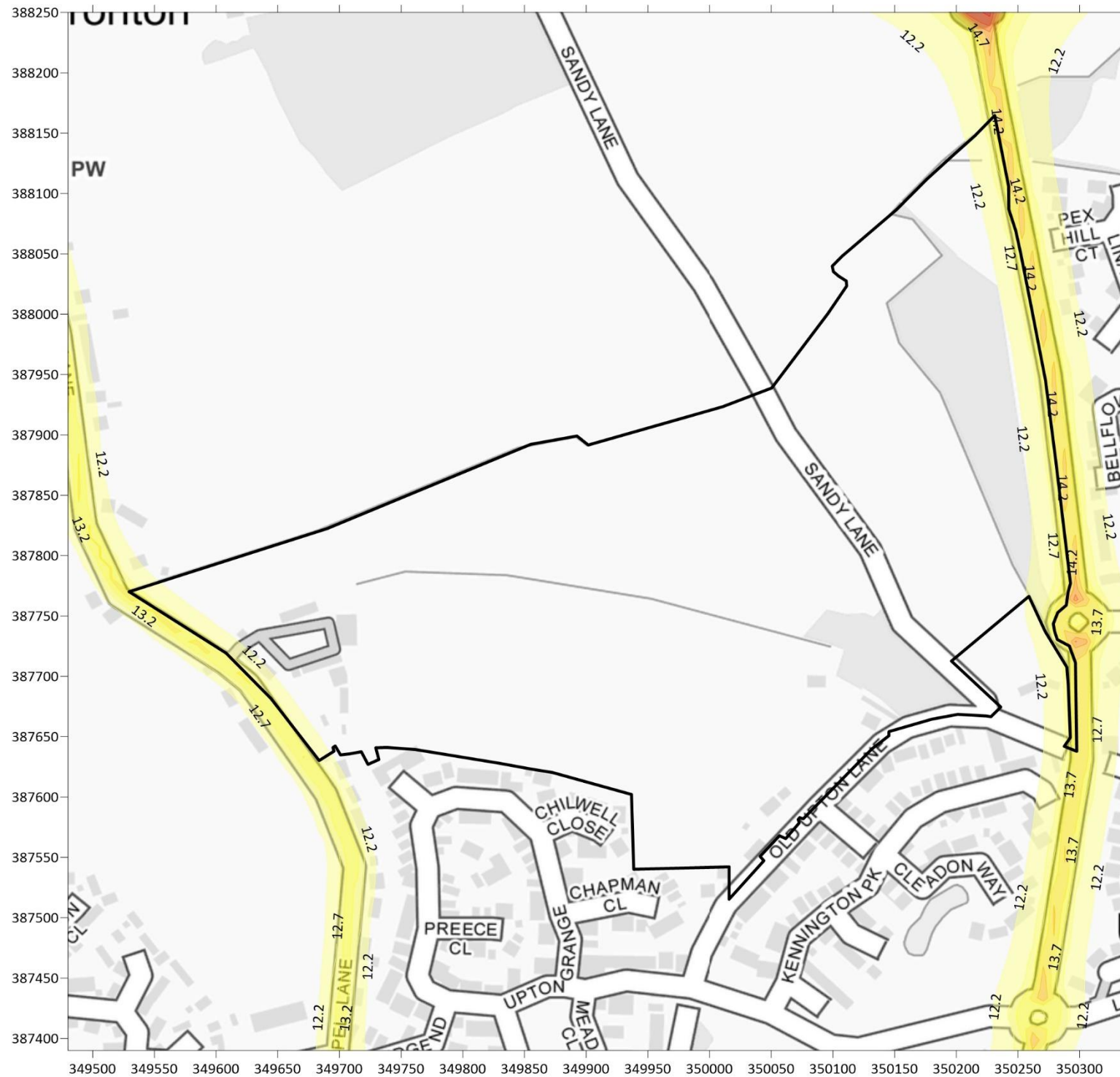
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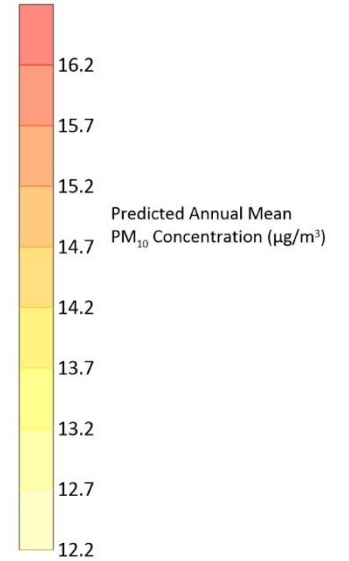


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Legend

Site Boundary



Title

Figure 8
Predicted Annual Mean PM₁₀
Concentrations (µg/m³)

Project

Chapel Lane, Widnes

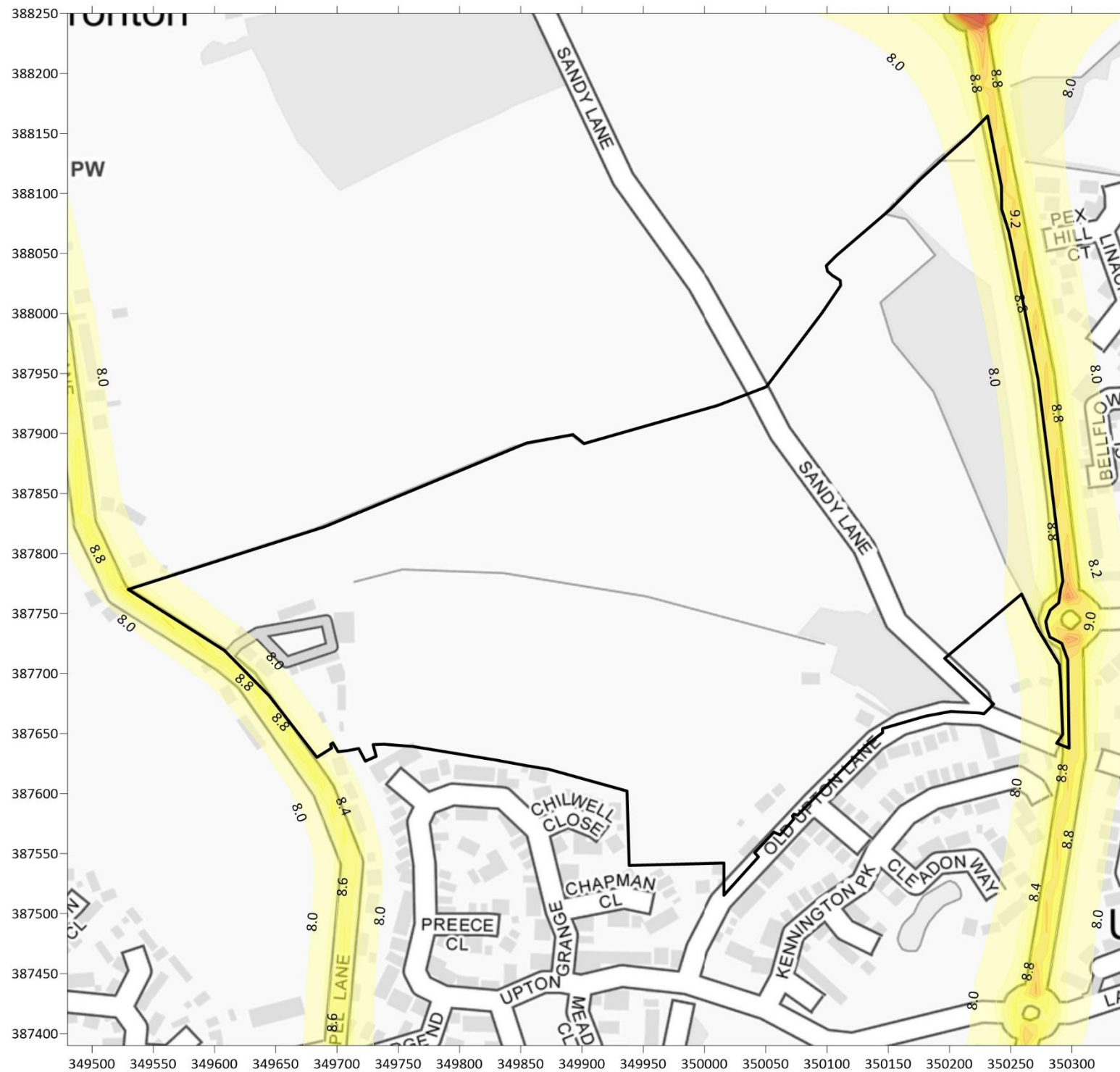
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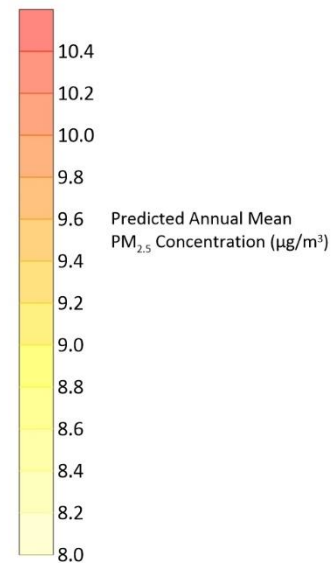


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Legend

Site Boundary



Title

Figure 9
Predicted Annual Mean PM_{2.5}
Concentrations (µg/m³)

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APPENDIX B – ASSESSMENT INPUTS

ASSESSMENT INPUTS

The Proposed Development has the potential to introduce future site users to poor air quality. Dispersion modelling using ADMS Roads was therefore undertaken to predict pollutant concentrations across the site to consider site suitability for the proposed end-use.

The assessment was undertaken in accordance with the guidance contained within the DEFRA document LAQM.TG(16)² and the EPUK and IAQM guidance⁴.

Dispersion Model

Dispersion modelling was undertaken using the ADMS-Roads dispersion model (version 5.0). ADMS-Roads is developed by Cambridge Environmental Research Consultants (CERC) and is routinely used throughout the world for the prediction of pollutant dispersion from road sources. Modelling predictions from this software package are accepted within the UK by the Environment Agency and DEFRA.

The model requires input data that details the following parameters:

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

Assessment Area

Ambient concentrations were predicted over the Proposed Development site and surrounding highway network. One Cartesian grid was included in the model over the area at approximately NGR: 349480, 387390 and 350340, 388250 at height of 1.5m to represent the proposed ground floor level for the 2024 opening year scenario.

Results were subsequently used to produce contour plots within the Surfer software package. Reference should be made to Figure 6 within Appendix A for a graphical representation of the verification inputs and operation phase DS extents, respectively.

Traffic Flow Data

Development flow traffic data and associated network distribution was provided by Vectos, the appointed Transport Consultants for the scheme, and indicated that a total flow generation of 2,770 AADT is anticipated as a result of the Proposed Development.

Baseline traffic data for the following road link were obtained from the Department for Transport (DfT):

- B5178 Deacon Road

The DfT Matrix web tool enables the user to view and download traffic flows on every link of the A-road and motorway network in Great Britain for the years 1999 to 2019. The DfT matrix is referenced in DEFRA guidance LAQM.TG(16)² as being a suitable source of data for air quality assessments and is therefore considered to provide a reasonable representation of traffic flows in the vicinity of the site.

Growth factors provided by the Trip End Model Presentation Program (TEMPO) software package were utilised to allow for conversion from the obtained 2019 traffic flow to 2024 which was used to represent the opening year scenario. Vehicle speeds were estimated based on the free flow potential of each link and local speed limits. Road widths were estimated from aerial photography and UK highway design standards.

A summary of the traffic data used in the verification scenario is provided in Table B1.

Table B1: 2019 Verification Traffic Data

Road Link		Road Width (m)	24 Hour AADT Flow	HDV Pop (%)	Mean Vehicle Speed (km/hr)	Data Source
L1	Cronton Road (West of Chapel lane)	7.30	5,642	2.6	40	TC
L2	Cronton Road Slow Down (West of Chapel lane)	7.10	5,642	2.6	16	TC
L3	Cronton Road Slow Down (East of Chapel lane)	7.20	9,375	1.7	16	TC
L4	Cronton Road (East of Chapel lane)	6.70	9,375	1.7	40	TC
L5	Cronton Road Roundabout approach (West of Queensbury)	11.00	9,375	1.7	16	TC
L6	Cronton Road/Queensbury Way Roundabout	8.60	11,635	1.7	16	TC
L7	Queensbury Way Roundabout approach	7.60	9,273	1.3	16	TC
L8	Queensbury Way	7.30	9,273	1.3	40	TC
L9	Queensbury Way/Upton Road Avenue Roundabout Approach	7.30	9,273	1.3	16	TC
L10	Queensbury Way/Upton Road Avenue Roundabout	8.00	6,681	1.2	16	TC
L11	Queensbury Way/Upton Road Avenue Roundabout Approach	8.70	9,283	1.3	16	TC
L12	Queensbury Way (South of Upton Rocks Avenue)	8.30	9,283	1.3	24	TC
L13	Queensbury Way (South of Upton Rocks Avenue)	9.20	9,283	1.3	16	TC
L14	Queensbury Way/Lanark Gardens Roundabout	8.20	4,642	1.3	16	TC
L15	Queensbury Way/Lanark Gardens Roundabout Approach	10.80	9,283	1.3	16	TC
L16	Queensbury Way	8.80	9,283	1.3	24	TC
L17	Queensbury Way/Galway Avenue Roundabout Approach	14.00	9,283	1.3	16	TC
L18	Queensbury Way/Galway Avenue Roundabout	8.50	4,642	1.3	16	TC
L19	Queensbury Way/Galway Avenue Roundabout Approach	8.80	9,283	1.3	16	TC
L20	Queensbury Way	7.50	9,283	1.3	24	TC
L21	Queensbury Way/Lingwell Avenue Roundabout Approach	8.80	9,283	1.3	16	TC
L22	Queensbury Way/Lingwell Avenue Roundabout	7.40	4,739	1.3	16	TC
L23	Queensbury Way/Lingwell Avenue Roundabout Approach	8.50	9,672	1.4	16	TC
L24	Queensbury Way	7.10	9,672	1.4	24	TC
L25	Queensbury Way/Prescot Roundabout Approach	10.00	9,672	1.4	16	TC
L26	Prescot Road/Queensbury Way Roundabout	9.60	8,711	1.2	16	TC
L27	Prescot Road (South of Queensbury Way) Slow Down	10.70	11,533	0.9	16	TC
L28	Prescot Road (South of Queensbury Way)	7.00	11,533	0.9	32	TC
L29	Chapel Lane (North of Site) Slow Down	5.40	5,043	0.7	40	TC

Road Link		Road Width (m)	24 Hour AADT Flow	HDV Pop (%)	Mean Vehicle Speed (km/hr)	Data Source
L30	Chapel Lane (North of Site)	5.90	5,043	0.7	40	TC
L31	Chapel Lane (South of Site)	6.40	4,804	0.8	40	TC
L32	Chapel Lane (South of Site) Slow Down	10.30	4,804	0.8	16	TC
L33	Prescot Road (South of Queensbury Way)/B5178 Approach	9.80	11,533	0.9	16	TC
L34	B5178 Liverpool Road	10.30	10,924	1.7	40	TC
L35	B5178 Liverpool Road Junction Slow Down	11.00	10,924	1.7	16	TC
L36	B5178 Deacon Road	6.56	10,932	3.5	40	DfT
L37	B5178 Deacon Road Slow Down	5.60	10,932	3.5	16	DfT
L38	B5178 Bradley Way Roundabout Approach	9.00	10,932	3.5	16	DfT
L39	Bradley Way Roundabout	8.80	5,466	3.5	16	DfT
L40	B5178 Roundabout Approach	10.00	10,932	3.5	16	DfT
L41	B5178	13.40	10,932	3.5	32	DfT
L42	Albert Road	13.60	10,932	3.5	16	DfT
L43	Albert Road/Halton View Road	7.60	10,932	3.5	24	DfT
L44	Cronton Road (East of Queensbury Way)	7.40	16,256	2.0	16	TC
L45	Cronton Road (East of Queensbury Way)	6.10	16,256	2.0	40	TC
L46	A5080 Cronton Road - between Queensbury Way and Norland Lane	11.20	16,256	2.0	24	TC
L47	B5413/A5080 Roundabout	11.20	15,191	2.8	24	TC
L48	A5080 Lunts Heath Road - between Birchfield Road and Wilmere Lane Slow Down	12.50	17,733	3.1	16	TC
L49	A5080 Lunts Heath Road - between Birchfield Road and Wilmere Lane	9.40	17,733	3.1	32	TC
L50	A5080 Lunts Heath Road - East of Wilmere Lane	8.70	8,476	1.8	32	TC
L51	A5080 Lunts Heath Road - East of Wilmere Lane Slow Down	16.80	8,476	1.8	16	TC
L52	A5080 Derby Road - East of Lunts Heath Road	10.80	16,915	1.6	32	TC
L53	B5419 Wilmere Lane - North of Lunts Heath Road Speed Up	5.00	11,433	1.8	24	TC
L54	B5419 Wilmere Lane - North of Lunts Heath Road Slow Down	10.00	11,433	1.8	16	TC
L55	B5419 Wilmere Lane - North of Lunts Heath Road	10.30	11,433	1.8	40	TC
L56	Smithy Lane - North of Cronton Road	6.90	4,030	1.4	40	TC
L57	Liverpool Road - West of Prescot Road	9.70	7,230	3.7	40	TC
L58	Hale Road - South of Prescot Road Slow Down	14.00	9,523	1.9	16	TC
L59	Hale Road - South of Prescot Road	9.60	9,523	1.9	40	TC

Road Link		Road Width (m)	24 Hour AADT Flow	HDV Pop (%)	Mean Vehicle Speed (km/hr)	Data Source
L60	Norlands Lane - North of Cronton Road	8.20	3,372	0.2	40	TC
L61	B5419 Birchfield Road - South of Lunts Heath Road	10.60	11,583	3.3	40	TC
L62	Hough Green Road - West of Chapel Lane	8.00	8,834	1.7	40	TC

Reference should be made to Figure 6 within Appendix A for a graphical representation of the road link locations used within the verification assessment. The road width, and mean vehicle speed shown in Table B1 remained the same for the 2024 scenarios.

A summary of the 2024 traffic data is shown in Table B2.

Table B2: 2024 Traffic Data

Road Link		DM Scenario		DS Scenario	
		24 Hr AADT Flow	HDV Prop (%)	24 Hr AADT Flow	HDV Prop (%)
L1	Cronton Road (West of Chapel lane)	5,712	3.8	6,424	3.4
L2	Cronton Road Slow Down (West of Chapel lane)	5,712	3.8	6,424	3.4
L3	Cronton Road Slow Down (East of Chapel lane)	8,038	2.5	8,822	2.3
L4	Cronton Road (East of Chapel lane)	8,038	2.5	8,822	2.3
L5	Cronton Road Roundabout approach (West of Queensbury)	8,038	2.5	8,822	2.3
L6	Cronton Road/Queensbury Way Roundabout	10,628	3.0	11,151	2.9
L7	Queensbury Way Roundabout approach	9,280	1.9	9,280	1.9
L8	Queensbury Way	9,280	1.9	9,280	1.9
L9	Queensbury Way/Upton Road Avenue Roundabout Approach	9,280	1.9	9,280	1.9
L10	Queensbury Way/Upton Road Avenue Roundabout	6,674	1.7	6,674	1.7
L11	Queensbury Way/Upton Road Avenue Roundabout Approach	9,289	1.9	9,289	1.9
L12	Queensbury Way (South of Upton Rocks Avenue)	9,289	1.9	9,289	1.9
L13	Queensbury Way (South of Upton Rocks Avenue)	9,289	1.9	9,289	1.9
L14	Queensbury Way/Lanark Gardens Roundabout	4,645	1.9	4,645	1.9
L15	Queensbury Way/Lanark Gardens Roundabout Approach	9,289	1.9	9,289	1.9
L16	Queensbury Way	9,289	1.9	9,289	1.9
L17	Queensbury Way/Galway Avenue Roundabout Approach	9,289	1.9	9,289	1.9
L18	Queensbury Way/Galway Avenue Roundabout	4,645	1.9	4,645	1.9
L19	Queensbury Way/Galway Avenue Roundabout Approach	9,289	1.9	9,289	1.9

Road Link		DM Scenario		DS Scenario	
		24 Hr AADT Flow	HDV Prop (%)	24 Hr AADT Flow	HDV Prop (%)
L20	Queensbury Way	9,289	1.9	9,289	1.9
L21	Queensbury Way/Lingwell Avenue Roundabout Approach	9,289	1.9	9,289	1.9
L22	Queensbury Way/Lingwell Avenue Roundabout	4,740	1.9	4,748	1.9
L23	Queensbury Way/Lingwell Avenue Roundabout Approach	9,670	2.0	9,701	2.0
L24	Queensbury Way	9,670	2.0	9,701	2.0
L25	Queensbury Way/Prescot Roundabout Approach	9,670	2.0	9,701	2.0
L26	Prescot Road/Queensbury Way Roundabout	8,767	1.8	9,238	1.7
L27	Prescot Road (South of Queensbury Way) Slow Down	11,397	1.4	12,228	1.3
L28	Prescot Road (South of Queensbury Way)	11,397	1.4	12,228	1.3
L29	Chapel Lane (North of Site) Slow Down	4,929	1.1	6,757	0.8
L30	Chapel Lane (North of Site)	4,929	1.1	6,757	0.8
L31	Chapel Lane (South of Site)	5,275	1.5	6,218	1.3
L32	Chapel Lane (South of Site) Slow Down	5,275	1.5	6,218	1.3
L33	Prescot Road (South of Queensbury Way)/B5178 Approach	11,397	1.4	12,228	1.3
L34	B5178 Liverpool Road	10,677	2.6	11,044	2.5
L35	B5178 Liverpool Road Junction Slow Down	10,677	2.6	11,044	2.5
L36	B5178 Deacon Road	11,356	3.5	11,723	3.3
L37	B5178 Deacon Road Slow Down	11,356	3.5	11,723	3.3
L38	B5178 Bradley Way Roundabout Approach	11,356	3.5	11,723	3.3
L39	Bradley Way Roundabout	5,678	3.5	5,862	3.3
L40	B5178 Roundabout Approach	11,356	3.5	11,723	3.3
L41	B5178	11,356	3.5	11,723	3.3
L42	Albert Road	11,356	3.5	11,723	3.3
L43	Albert Road/Halton View Road	11,356	3.5	11,723	3.3
L44	Cronton Road (East of Queensbury Way)	14,567	4.1	15,351	3.9
L45	Cronton Road (East of Queensbury Way)	14,567	4.1	15,351	3.9
L46	A5080 Cronton Road - between Queensbury Way and Norland Lane	14,567	4.1	15,351	3.9
L47	B5413/A5080 Roundabout	14,754	4.5	15,271	4.3
L48	A5080 Lunts Heath Road - between Birchfield Road and Wilmere Lane Slow Down	18,094	4.5	18,819	4.3
L49	A5080 Lunts Heath Road - between Birchfield Road and Wilmere Lane	18,094	4.5	18,819	4.3
L50	A5080 Lunts Heath Road - East of Wilmere Lane	9,960	3.2	10,411	3.0

Road Link		DM Scenario		DS Scenario	
		24 Hr AADT Flow	HDV Prop (%)	24 Hr AADT Flow	HDV Prop (%)
L51	A5080 Lunts Heath Road - East of Wilmere Lane Slow Down	9,960	3.2	10,411	3.0
L52	A5080 Derby Road - East of Lunts Heath Road	17,400	2.3	17,810	2.3
L53	B5419 Wilmere Lane - North of Lunts Heath Road Speed Up	11,328	2.7	11,603	2.6
L54	B5419 Wilmere Lane - North of Lunts Heath Road Slow Down	11,328	2.7	11,603	2.6
L55	B5419 Wilmere Lane - North of Lunts Heath Road	11,328	2.7	11,603	2.6
L56	Smithy Lane - North of Cronton Road	3,939	2.1	4,272	2.0
L57	Liverpool Road - West of Prescott Road	8,743	1.9	8,803	1.9
L58	Hale Road - South of Prescott Road Slow Down	9,392	2.8	9,796	2.7
L59	Hale Road - South of Prescott Road	9,392	2.8	9,796	2.7
L60	Norlands Lane - North of Cronton Road	3,358	0.4	3,358	0.4
L61	B5419 Birchfield Road - South of Lunts Heath Road	11,600	4.9	11,641	4.9
L62	Hough Green Road - West of Chapel Lane	8,725	2.5	8,804	2.5

Reference should be made to Figure 6 within Appendix A for a graphical representation of the road link locations used within the operation phase assessment.

Emission Factors

Emission factors for each link were calculated using the relevant traffic flows and the Emissions Factor Toolkit (version 11.0) released in November 2021, which incorporates updated COPERT 5.3 vehicle emissions factors for NO_x, PM₁₀ and PM_{2.5} and EURO 6 vehicle fleet sub-categories.

NO_x to NO₂ Conversion

Predicted annual mean NO_x concentrations from the dispersion model were converted to NO₂ concentrations using the NO_x to NO₂ Calculator (v.8.1) provided by DEFRA, which is the method detailed within LAQM.TG(16)².

Meteorological Data

Meteorological data used in this assessment was taken from Liverpool meteorological station over the period 1st January 2019 to 31st December 2019 (inclusive).

Liverpool meteorological station is located at approximate NGR: 343640, 381770 which is approximately 8.2km south west of the Proposed Development. Although there is a large distance between the application site and Liverpool the use of this data has prior approval from the Environmental Health Department at HBC and is therefore considered to provide a reasonable representation of conditions at the development site.

All meteorological records used in the assessment were provided by Atmospheric Dispersion Modelling (ADM) Ltd, which is an established distributor of data within the UK. Reference should be made to Figure 5 within Appendix A for a wind rose of utilised meteorological data.

Roughness Length

The specific roughness length (z_0) values used to represent conditions during the verification process, DM/DS scenario, as well as conditions at the Liverpool meteorological station are summarised in Table B3.

Table B3: Utilised Roughness Lengths

Scenario	Roughness Length (m)	ADMS Description
Verification, DM and DS Scenarios	0.5	Parkland, open suburbia
Liverpool Meteorological Station	0.2	Agricultural areas (min)

These values of z_0 are considered appropriate for the morphology of the assessment area.

Monin-Obukhov Length

The Monin-Obukhov length provides a measure of the stability of the atmosphere within certain urban or rural contexts. The specific length values used to represent conditions during the verification process, DM/DS scenario, as well as conditions at the Liverpool are summarised in Table B4.

Table B4: Utilised Monin-Obukhov Lengths

Scenario	Monin-Obukhov Length (m)	ADMS Description
Verification, DM and DS Scenarios	30	Mixed urban/industrial
Liverpool Meteorological Station	10	Small Towns <50,000

This Monin-Obukhov value is considered appropriate for the morphology of the assessment area.

Background Concentrations

The 2024 annual mean background concentrations detailed in Table 6, was used in the dispersion modelling assessment to represent annual mean pollutant levels at the Proposed Development site and local monitoring sites.

Table B5 displays the specific background concentrations as predicted by DEFRA, utilised to represent the condition at the monitoring locations used within the verification process.

Table B5: Predicted Background Pollutant Concentrations for Monitoring Locations

Monitoring Location	DEFRA Grid Square	Pollutant	2019 Predicted Background Concentration ($\mu\text{g}/\text{m}^3$)
12,13,15	351500, 386500	NO _x	20.10
		NO ₂	15.90
HBC2	352500, 386500	NO _x	22.10
		NO ₂	15.90

Table B6 displays the predicted background concentrations by DEFRA used in the operational phase assessment for the sensitive receptor locations.

Table B6: Predicted Background Pollutant Concentrations at Sensitive Receptors

Monitoring Location	DEFRA Grid Square	Pollutant	2024 Predicted Background Concentration ($\mu\text{g}/\text{m}^3$)
R1, R2, R9 to R13	349500, 388500	NO _x	14.46
		NO ₂	10.93
		PM ₁₀	11.53
		PM _{2.5}	7.42
R3 to R7	349500, 387500	NO _x	14.21
		NO ₂	10.73
		PM ₁₀	11.82
		PM _{2.5}	7.86
R8, R21 to R24	349500, 386500	NO _x	15.25
		NO ₂	11.44
		PM ₁₀	11.85
		PM _{2.5}	8.22
R14 to R17	350500, 388500	NO _x	14.52
		NO ₂	10.97
		PM ₁₀	11.27
		PM _{2.5}	7.41
R18 to R20	351500, 388500	NO _x	14.57
		NO ₂	11.00
		PM ₁₀	11.87
		PM _{2.5}	7.62
R25 to R28	350500, 386500	NO _x	14.85
		NO ₂	11.17
		PM ₁₀	11.31
		PM _{2.5}	7.76
R29 to R24	351500, 386500	NO _x	16.55
		NO ₂	12.31
		PM ₁₀	12.30
		PM _{2.5}	8.71

2019 background concentrations for each receptor location have been used for the sensitivity analysis. The results of this are detailed in Appendix D.

Verification

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

- Estimates of background concentrations;

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

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

For the purpose of this assessment model verification was undertaken for 2019, using traffic data, meteorological data and monitoring results from this year.

HBC undertakes periodic monitoring of NO₂ concentrations at 4 roadside monitoring location within the assessment extents. The road contribution to total NO_x concentration was calculated from the monitored NO₂ result for use in the verification process. This was undertaken following the methodology contained within DEFRA guidance LAQM.TG(16)². The monitored annual mean NO_x concentration and calculated road NO_x concentration are summarised in Table B7.

Table B7: NO_x Concentrations

Site ID	Monitored Road NO _x Concentration (µg/m ³)	Modelled Road NO _x Concentration (µg/m ³)	% Difference ((Monitored - Modelled)/Monitored) * 100
12	25.58	8.71	66%
13	24.16	8.18	66%
15	25.99	8.89	66%
HBC2	21.38	8.78	59%

The monitored and modelled NO_x road contribution concentrations were graphed and the equation of the trend line based on the linear progression through zero was calculated, as shown in Graph 1

This indicated that a verification factor of **2.8070** was required to be applied to all NO_x modelling results, showing the model overestimated pollutant concentrations throughout the assessment extents.

Graph 1 is provided below.

Graph 1 - Verification Adjustment Factor

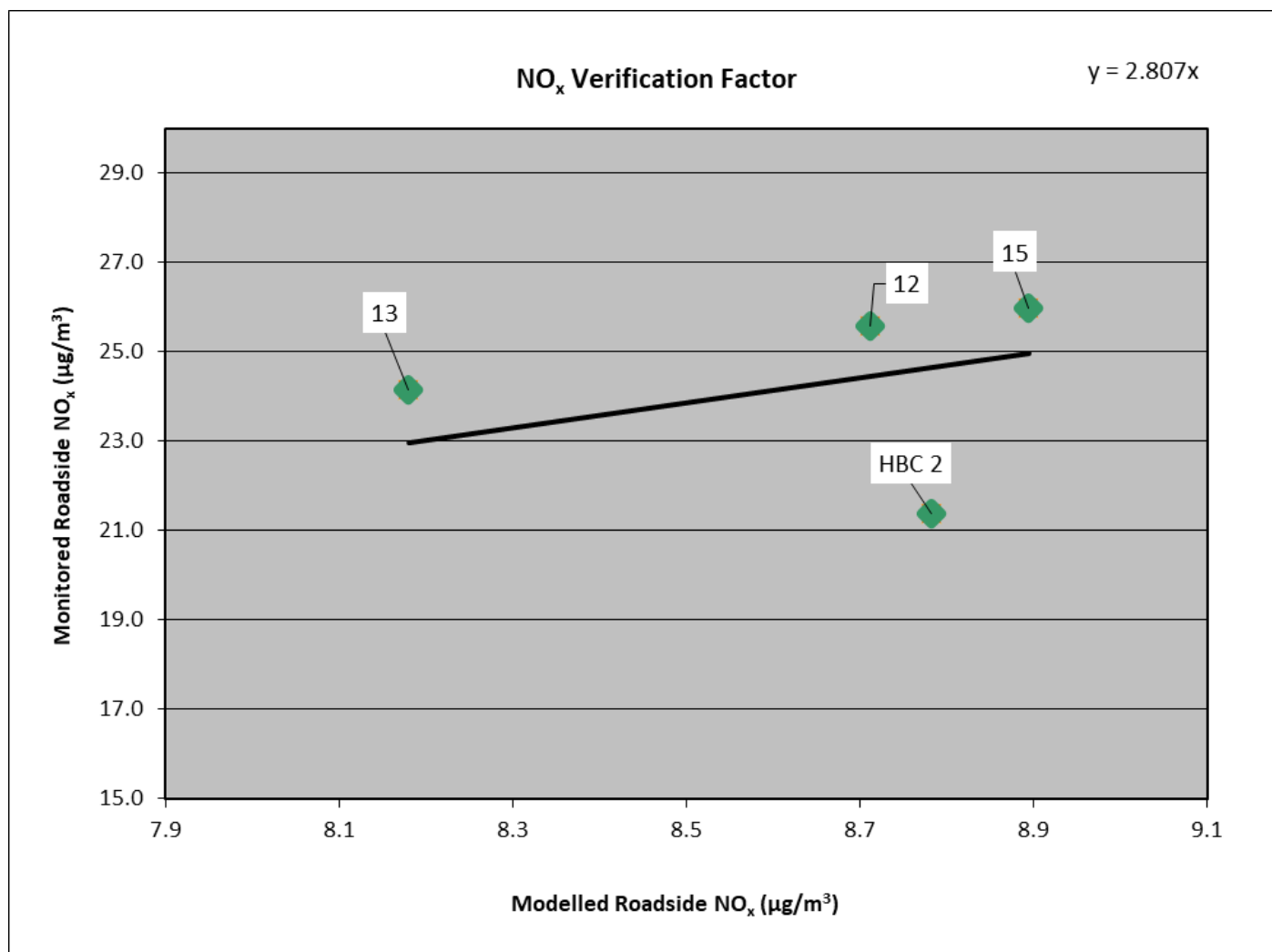


Table B8 presents the monitored annual mean NO₂ concentrations and the adjusted modelled total NO₂ concentration based on the above verification factor. Exceedances of the annual mean NO₂ AQO are highlighted in **bold**.

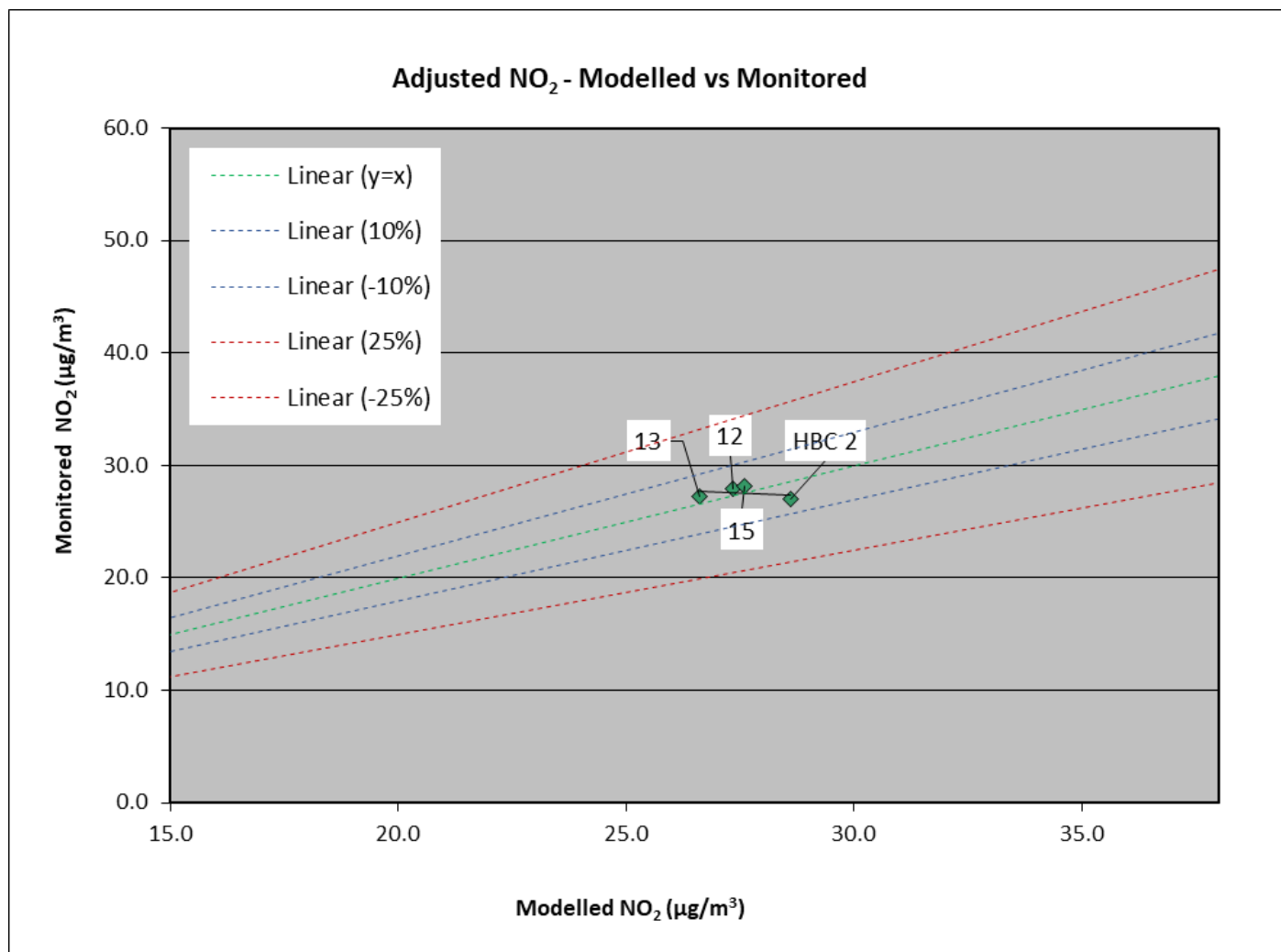
Table B8: NO₂ Concentrations

Site ID	Monitored Road NO ₂ Concentration (µg/m³)	Adjusted Modelled Road NO ₂ Concentration (µg/m³)	% Difference ((Monitored - Modelled)/Monitored) * 100
12	27.90	27.35	2%
13	27.20	26.61	2%
15	28.10	27.60	2%
HBC 2	27.00	28.61	-6%

As demonstrated in Table B8, the percentage difference between modelled and monitored concentrations is deemed acceptable and is less than 25% in all cases, and less than 10% at all locations. This reduces uncertainties in the model predictions and provide a robust representation of pollutant concentrations in accordance with the guidance suggested in LAQM.TG(16)².

A graphical representation of the adjusted NO₂ concentrations is provided within Graph 2.

Graph 2 – Modelled vs Monitored NO₂



HBC also undertakes monitoring of annual mean PM₁₀ concentrations at one monitoring locations within the assessment extents, it was therefore possible to provide a separate PM₁₀ verification factor. It should be noted that the monitoring location (HBC2) is located within a street canyon and as such, this location is considered to experience localised conditions, which are not representative of the site and the whole assessment extents.

As such, the NO_x adjustment factor of **2.8070** was utilised to adjust model predictions of PM₁₀ and PM_{2.5} in accordance with the guidance provided within LAQM.TG(16)².

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APPENDIX C – ASSESSMENT RESULTS

Predicted Concentrations at Sensitive Receptors

Nitrogen Dioxide (NO₂)

Annual mean NO₂ concentrations were predicted for 2024 DM and DS scenarios and are summarised in Table C1.

Table C1: Predicted Annual Mean NO₂ Concentrations

Potential Impact		Predicted Annual Mean NO ₂ Concentration (µg/m ³)		
		DM	DS	Change
R1	5 Chapel Lane	14.70	15.47	0.77
R2	2 Chapel Lane	13.71	14.37	0.66
R3	91 Chapel Lane	14.16	15.28	1.12
R4	6 Chapel Lane	12.68	13.26	0.58
R5	26 Chapel Lane	12.60	12.88	0.28
R6	1 Ash Priors	12.28	12.48	0.20
R7	74 Prescott Road	13.19	13.46	0.27
R8	44 Poleacre Drive	18.35	18.75	0.40
R9	413 Cronton Road	14.92	15.43	0.51
R10	377 Cronton Road	13.52	13.83	0.31
R11	433-435 Cronton Road	15.16	15.56	0.40
R12	432 Cronton Road	15.95	16.53	0.58
R13	1 Hall Lane	14.64	14.97	0.33
R14	Cronton Sixth Form College	15.30	15.51	0.21
R15	87 Cronton Lane	17.41	17.71	0.30
R16	25 Cronton Road	18.52	18.85	0.33
R17	14 Cronton Road	15.99	16.21	0.22
R18	166 Lunts Heath Road	20.31	20.60	0.29
R19	267 Lunts Heath Road	16.27	16.45	0.18
R20	46 Lunts Heath Road	15.95	16.15	0.20
R21	5 Prescott Road	16.19	16.46	0.27
R22	2 Prescot Road	17.58	17.95	0.37
R23	8 Hale Road	15.15	15.30	0.15
R24	3 Hale Road	15.10	15.24	0.14
R25	17 Liverpool Road	17.13	17.33	0.20
R26	147 Liverpool Road	14.11	14.21	0.10
R27	108 Liverpool Road	15.50	15.64	0.14
R28	49 Three Crowns Close	13.96	14.05	0.09
R29	110 Leigh Avenue	15.50	15.60	0.10
R30	101 Leigh Avenue	15.48	15.58	0.10
R31	St Bede's Catholic Infant School	18.24	18.41	0.17

Potential Impact		Predicted Annual Mean NO ₂ Concentration (µg/m ³)		
		DM	DS	Change
R32	27 Leigh Avenue	15.49	15.59	0.10
R33	26 Deacon Road	16.09	16.20	0.11
R34	13 Deacon Road	20.36	20.59	0.23

As indicated in Table C1, annual mean NO₂ concentrations were below the relevant AQO at all receptor locations considered.

Predicted impacts on annual mean NO₂ concentrations are summarised in Table C2.

Table C2: Predicted NO₂ Impacts

Potential Impact		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R1	5 Chapel Lane	1.93	75% or Less of AQO	Negligible
R2	2 Chapel Lane	1.65	75% or Less of AQO	Negligible
R3	91 Chapel Lane	2.80	75% or Less of AQO	Negligible
R4	6 Chapel Lane	1.45	75% or Less of AQO	Negligible
R5	26 Chapel Lane	0.70	75% or Less of AQO	Negligible
R6	1 Ash Priors	0.50	75% or Less of AQO	Negligible
R7	74 Prescott Road	0.68	75% or Less of AQO	Negligible
R8	44 Poleacre Drive	1.00	75% or Less of AQO	Negligible
R9	413 Cronton Road	1.28	75% or Less of AQO	Negligible
R10	377 Cronton Road	0.78	75% or Less of AQO	Negligible
R11	433-435 Cronton Road	1.00	75% or Less of AQO	Negligible
R12	432 Cronton Road	1.45	75% or Less of AQO	Negligible
R13	1 Hall Lane	0.83	75% or Less of AQO	Negligible
R14	Cronton Sixth Form College	0.52	75% or Less of AQO	Negligible
R15	87 Cronton Lane	0.75	75% or Less of AQO	Negligible
R16	25 Cronton Road	0.83	75% or Less of AQO	Negligible
R17	14 Cronton Road	0.55	75% or Less of AQO	Negligible
R18	166 Lunts Heath Road	0.73	75% or Less of AQO	Negligible
R19	267 Lunts Heath Road	0.45	75% or Less of AQO	Negligible
R20	46 Lunts Heath Road	0.50	75% or Less of AQO	Negligible
R21	5 Prescott Road	0.67	75% or Less of AQO	Negligible
R22	2 Prescot Road	0.93	75% or Less of AQO	Negligible
R23	8 Hale Road	0.38	75% or Less of AQO	Negligible
R24	3 Hale Road	0.35	75% or Less of AQO	Negligible
R25	17 Liverpool Road	0.50	75% or Less of AQO	Negligible
R26	147 Liverpool Road	0.25	75% or Less of AQO	Negligible

Potential Impact		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R27	108 Liverpool Road	0.35	75% or Less of AQO	Negligible
R28	49 Three Crowns Close	0.23	75% or Less of AQO	Negligible
R29	110 Leigh Avenue	0.25	75% or Less of AQO	Negligible
R30	101 Leigh Avenue	0.25	75% or Less of AQO	Negligible
R31	St Bede's Catholic Infant School	0.43	75% or Less of AQO	Negligible
R32	27 Leigh Avenue	0.25	75% or Less of AQO	Negligible
R33	26 Deacon Road	0.27	75% or Less of AQO	Negligible
R34	13 Deacon Road	0.58	75% or Less of AQO	Negligible

As indicated in Table C2 impacts on annual mean NO₂ concentrations as a result of road vehicle exhaust emissions associated with the development were predicted to be **negligible** at all receptor locations. It is therefore considered that the overall impacts as a result of the proposed development are **not significant**. Further justifications are discussed in Section 5.2.3 of the main report.

Particulate Matter (PM₁₀)

Annual mean PM₁₀ concentrations were predicted for 2024 DM and DS scenarios and are summarised Table C3.

Table C3: Predicted Annual Mean PM₁₀ Concentrations

Potential Impact		Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)		
		DM	DS	Change
R1	5 Chapel Lane	12.54	12.76	0.22
R2	2 Chapel Lane	12.30	12.49	0.19
R3	91 Chapel Lane	12.81	13.14	0.33
R4	6 Chapel Lane	12.37	12.54	0.17
R5	26 Chapel Lane	12.35	12.43	0.08
R6	1 Ash Priors	12.25	12.31	0.06
R7	74 Prescott Road	12.48	12.56	0.08
R8	44 Poleacre Drive	13.57	13.68	0.11
R9	413 Cronton Road	12.63	12.77	0.14
R10	377 Cronton Road	12.29	12.38	0.09
R11	433-435 Cronton Road	12.77	12.88	0.11
R12	432 Cronton Road	12.85	13.01	0.16
R13	1 Hall Lane	12.62	12.71	0.09
R14	Cronton Sixth Form College	12.54	12.60	0.06
R15	87 Cronton Lane	13.19	13.28	0.09
R16	25 Cronton Road	13.51	13.61	0.10
R17	14 Cronton Road	12.74	12.81	0.07

Potential Impact		Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)		
		DM	DS	Change
R18	166 Lunts Heath Road	14.40	14.48	0.08
R19	267 Lunts Heath Road	13.27	13.32	0.05
R20	46 Lunts Heath Road	13.22	13.27	0.05
R21	5 Prescott Road	13.12	13.19	0.07
R22	2 Prescot Road	13.51	13.62	0.11
R23	8 Hale Road	12.93	12.98	0.05
R24	3 Hale Road	12.92	12.96	0.04
R25	17 Liverpool Road	13.08	13.14	0.06
R26	147 Liverpool Road	12.17	12.20	0.03
R27	108 Liverpool Road	12.59	12.63	0.04
R28	49 Three Crowns Close	12.13	12.16	0.03
R29	110 Leigh Avenue	13.24	13.27	0.03
R30	101 Leigh Avenue	13.23	13.26	0.03
R31	St Bede's Catholic Infant School	13.94	13.99	0.05
R32	27 Leigh Avenue	13.22	13.25	0.03
R33	26 Deacon Road	13.38	13.41	0.03
R34	13 Deacon Road	14.71	14.78	0.07

As indicated in Table C3 annual mean PM₁₀ concentrations were below the relevant AQO at all receptor locations considered.

Predicted impacts on annual mean PM₁₀ concentrations are summarised in Table C4.

Table C4: Predicted PM₁₀ Impacts

Potential Impact		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R1	5 Chapel Lane	0.55	75% or Less of AQO	Negligible
R2	2 Chapel Lane	0.47	75% or Less of AQO	Negligible
R3	91 Chapel Lane	0.83	75% or Less of AQO	Negligible
R4	6 Chapel Lane	0.43	75% or Less of AQO	Negligible
R5	26 Chapel Lane	0.20	75% or Less of AQO	Negligible
R6	1 Ash Priors	0.15	75% or Less of AQO	Negligible
R7	74 Prescott Road	0.20	75% or Less of AQO	Negligible
R8	44 Poleacre Drive	0.27	75% or Less of AQO	Negligible
R9	413 Cronton Road	0.35	75% or Less of AQO	Negligible
R10	377 Cronton Road	0.23	75% or Less of AQO	Negligible
R11	433-435 Cronton Road	0.28	75% or Less of AQO	Negligible
R12	432 Cronton Road	0.40	75% or Less of AQO	Negligible

Potential Impact		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R13	1 Hall Lane	0.23	75% or Less of AQO	Negligible
R14	Cronton Sixth Form College	0.15	75% or Less of AQO	Negligible
R15	87 Cronton Lane	0.23	75% or Less of AQO	Negligible
R16	25 Cronton Road	0.25	75% or Less of AQO	Negligible
R17	14 Cronton Road	0.18	75% or Less of AQO	Negligible
R18	166 Lunts Heath Road	0.20	75% or Less of AQO	Negligible
R19	267 Lunts Heath Road	0.13	75% or Less of AQO	Negligible
R20	46 Lunts Heath Road	0.12	75% or Less of AQO	Negligible
R21	5 Prescott Road	0.18	75% or Less of AQO	Negligible
R22	2 Prescot Road	0.27	75% or Less of AQO	Negligible
R23	8 Hale Road	0.13	75% or Less of AQO	Negligible
R24	3 Hale Road	0.10	75% or Less of AQO	Negligible
R25	17 Liverpool Road	0.15	75% or Less of AQO	Negligible
R26	147 Liverpool Road	0.07	75% or Less of AQO	Negligible
R27	108 Liverpool Road	0.10	75% or Less of AQO	Negligible
R28	49 Three Crowns Close	0.07	75% or Less of AQO	Negligible
R29	110 Leigh Avenue	0.07	75% or Less of AQO	Negligible
R30	101 Leigh Avenue	0.07	75% or Less of AQO	Negligible
R31	St Bede's Catholic Infant School	0.13	75% or Less of AQO	Negligible
R32	27 Leigh Avenue	0.07	75% or Less of AQO	Negligible
R33	26 Deacon Road	0.07	75% or Less of AQO	Negligible
R34	13 Deacon Road	0.17	75% or Less of AQO	Negligible

As indicated in Table C4 impacts on annual mean PM₁₀ concentrations as a result of road vehicle exhaust emissions associated with the development were predicted to be **negligible** at all receptor locations. It is therefore considered that the overall impacts as a result of the Proposed Development are **not significant**. Further justifications are discussed in Section 5.2.3 of the main report.

Particulate Matter (PM_{2.5})

Annual mean PM_{2.5} concentrations were predicted for 2024 DM and DS scenarios and are summarised Table C5.

Table C5: Predicted Annual Mean PM_{2.5} Concentrations

Potential Impact		Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)		
		DM	DS	Change
R1	5 Chapel Lane	7.99	8.11	0.12
R2	2 Chapel Lane	7.85	7.96	0.11
R3	91 Chapel Lane	8.42	8.60	0.18

Potential Impact		Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)		
		DM	DS	Change
R4	6 Chapel Lane	8.17	8.27	0.10
R5	26 Chapel Lane	8.16	8.20	0.04
R6	1 Ash Priors	8.10	8.13	0.03
R7	74 Prescott Road	8.23	8.28	0.05
R8	44 Poleacre Drive	9.20	9.26	0.06
R9	413 Cronton Road	8.04	8.12	0.08
R10	377 Cronton Road	7.85	7.89	0.04
R11	433-435 Cronton Road	8.11	8.18	0.07
R12	432 Cronton Road	8.17	8.26	0.09
R13	1 Hall Lane	8.03	8.08	0.05
R14	Cronton Sixth Form College	8.12	8.15	0.03
R15	87 Cronton Lane	8.49	8.54	0.05
R16	25 Cronton Road	8.66	8.72	0.06
R17	14 Cronton Road	8.23	8.27	0.04
R18	166 Lunts Heath Road	9.05	9.09	0.04
R19	267 Lunts Heath Road	8.41	8.44	0.03
R20	46 Lunts Heath Road	8.38	8.41	0.03
R21	5 Prescott Road	8.93	8.98	0.05
R22	2 Prescot Road	9.16	9.22	0.06
R23	8 Hale Road	8.83	8.85	0.02
R24	3 Hale Road	8.82	8.84	0.02
R25	17 Liverpool Road	8.75	8.78	0.03
R26	147 Liverpool Road	8.24	8.26	0.02
R27	108 Liverpool Road	8.47	8.50	0.03
R28	49 Three Crowns Close	8.22	8.23	0.01
R29	110 Leigh Avenue	9.24	9.25	0.01
R30	101 Leigh Avenue	9.23	9.25	0.02
R31	St Bede's Catholic Infant School	9.63	9.66	0.03
R32	27 Leigh Avenue	9.22	9.24	0.02
R33	26 Deacon Road	9.31	9.33	0.02
R34	13 Deacon Road	10.06	10.10	0.04

As indicated in Table C5 annual mean PM_{2.5} concentrations were below the relevant AQO at all receptor locations considered.

Predicted impacts on annual mean PM_{2.5} concentrations are summarised in Table C6.

Table C6: Predicted PM_{2.5} Impacts

Potential Impact		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R1	5 Chapel Lane	0.48	75% or Less of AQO	Negligible
R2	2 Chapel Lane	0.44	75% or Less of AQO	Negligible
R3	91 Chapel Lane	0.72	75% or Less of AQO	Negligible
R4	6 Chapel Lane	0.40	75% or Less of AQO	Negligible
R5	26 Chapel Lane	0.16	75% or Less of AQO	Negligible
R6	1 Ash Priors	0.12	75% or Less of AQO	Negligible
R7	74 Prescott Road	0.20	75% or Less of AQO	Negligible
R8	44 Poleacre Drive	0.24	75% or Less of AQO	Negligible
R9	413 Cronton Road	0.32	75% or Less of AQO	Negligible
R10	377 Cronton Road	0.16	75% or Less of AQO	Negligible
R11	433-435 Cronton Road	0.28	75% or Less of AQO	Negligible
R12	432 Cronton Road	0.36	75% or Less of AQO	Negligible
R13	1 Hall Lane	0.20	75% or Less of AQO	Negligible
R14	Cronton Sixth Form College	0.12	75% or Less of AQO	Negligible
R15	87 Cronton Lane	0.20	75% or Less of AQO	Negligible
R16	25 Cronton Road	0.24	75% or Less of AQO	Negligible
R17	14 Cronton Road	0.16	75% or Less of AQO	Negligible
R18	166 Lunts Heath Road	0.16	75% or Less of AQO	Negligible
R19	267 Lunts Heath Road	0.12	75% or Less of AQO	Negligible
R20	46 Lunts Heath Road	0.12	75% or Less of AQO	Negligible
R21	5 Prescott Road	0.20	75% or Less of AQO	Negligible
R22	2 Prescot Road	0.24	75% or Less of AQO	Negligible
R23	8 Hale Road	0.08	75% or Less of AQO	Negligible
R24	3 Hale Road	0.08	75% or Less of AQO	Negligible
R25	17 Liverpool Road	0.12	75% or Less of AQO	Negligible
R26	147 Liverpool Road	0.08	75% or Less of AQO	Negligible
R27	108 Liverpool Road	0.12	75% or Less of AQO	Negligible
R28	49 Three Crowns Close	0.04	75% or Less of AQO	Negligible
R29	110 Leigh Avenue	0.04	75% or Less of AQO	Negligible
R30	101 Leigh Avenue	0.08	75% or Less of AQO	Negligible
R31	St Bede's Catholic Infant School	0.12	75% or Less of AQO	Negligible
R32	27 Leigh Avenue	0.08	75% or Less of AQO	Negligible
R33	26 Deacon Road	0.08	75% or Less of AQO	Negligible
R34	13 Deacon Road	0.16	75% or Less of AQO	Negligible

As indicated in Table C6 impacts on annual mean PM_{2.5} concentrations as a result of road vehicle exhaust emissions associated with the development were predicted to be **negligible** at all receptor locations. It is therefore considered that the overall impacts as a result of the Proposed Development are **not significant**. Further justifications are discussed in Section 5.2.3.

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APPENDIX D – SENSITIVITY ANALYSIS RESULTS

Predicted Concentrations at Sensitive Receptors – 2019 Emissions

Sensitivity analysis was undertaken to assess associated road vehicle exhaust emissions impacts based on the use of 2024 traffic data using 2019 emission factors. The use of 2019 emission factors assumes that vehicle emission factors will not improve in line with current predictions and future emission factors will remain consistent with those predicted for the baseline year. This ensures a worst-case scenario.

The results are detailed in the following Sections.

Nitrogen Dioxide (NO₂)

Annual mean NO₂ concentrations were predicted for 2024 DM and DS scenarios and are summarised in Table D1.

Table D1: Predicted Annual Mean NO₂ Concentrations

Potential Impact		Predicted Annual Mean NO ₂ Concentration (µg/m ³)		
		DM	DS	Change
R1	5 Chapel Lane	19.47	20.67	1.20
R2	2 Chapel Lane	17.85	18.88	1.03
R3	91 Chapel Lane	18.34	20.07	1.73
R4	6 Chapel Lane	15.98	16.89	0.91
R5	26 Chapel Lane	15.87	16.32	0.45
R6	1 Ash Priors	15.36	15.68	0.32
R7	74 Prescott Road	16.84	17.26	0.42
R8	44 Poleacre Drive	24.87	25.49	0.62
R9	413 Cronton Road	19.96	20.74	0.78
R10	377 Cronton Road	17.63	18.10	0.47
R11	433-435 Cronton Road	20.23	20.85	0.62
R12	432 Cronton Road	21.57	22.46	0.89
R13	1 Hall Lane	19.39	19.90	0.51
R14	Cronton Sixth Form College	20.63	20.95	0.32
R15	87 Cronton Lane	24.08	24.54	0.46
R16	25 Cronton Road	25.91	26.41	0.50
R17	14 Cronton Road	21.79	22.13	0.34
R18	166 Lunts Heath Road	28.93	29.37	0.44
R19	267 Lunts Heath Road	22.21	22.49	0.28
R20	46 Lunts Heath Road	21.61	21.92	0.31
R21	5 Prescott Road	21.42	21.83	0.41
R22	2 Prescot Road	23.61	24.17	0.56
R23	8 Hale Road	19.83	20.05	0.22
R24	3 Hale Road	19.74	19.97	0.23
R25	17 Liverpool Road	23.12	23.42	0.30
R26	147 Liverpool Road	18.23	18.38	0.15

Potential Impact		Predicted Annual Mean NO ₂ Concentration (µg/m ³)		
		DM	DS	Change
R27	108 Liverpool Road	20.48	20.70	0.22
R28	49 Three Crowns Close	17.98	18.12	0.14
R29	110 Leigh Avenue	19.94	20.10	0.16
R30	101 Leigh Avenue	19.91	20.07	0.16
R31	St Bede's Catholic Infant School	24.51	24.78	0.27
R32	27 Leigh Avenue	20.01	20.16	0.15
R33	26 Deacon Road	21.01	21.18	0.17
R34	13 Deacon Road	27.94	28.29	0.35

As indicated in Table D1, annual mean NO₂ concentrations were below the relevant AQO at all receptor locations considered.

Predicted impacts on annual mean NO₂ concentrations are summarised in Table D2.

Table D2: Predicted NO₂ Impacts

Potential Impact		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R1	5 Chapel Lane	3.00	75% or Less of AQO	Negligible
R2	2 Chapel Lane	2.57	75% or Less of AQO	Negligible
R3	91 Chapel Lane	4.33	75% or Less of AQO	Negligible
R4	6 Chapel Lane	2.28	75% or Less of AQO	Negligible
R5	26 Chapel Lane	1.13	75% or Less of AQO	Negligible
R6	1 Ash Priors	0.80	75% or Less of AQO	Negligible
R7	74 Prescott Road	1.05	75% or Less of AQO	Negligible
R8	44 Poleacre Drive	1.55	75% or Less of AQO	Negligible
R9	413 Cronton Road	1.95	75% or Less of AQO	Negligible
R10	377 Cronton Road	1.18	75% or Less of AQO	Negligible
R11	433-435 Cronton Road	1.55	75% or Less of AQO	Negligible
R12	432 Cronton Road	2.23	75% or Less of AQO	Negligible
R13	1 Hall Lane	1.28	75% or Less of AQO	Negligible
R14	Cronton Sixth Form College	0.80	75% or Less of AQO	Negligible
R15	87 Cronton Lane	1.15	75% or Less of AQO	Negligible
R16	25 Cronton Road	1.25	75% or Less of AQO	Negligible
R17	14 Cronton Road	0.85	75% or Less of AQO	Negligible
R18	166 Lunts Heath Road	1.10	75% or Less of AQO	Negligible
R19	267 Lunts Heath Road	0.70	75% or Less of AQO	Negligible
R20	46 Lunts Heath Road	0.78	75% or Less of AQO	Negligible
R21	5 Prescott Road	1.02	75% or Less of AQO	Negligible

Potential Impact		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R22	2 Prescott Road	1.40	75% or Less of AQO	Negligible
R23	8 Hale Road	0.55	75% or Less of AQO	Negligible
R24	3 Hale Road	0.58	75% or Less of AQO	Negligible
R25	17 Liverpool Road	0.75	75% or Less of AQO	Negligible
R26	147 Liverpool Road	0.37	75% or Less of AQO	Negligible
R27	108 Liverpool Road	0.55	75% or Less of AQO	Negligible
R28	49 Three Crowns Close	0.35	75% or Less of AQO	Negligible
R29	110 Leigh Avenue	0.40	75% or Less of AQO	Negligible
R30	101 Leigh Avenue	0.40	75% or Less of AQO	Negligible
R31	St Bede's Catholic Infant School	0.67	75% or Less of AQO	Negligible
R32	27 Leigh Avenue	0.37	75% or Less of AQO	Negligible
R33	26 Deacon Road	0.42	75% or Less of AQO	Negligible
R34	13 Deacon Road	0.87	75% or Less of AQO	Negligible

As indicated in Table D2 impacts on annual mean NO₂ concentrations as a result of road vehicle exhaust emissions associated with the development were predicted to be **not significant** at all receptor locations.

Particulate Matter (PM₁₀)

Annual mean PM₁₀ concentrations were predicted for 2024 DM and DS scenarios and are summarised Table D3.

Table D3: Predicted Annual Mean PM₁₀ Concentrations

Potential Impact		Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)		
		DM	DS	Change
R1	5 Chapel Lane	13.26	13.49	0.23
R2	2 Chapel Lane	13.01	13.21	0.20
R3	91 Chapel Lane	13.54	13.88	0.34
R4	6 Chapel Lane	13.08	13.26	0.18
R5	26 Chapel Lane	13.06	13.14	0.08
R6	1 Ash Priors	12.95	13.02	0.07
R7	74 Prescott Road	13.20	13.29	0.09
R8	44 Poleacre Drive	14.40	14.51	0.11
R9	413 Cronton Road	13.36	13.51	0.15
R10	377 Cronton Road	12.99	13.08	0.09
R11	433-435 Cronton Road	13.49	13.62	0.13
R12	432 Cronton Road	13.60	13.76	0.16
R13	1 Hall Lane	13.34	13.44	0.10
R14	Cronton Sixth Form College	13.26	13.33	0.07

Potential Impact		Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)		
		DM	DS	Change
R15	87 Cronton Lane	13.95	14.04	0.09
R16	25 Cronton Road	14.28	14.39	0.11
R17	14 Cronton Road	13.48	13.55	0.07
R18	166 Lunts Heath Road	15.21	15.30	0.09
R19	267 Lunts Heath Road	14.02	14.07	0.05
R20	46 Lunts Heath Road	13.95	14.01	0.06
R21	5 Prescott Road	13.91	13.98	0.07
R22	2 Prescot Road	14.32	14.43	0.11
R23	8 Hale Road	13.71	13.75	0.04
R24	3 Hale Road	13.70	13.74	0.04
R25	17 Liverpool Road	13.85	13.92	0.07
R26	147 Liverpool Road	12.90	12.93	0.03
R27	108 Liverpool Road	13.34	13.38	0.04
R28	49 Three Crowns Close	12.86	12.89	0.03
R29	110 Leigh Avenue	14.01	14.04	0.03
R30	101 Leigh Avenue	14.00	14.03	0.03
R31	St Bede's Catholic Infant School	14.75	14.80	0.05
R32	27 Leigh Avenue	13.99	14.02	0.03
R33	26 Deacon Road	14.16	14.19	0.03
R34	13 Deacon Road	15.55	15.63	0.08

As indicated in Table D3 annual mean PM₁₀ concentrations were below the relevant AQO at all receptor locations considered.

Predicted impacts on annual mean PM₁₀ concentrations are summarised in Table D4.

Table D4: Predicted PM₁₀ Impacts

Potential Impact		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R1	5 Chapel Lane	0.58	75% or Less of AQO	Negligible
R2	2 Chapel Lane	0.50	75% or Less of AQO	Negligible
R3	91 Chapel Lane	0.85	75% or Less of AQO	Negligible
R4	6 Chapel Lane	0.45	75% or Less of AQO	Negligible
R5	26 Chapel Lane	0.20	75% or Less of AQO	Negligible
R6	1 Ash Priors	0.18	75% or Less of AQO	Negligible
R7	74 Prescott Road	0.23	75% or Less of AQO	Negligible
R8	44 Poleacre Drive	0.27	75% or Less of AQO	Negligible
R9	413 Cronton Road	0.38	75% or Less of AQO	Negligible

Potential Impact		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R10	377 Cronton Road	0.23	75% or Less of AQO	Negligible
R11	433-435 Cronton Road	0.32	75% or Less of AQO	Negligible
R12	432 Cronton Road	0.40	75% or Less of AQO	Negligible
R13	1 Hall Lane	0.25	75% or Less of AQO	Negligible
R14	Cronton Sixth Form College	0.18	75% or Less of AQO	Negligible
R15	87 Cronton Lane	0.23	75% or Less of AQO	Negligible
R16	25 Cronton Road	0.28	75% or Less of AQO	Negligible
R17	14 Cronton Road	0.18	75% or Less of AQO	Negligible
R18	166 Lunts Heath Road	0.23	75% or Less of AQO	Negligible
R19	267 Lunts Heath Road	0.13	75% or Less of AQO	Negligible
R20	46 Lunts Heath Road	0.15	75% or Less of AQO	Negligible
R21	5 Prescott Road	0.18	75% or Less of AQO	Negligible
R22	2 Prescot Road	0.27	75% or Less of AQO	Negligible
R23	8 Hale Road	0.10	75% or Less of AQO	Negligible
R24	3 Hale Road	0.10	75% or Less of AQO	Negligible
R25	17 Liverpool Road	0.18	75% or Less of AQO	Negligible
R26	147 Liverpool Road	0.07	75% or Less of AQO	Negligible
R27	108 Liverpool Road	0.10	75% or Less of AQO	Negligible
R28	49 Three Crowns Close	0.08	75% or Less of AQO	Negligible
R29	110 Leigh Avenue	0.07	75% or Less of AQO	Negligible
R30	101 Leigh Avenue	0.07	75% or Less of AQO	Negligible
R31	St Bede's Catholic Infant School	0.13	75% or Less of AQO	Negligible
R32	27 Leigh Avenue	0.07	75% or Less of AQO	Negligible
R33	26 Deacon Road	0.07	75% or Less of AQO	Negligible
R34	13 Deacon Road	0.20	75% or Less of AQO	Negligible

As indicated in Table D4 impacts on annual mean PM₁₀ concentrations as a result of road vehicle exhaust emissions associated with the development were predicted to be **negligible** at all receptor locations.

Particulate Matter (PM_{2.5})

Annual mean PM_{2.5} concentrations were predicted for 2024 DM and DS scenarios and are summarised Table D5.

Table D5: Predicted Annual Mean PM_{2.5} Concentrations

Potential Impact		Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)		
		DM	DS	Change
R1	5 Chapel Lane	8.56	8.69	0.13
R2	2 Chapel Lane	8.41	8.53	0.12

Potential Impact		Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)		
		DM	DS	Change
R3	91 Chapel Lane	8.98	9.18	0.20
R4	6 Chapel Lane	8.71	8.82	0.11
R5	26 Chapel Lane	8.70	8.75	0.05
R6	1 Ash Priors	8.64	8.67	0.03
R7	74 Prescott Road	8.79	8.83	0.04
R8	44 Poleacre Drive	9.84	9.91	0.07
R9	413 Cronton Road	8.62	8.70	0.08
R10	377 Cronton Road	8.40	8.45	0.05
R11	433-435 Cronton Road	8.69	8.76	0.07
R12	432 Cronton Road	8.76	8.86	0.10
R13	1 Hall Lane	8.60	8.66	0.06
R14	Cronton Sixth Form College	8.69	8.73	0.04
R15	87 Cronton Lane	9.09	9.14	0.05
R16	25 Cronton Road	9.28	9.35	0.07
R17	14 Cronton Road	8.82	8.86	0.04
R18	166 Lunts Heath Road	9.71	9.76	0.05
R19	267 Lunts Heath Road	9.00	9.03	0.03
R20	46 Lunts Heath Road	8.96	9.00	0.04
R21	5 Prescott Road	9.54	9.59	0.05
R22	2 Prescot Road	9.79	9.85	0.06
R23	8 Hale Road	9.42	9.45	0.03
R24	3 Hale Road	9.41	9.44	0.03
R25	17 Liverpool Road	9.36	9.40	0.04
R26	147 Liverpool Road	8.81	8.82	0.01
R27	108 Liverpool Road	9.06	9.09	0.03
R28	49 Three Crowns Close	8.78	8.80	0.02
R29	110 Leigh Avenue	9.83	9.85	0.02
R30	101 Leigh Avenue	9.83	9.84	0.01
R31	St Bede's Catholic Infant School	10.27	10.30	0.03
R32	27 Leigh Avenue	9.82	9.84	0.02
R33	26 Deacon Road	9.92	9.94	0.02
R34	13 Deacon Road	10.73	10.77	0.04

As indicated in Table D5 annual mean PM_{2.5} concentrations were below the relevant AQO at all receptor locations considered.

Predicted impacts on annual mean PM_{2.5} concentrations are summarised in Table D6.

Table D6: Predicted PM_{2.5} Impacts

Potential Impact		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R1	5 Chapel Lane	0.52	75% or Less of AQO	Negligible
R2	2 Chapel Lane	0.48	75% or Less of AQO	Negligible
R3	91 Chapel Lane	0.80	75% or Less of AQO	Negligible
R4	6 Chapel Lane	0.44	75% or Less of AQO	Negligible
R5	26 Chapel Lane	0.20	75% or Less of AQO	Negligible
R6	1 Ash Priors	0.12	75% or Less of AQO	Negligible
R7	74 Prescott Road	0.16	75% or Less of AQO	Negligible
R8	44 Poleacre Drive	0.28	75% or Less of AQO	Negligible
R9	413 Cronton Road	0.32	75% or Less of AQO	Negligible
R10	377 Cronton Road	0.20	75% or Less of AQO	Negligible
R11	433-435 Cronton Road	0.28	75% or Less of AQO	Negligible
R12	432 Cronton Road	0.40	75% or Less of AQO	Negligible
R13	1 Hall Lane	0.24	75% or Less of AQO	Negligible
R14	Cronton Sixth Form College	0.16	75% or Less of AQO	Negligible
R15	87 Cronton Lane	0.20	75% or Less of AQO	Negligible
R16	25 Cronton Road	0.28	75% or Less of AQO	Negligible
R17	14 Cronton Road	0.16	75% or Less of AQO	Negligible
R18	166 Lunts Heath Road	0.20	75% or Less of AQO	Negligible
R19	267 Lunts Heath Road	0.12	75% or Less of AQO	Negligible
R20	46 Lunts Heath Road	0.16	75% or Less of AQO	Negligible
R21	5 Prescott Road	0.20	75% or Less of AQO	Negligible
R22	2 Prescot Road	0.24	75% or Less of AQO	Negligible
R23	8 Hale Road	0.12	75% or Less of AQO	Negligible
R24	3 Hale Road	0.12	75% or Less of AQO	Negligible
R25	17 Liverpool Road	0.16	75% or Less of AQO	Negligible
R26	147 Liverpool Road	0.04	75% or Less of AQO	Negligible
R27	108 Liverpool Road	0.12	75% or Less of AQO	Negligible
R28	49 Three Crowns Close	0.08	75% or Less of AQO	Negligible
R29	110 Leigh Avenue	0.08	75% or Less of AQO	Negligible
R30	101 Leigh Avenue	0.04	75% or Less of AQO	Negligible
R31	St Bede's Catholic Infant School	0.12	75% or Less of AQO	Negligible
R32	27 Leigh Avenue	0.08	75% or Less of AQO	Negligible
R33	26 Deacon Road	0.08	75% or Less of AQO	Negligible
R34	13 Deacon Road	0.16	75% or Less of AQO	Negligible

As indicated in Table D6 impacts on annual mean PM_{2.5} concentrations as a result of road vehicle exhaust emissions associated with the development were predicted to be **negligible** at all receptor locations.

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APPENDIX E – CONSTRUCTION PHASE ASSESSMENT CRITERIA

CONSTRUCTION PHASE METHODOLOGY

There is the potential for fugitive dust emissions to occur as a result of construction phase activities. These have been assessed in accordance with the methodology outlined within the Institute of Air Quality Management (IAQM) document 'Guidance on the Assessment of Dust from Demolition and Construction'³.

Activities are divided into four types to reflect their different potential impacts. These are:

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

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

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

The assessment steps are detailed below.

Step 1

Step 1 screens the requirement for a more detailed assessment. Should human receptors be identified within 350m from the site boundary or 50m from the construction vehicle route up to 500m from the site entrance, then the assessment should proceed to Step 2. Additionally, should ecological receptors be identified within 50m of the boundary site or 50m from the construction vehicle route up to 500m from the site entrance, then the assessment should also proceed to Step 2.

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

Step 2

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

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

The two factors are combined in Step 2C to determine the risk of dust impacts without mitigation applied. Step 2A defines the potential magnitude of dust emission through the construction phase. The relevant criteria are summarised in Table E1.

Table E1: Construction Dust - Magnitude of Emission

Magnitude	Activity	Criteria
Large	Demolition	• Total building volume greater than 50,000m³ • Potentially dusty construction material (e.g. concrete) • On-site crushing and screening • Demolition activities greater than 20m above ground level
	Earthworks	• Total site area greater than 10,000m² • Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) • More than 10 heavy earth moving vehicles active at any one time

Magnitude	Activity	Criteria
		- Formation of bunds greater than 8m in height - More than 100,000 tonnes of material moved
	Construction	- Total building volume greater than 100,000m³ - On site concrete batching - Sandblasting
	Trackout	- More than 50 Heavy Duty Vehicle (HDV) trips per day - Potentially dusty surface material (e.g. high clay content) - Unpaved road length greater than 100m
Medium	Demolition	- Total building volume 20,000m³ to 50,000m³ - Potentially dusty construction material - Demolition activities 10m to 20m above ground level
	Earthworks	- Total site area 2,500m² to 10,000m² - Moderately dusty soil type (e.g. silt) 5 to 10 heavy earth moving vehicles active at any one time - Formation of bunds 4m to 8m in height - Total material moved 20,000 tonnes to 100,000 tonnes
	Construction	- Total building volume 25,000m³ to 100,000m³ - Potentially dusty construction material (e.g. concrete) - On site concrete batching
	Trackout	10 to 50 HDV trips per day - Moderately dusty surface material (e.g. high clay content) - Unpaved road length 50m to 100m
Small	Demolition	- Total building volume under 20,000m³ - Construction material with low potential for dust release (e.g. metal cladding or timber) - Demolition activities less than 10m above ground level - Demolition during wetter months
	Earthworks	- Total site area less than 2,500m² - Soil type with large grain size (e.g. sand) - Less than 5 heavy earth moving vehicles active at any one time - Formation of bunds less than 4m in height - Total material moved less than 20,000 tonnes - Earthworks during wetter months
	Construction	- Total building volume less than 25,000m³ - Construction material with low potential for dust release (e.g. metal cladding or timber)
	Trackout	<10 HDV (3.5t) outward movements in any one day - Surface material with low potential for dust release - Unpaved road length <50m

Step 2B defines the sensitivity of the area around the development site for construction, earthworks and trackout. The factors influencing the sensitivity of the area are shown in Table E2.

Table E2: Examples of Factors Defining Sensitivity of an Area

Sensitivity	Examples	
	Human Receptors	Ecological Receptors
High	- Users expect of high levels of amenity - High aesthetic or value property - People expected to be present continuously for extended periods of time	Internationally or nationally designated site e.g. Special Area of Conservation

Sensitivity	Examples	
	Human Receptors	Ecological Receptors
	Locations where members of the public are exposed over a time period relevant to the AQO for PM₁₀ e.g. residential properties, hospitals, schools and residential care homes	
Medium	- Users would expect to enjoy a reasonable level of amenity - Aesthetics or value of their property could be diminished by soiling - People or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land e.g. parks and places of work	Nationally designated site e.g. Sites of Special Scientific Interest
Low	- Enjoyment of amenity would not reasonably be expected - Property would not be expected to be diminished in appearance - Transient exposure, where people would only be expected to be present for limited periods. e.g. public footpaths, playing fields, shopping streets, playing fields, farmland, footpaths, short term car park and roads	Locally designated site e.g. Local Nature Reserve

The guidance also provides the following factors to consider when determining the sensitivity of an area to potential dust impacts during the construction phase:

- Any history of dust generating activities in the area;
- The likelihood of concurrent dust generating activity on nearby sites;
- Any pre-existing screening between the source and the receptors;
- Any conclusions drawn from analysing local meteorological data which accurately represent the area; and if relevant the season during which works will take place;
- Any conclusions drawn from local topography;
- Duration of the potential impact, as a receptor may become more sensitive over time; and
- Any known specific receptor sensitivities which go beyond the classifications given in the document.

These factors were considered in the undertaking of this assessment.

The sensitivity of the area to dust soiling effects on people and property is shown in Table E3.

Table E3: Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		Less than 20	Less than 50	Less than 100	Less than 350
High	More than 100	High	High	Medium	Low
	10 - 100	High	Medium	Low	Low
	1 - 10	Medium	Low	Low	Low
Medium	More than 1	Medium	Low	Low	Low
Low	More than 1	Low	Low	Low	Low

Table E4 outlines the sensitivity of the area to human health impacts.

Table E4: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	Number of Receptors	Distance from the Source (m)				
			Less than 20	Less than 50	Less than 100	Less than 200	Less than 350
High	Greater than 32µg/m ³	More than 100	High	High	High	Medium	Low
		10 - 100	High	High	Medium	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	28 - 32µg/m ³	More than 100	High	High	Medium	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	24 - 28µg/m ³	More than 100	High	Medium	Low	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	Less than 24µg/m ³	More than 100	Medium	Low	Low	Low	Low
		10 - 100	Low	Low	Low	Low	Low
	Less than 24µg/m ³	More than 100	Medium	Low	Low	Low	Low
		10 - 100	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Medium	Greater than 32µg/m ³	More than 10	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	28 - 32µg/m ³	More than 10	Medium	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	24 - 28µg/m ³	More than 10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	Less than 24µg/m ³	More than 10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Low	-	More than 1	Low	Low	Low	Low	Low

Table E5 outlines the sensitivity of the area to ecological impacts.

Table E5: Sensitivity of the Area to Ecological Impacts

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

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

Table E6 outlines the risk category from demolition activities.

Table E6: Dust Risk Category from Demolition

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

Table E7 outlines the risk category from earthworks and construction activities.

Table E7: Dust Risk Category from Earthworks and Construction

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

Table E8 outlines the risk category from trackout.

Table E8: Dust Risk Category from Trackout

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

Step 3

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

Step 4

Once the risk of dust impacts has been determined and the appropriate mitigation measures identified, the final step is to determine the significance of any residual impacts. For almost all construction activity, the aim should be to control effects through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'.

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APPENDIX F – ASSESSORS CURRICULUM VITAE

RACHAEL HARRISON

Air Quality Consultant

BSc (Hons), AMIEnvSc, AIAQM

KEY EXPERIENCE

Rachael is an Environmental Consultant with specialist experience in the air quality sector. Her key capabilities include:

- Production of Air Quality Assessments to the Department for Environment, Food and Rural Affairs (DEFRA), Environment Agency and Environmental Protection UK (EPUK) methodologies for clients from the residential, retail and commercial sectors.
- Detailed dispersion modelling of road vehicle emissions using ADMS-Roads. Studies have included impact assessment of pollutant concentrations at various floor levels and assessment of suitability of development sites for proposed end-use.
- Assessment of dust impacts from construction sites to the Institute of Air Quality Management (IAQM) methodology.
- Assessment of Odour Impact from commercial and industrial processes in line with Environment Agency (EA) and IAQM methodologies and guidance
- Quantification of Ecological Impacts associated with Nitrogen and Acid Deposition from industrial processes
- Production of air quality mitigation strategies for developments throughout the UK.

SELECT PROJECTS SUMMARY

- Prescott Garden Centre - for a residential development of 227 dwellings.
- Keighley Road, Halifax – Air Quality assessment with dust and odour for residential development adjacent farm.
- New Bedford Road, Luton -AQA for residential redevelopment adjacent rail station
- Sovereign Crescent- AQA for ecological impacts on designated sites as a result of residential development.
- Banbury Magistrates Court – Production of AQA for redevelopment of existing building for residential use.
- Meat Market, Glasgow – AQA for development of residential units

ES Chapters

- Halsnead - Production of a number of ES chapters for large-scale residential developments
- Reading Metropolitan – Road, Rail and Energy Assessment for large-scale mixed use multi storey buildings
- Warburton Lane - EIA for a medium scale residential development within Manchester
- C02 Central Dock - EIA for a large scale residential development of 650 dwellings

Odour Assessments

- Wright Street, Renfrew – Quantitative odour assessment in support of a proposed residential development adjacent to a waste water treatment works.
- Optimus Point, Leicester - Qualitative assessment in support of a warehouse development in close proximity to existing vape production.
- Café Torelli, Kew - Kitchen odour risk assessment in support of a existing coffee shop and hot food takeaway.

London Experience

- The Bear Project - AQA for a mixed use development located within the Lewisham AQMA.
- Summerstown, Merton- AQA for a residential development located within the Merton AQMA and AQN Assessment
- Old Police Station - AQA for a residential development located within the Richmond AQMA
- Kings George's gate, Tolworth - AQA for mixed use scheme in AQMA in Kingston upon Thames, including an AQN and vertical slice modelling.
- Rotherhithe Street, Southwark - AQA for a residential development within the Southwark AQMA

Car Park Developments

- Radcliffe/Whitefield/Hollinwood Park & Rides – A series of extension to existing P&R facilities within Greater Manchester
- Beck Hill MSCP – Development of a multistorey car park in place of existing surface car park.
- Welwyn MSCP - Development of a multistorey car park in place of existing surface car park.

Monitoring & Surveying Experience

- Co-ordination and management of NO2 diffusion tube monitoring surveys in accordance with DEFRA guidance.
- Odour Acuity certified, undertaken numerous site sniff tests

QUALIFICATIONS

- Bachelor of Science
- Odour Acuity Certified Master of Science