



Air Quality Assessment
Proposed Residential Development,
Land off Main Road, Rhosrobin, Wrexham

Reference: 14-931-R1-1
Date: May 2021



AIR QUALITY ASSESSMENT

Proposed Residential Development
Land off Main Road, Rhosrobin,
Wrexham

Prepared for:
Castle Green Homes Limited

Report Ref: 14-931-R1-1
Date Issued: May 2021

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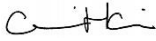
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1. INTRODUCTION

1.1. BACKGROUND

E3P has been commissioned by Castle Green Homes Limited to produce an Air Quality Assessment in support of the proposed residential development on land off Main Road, Rhosrobin, Wrexham.

The development has the potential to expose future residents to existing air quality issues due to the proximity of the site to the A483 and associated vehicle exhaust emissions. An Air Quality Assessment was therefore undertaken in order to determine baseline conditions and consider site suitability for the proposed end-use. This is detailed in the following report.

1.2. SITE LOCATION AND CONTEXT

The site is located on land off Main Road, Rhosrobin, at National Grid Reference (NGR): 333263, 352756. Reference should be made to Figure 1 for a map of the site and surrounding area.

The proposals comprise construction of circa 189 residential dwellings and associated infrastructure.

The development is located in close proximity to the A483. As such, concerns have been raised by Wrexham County Borough Council (WCBC) that future residents may be exposed to elevated pollution levels¹. An Air Quality Assessment was therefore undertaken in order to determine baseline conditions and consider site suitability for the proposed end-use.

1.3. LIMITATIONS

The limitations of this report are presented in Appendix II.

1.4. CONFIDENTIALITY

E3P 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 E3P; a charge may be levied against such approval.

¹ Memorandum P/2021/0135, Ian Jones, Public Protection Service Manager at WCBC, 29th March 2021.



2. LEGISLATION AND POLICY

2.1. LEGISLATION

The Air Quality Standards Regulations (2010) came into force on 11th June 2010 and include Air Quality Limit Values (AQLVs) for the following pollutants:

- ✳ Nitrogen dioxide (NO₂);
- ✳ Sulphur dioxide;
- ✳ Lead;
- ✳ Particulate matter with an aerodynamic diameter of less than 10µm (PM₁₀);
- ✳ Particulate matter with an aerodynamic diameter of less than 2.5µm;
- ✳ Benzene; and,
- ✳ Carbon monoxide.

Air Quality Target Values were also provided for an additional 5 pollutants.

Part IV of the Environment Act (1995) 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 the Department for Environment, Food and Rural Affairs (DEFRA) and published in July 2007². 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 exceedences over a specified timescale. These are generally in line with the AQLVs, although the requirements for the determination of compliance vary.

Table 2.1 presents the AQOs for pollutants considered within this assessment.

TABLE 2.1 AIR QUALITY OBJECTIVES

POLLUTANT	AIR QUALITY OBJECTIVE	
	Concentration (µg/m ³)	Averaging Period
NO ₂	40	Annual mean
	200	1-hour mean, not to be exceeded on more than 18 occasions per annum
PM ₁₀	40	Annual mean
	50	24-hour mean, not to be exceeded on more than 35 occasions per annum

Table 2.2 summarises the advice provided in DEFRA guidance³ on where the AQOs for pollutants considered within this report apply.

² The AQS for England, Scotland, Wales and Northern Ireland, DEFRA, 2007.

³ Local Air Quality Management Technical Guidance (TG16), DEFRA, 2021.



TABLE 2.2 EXAMPLES OF WHERE THE AIR QUALITY OBJECTIVES APPLY

AVERAGING PERIOD	OBJECTIVE SHOULD APPLY AT	OBJECTIVE SHOULD NOT APPLY AT
Annual mean	All locations where members of the public might be regularly exposed Building façades of residential properties, schools (including all of playgrounds), hospitals (and their grounds), care homes (and their grounds) 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 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	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
1-hour mean	All locations where the annual mean and 24 and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping street) 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 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

2.2. LOCAL AIR QUALITY MANAGEMENT

Under Section 82 of the Environment Act (1995) (Part IV) Local Authorities (LAs) are required to periodically review and assess air quality within their area of jurisdiction under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves comparing present and likely future pollutant concentrations against the AQOs. If it is predicted that levels at locations of relevant exposure, as summarised in Table 2.2, are likely to be exceeded, the LA is required to declare an Air Quality Management Area (AQMA). For each AQMA the LA is required to produce an Air Quality Action Plan (AQAP), the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

2.3. NATIONAL PLANNING POLICY

Planning Policy Wales⁴ was published in December 2018 and sets out the land use planning policies of the Welsh Government, including air quality. Chapter 6, Section 6.7 - Air Quality and Soundscape provides a framework for addressing air quality and states that:

⁴ Planning Policy Wales Edition 11, Welsh Assembly Government, 2021.



"The planning system should maximise its contribution to achieving the well-being goals, and in particular a healthier Wales, by aiming to reduce average population exposure to air and noise pollution alongside action to tackle high pollution hotspots. In doing so, it should consider the long-term effects of current and predicted levels of air and noise pollution on individuals, society and the environment and identify and pursue any opportunities to reduce, or at least, minimise population exposure to air and noise pollution, and improve soundscapes, where it is practical and feasible to do so.

[...]

In proposing new development, planning authorities and developers must, therefore:

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

This has been considered throughout this assessment.

2.4. LOCAL PLANNING POLICY

The Wrexham Unitary Development Plan⁵ (WUDP) was adopted by WCBC on 14th February 2005. A review of the WUDP identified the following policy which was relevant to this assessment:

"Policy GDP1

All new development should:-

[...]

f) Ensure the safety and amenity of the public and safeguard the environment from the adverse effects of pollution of water, land or air, hazards from industry and quarrying, and associated noise, odour or vibration arising from development.

[...]"

This policy has been considered throughout this assessment.

⁵

WUDP, WCBC, 2005.



3. BASELINE

3.1. INTRODUCTION

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

3.2. LOCAL AIR QUALITY MANAGEMENT

As required by the Environment Act (1995), WCBC has undertaken Review and Assessment of air quality within their area of jurisdiction. This process has indicated that concentration of air pollutants considered within the AQS are currently below the relevant AQOs. As such, no AQMAs have been designated within the county.

3.3. AIR QUALITY MONITORING

Monitoring of pollutant concentrations is undertaken by WCBC throughout their area of jurisdiction. Recent NO₂ results recorded in the vicinity of the development are shown in Table 3.1.

TABLE 3.1 MONITORING RESULTS NO₂

MONITORING SITE		MONITORED NO ₂ CONCENTRATION (µg/m ³)		
		2017	2018	2019
32	Sycamores	26.7	27.2	23.7
54	Pandy Lane ^(a)	-	-	22.7
56	Top Farm Road ^(a)	-	-	18.8

Note: (a) Monitor commissioned in 2019.

As shown in Table 3.1, annual mean NO₂ concentrations were below the AQO of 40µg/m³ at all monitoring locations in recent years. Reference should be made to Figure 2 for a map of the survey locations.

WCBC do not undertake monitoring of PM₁₀ concentrations in the vicinity of the site.

3.4. BACKGROUND POLLUTANT CONCENTRATIONS

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 in grid square NGR: 333500, 352500. Data for this location was downloaded from the DEFRA website⁶ for the purpose of the assessment and is summarised in Table 3.2.

TABLE 3.2 BACKGROUND POLLUTANT CONCENTRATIONS

POLLUTANT	PREDICTED BACKGROUND POLLUTANT CONCENTRATION (µg/m ³)		
	2019	2021	2024
NO ₂	10.75	9.76	8.54

⁶ <http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018>.



POLLUTANT	PREDICTED BACKGROUND POLLUTANT CONCENTRATION ($\mu\text{g}/\text{m}^3$)		
	2019	2021	2024
PM₁₀	11.83	11.48	11.14

As shown in Table 3.2 predicted background NO₂ and PM₁₀ concentrations are below the relevant AQOs at the development site.



4. METHODOLOGY

4.1. INTRODUCTION

The proposed development has the potential to expose future occupants to elevated pollution concentrations. Conditions at the site have therefore been assessed in accordance with the following methodology, which was agreed with Paul Campini, Environmental Health Officer at WCBC on 6th May, 2021.

4.2. DISPERSION MODEL

Dispersion modelling was undertaken in order to predict NO₂ and PM₁₀ concentrations across the site using the ADMS-Roads dispersion model (version 5.0.0.1). 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.

Modelling was undertaken for 2019 to allow verification against recent monitoring results and 2024 to represent the development opening year.

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 (z_0); and,
- ✿ Monin-Obukhov length.

These are detailed in the following Sections.

4.3. ASSESSMENT AREA

Ambient concentrations were predicted over the area NGR: 332860, 352280 to 333770, 353190. One Cartesian grid was used within the model to produce data suitable for contour plotting using the Surfer software package.

It should be noted that although the grid only covered the proposed site, road links were extended in order to ensure the impact of all relevant vehicle emissions in the vicinity of the development were considered.

Reference should be made to Figure 3 for a graphical representation of the assessment area grid extents.



4.4. TRAFFIC FLOW DATA

Baseline traffic data for use in the assessment, including 24-hour Annual Average Daily Traffic (AADT) flows and fleet composition as Heavy Duty Vehicle (HDV) proportion, was obtained from the Department for Transport (DfT)⁷. The DfT web tool enables the user to view and download traffic flows on every link of the 'A' road and motorway network, as well as selected minor roads, in Great Britain for the years 1999 to 2019. It should be noted that the DfT web tool is referenced in DEFRA guidance⁸ as being a suitable source of data for air quality assessments and it is therefore considered to provide a reasonable estimate of traffic flows in the vicinity of the site.

The baseline traffic data was converted to the site opening year utilising a factor obtained from TEMPro (Version 7.2). This software package has been developed by the DfT to calculate future traffic growth throughout the UK.

Road widths and vehicle speeds were estimated from aerial photography and UK highway design standards. A summary of the traffic data used in the assessments is provided in Table 4.1.

TABLE 4.1 TRAFFIC DATA

LINK		24-HOUR AADT FLOW		HDV PROP. OF FLEET (%)	ROAD WIDTH (m)	AVG. VEHICLE SPEED (km/h)
		2019	2024			
L1	B5425 Main Road	8,965	9,519	3.43	7.1	45
L2	A483 Northbound (NB)	26,490	28,124	5.87	7.0	80
L3	A483 Southbound (SB)	28,678	30,447	5.74	7.0	80
L4	A483 NB slip road south of roundabout	7,947	8,437	5.87	6.0	65
L5	A483 NB approach to roundabout	7,947	8,437	5.87	10.5	25
L6	A483 SB slip road south of roundabout	8,603	9,134	5.74	7.0	50
L7	A483 SB approach to roundabout	8,603	9,134	5.74	7.0	25
L8	A483 NB approach to roundabout	7,947	8,437	5.87	6.0	25
L9	A483 NB slip road north of roundabout	7,947	8,437	5.87	4.0	65
L10	A483 SB slip road north of roundabout	8,603	9,134	5.74	6.5	65
L11	A483 SB approach to roundabout	8,603	9,134	5.74	10.5	25
L12	A5156	22,603	23,998	9.29	13.0	90
L13	A5156 approach to roundabout SB	11,302	11,999	9.29	7.5	25
L14	A5156 Approach to roundabout NB	11,302	11,999	9.29	10.5	25
L15	A5152	10,796	11,462	2.18	8.0	45
L16	A5152 Westbound approach to roundabout	5,398	5,731	2.18	7.7	25
L17	A5152 Eastbound from roundabout	5,398	5,731	2.18	8.0	25

⁷ <https://roadtraffic.dft.gov.uk/>.

⁸ Local Air Quality Management Technical Guidance (TG16), DEFRA, 2021.



LINK		24-HOUR AADT FLOW		HDV PROP. OF FLEET (%)	ROAD WIDTH (m)	AVG. VEHICLE SPEED (km/h)
		2019	2024			
R1	Roundabout	16,625	17,651	9.29	12.0	25

Reference should be made to Figure 3 for a graphical representation of the road link locations.

4.5. EMISSION FACTORS

Emission factors for each link were calculated using the relevant traffic flows and the Emissions Factor Toolkit (version 10.1). This has been produced by DEFRA and incorporates COPERT 5.3 vehicle emission factors and fleet information.

There is current uncertainty over NO₂ concentrations within the UK, with the implementation of new vehicle emission standards not resulting in the previously expected reduction in roadside levels. Therefore, 2019 emission factors were utilised in preference to the development opening year in order to provide robust model outputs. As predictions for 2019 were verified, it is considered the results are a robust indication of worst case concentrations for the future year.

4.6. METEOROLOGICAL DATA

Meteorological data used in the assessment was taken from Shawbury meteorological station over the period 1st January 2019 to 21st December 2019 (inclusive). Shawbury meteorological station is located at NGR: 354931, 322117, which is approximately 37.5km south-east of the development. It is anticipated that conditions would be reasonably similar over a distance of this magnitude. The data was therefore considered suitable for an assessment of this nature.

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 4 for a wind rose of the utilised meteorological data.

4.7. ROUGHNESS LENGTH

The z_0 is a modelling parameter applied to allow consideration of surface height roughness elements. A z_0 of 0.5m was used to describe the modelling extents. This value is considered appropriate for the morphology of the area and is suggested within ADMS-Roads as being suitable for 'parkland, open suburbia'.

A z_0 of 0.3m was used to describe the meteorological site. This value is considered appropriate for the morphology of the area and is suggested within ADMS-Roads as being suitable for 'agricultural areas (max)'.

4.8. MONIN-OBUKHOV LENGTH

The Monin-Obukhov length provides a measure of the stability of the atmosphere. A minimum Monin-Obukhov length of 30m was used to describe the modelling extents. This value is considered appropriate for the nature of the area and is suggested within ADMS-Roads as being suitable for 'cities and large towns'.



A minimum Monin-Obukhov length of 10m was used to describe the meteorological site. This value is considered appropriate for the nature of the area and is suggested within ADMS-Roads as being suitable for 'small towns <50,000'.

4.9. BACKGROUND CONCENTRATIONS

Background NO₂ and PM₁₀ concentrations for use in the assessment were obtained from the DEFRA mapping study for the grid square containing the development site, as shown in Table 3.2.

Similarly to emission factors, the background concentrations from 2019 were utilised in preference to the opening year. This provided a robust assessment and is likely to overestimate pollutant concentrations during the operation of the proposal.

4.10. NO_x TO NO₂ CONVERSION

Predicted annual mean oxides of nitrogen (NO_x) concentrations were converted to NO₂ concentrations using the spreadsheet (version 8.1) provided by DEFRA, which is the method detailed within DEFRA guidance⁹.

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

WCBC undertook monitoring of NO₂ concentrations at three locations within the vicinity of the roads included in the model in 2019. The results were obtained and the road contribution to total NO_x concentrations calculated following the methodology contained within DEFRA guidance¹⁰. The monitored annual mean NO₂ concentrations and calculated road NO_x concentrations are summarised in Table 4.2.

⁹ Local Air Quality Management Technical Guidance (TG16), DEFRA, 2021.

¹⁰ Local Air Quality Management Technical Guidance (TG16), DEFRA, 2021.



TABLE 4.2 NO_x VERIFICATION - MONITORING RESULTS

MONITORING LOCATION		MONITORED NO ₂ CONCENTRATION (µg/m ³)	CALCULATED ROAD NO _x CONCENTRATION (µg/m ³)
32	Sycamores	23.7	24.45
54	Pandy Lane	22.7	22.47
56	Top Farm Road	18.8	14.90

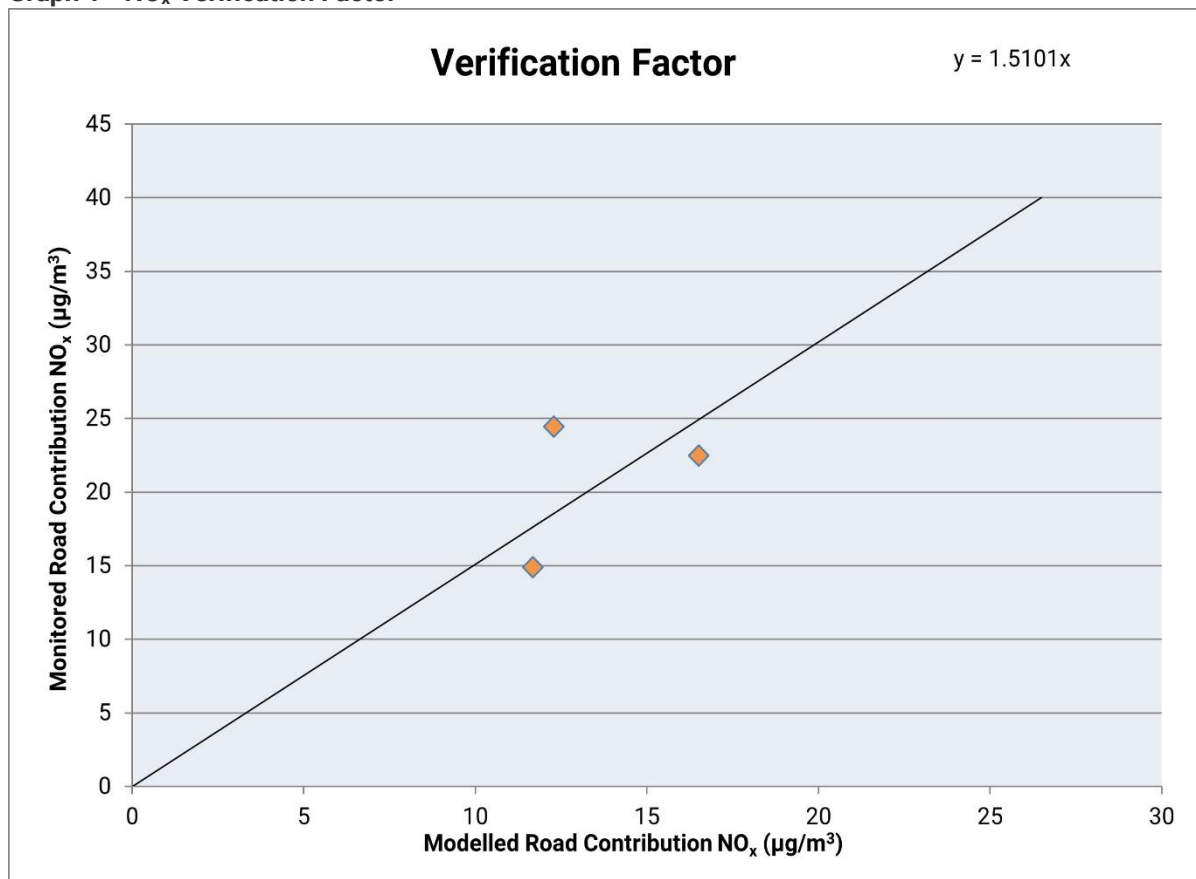
The annual mean road NO_x concentrations predicted from the dispersion model and road NO_x concentrations calculated from the 2019 monitoring results are summarised in Table 4.3.

TABLE 4.3 NO_x VERIFICATION - MODELLING RESULTS

MONITORING LOCATION		CALCULATED ROAD NO _x CONCENTRATION (µg/m ³)	MODELLED ROAD NO _x CONCENTRATION (µg/m ³)
32	Sycamores	24.45	12.29
54	Pandy Lane	22.47	16.50
56	Top Farm Road	14.90	11.68

The monitored and modelled road NO_x concentrations were graphed and the equation of the trendline based on linear progression through zero calculated. This indicated a verification factor of 1.5101 was required to be applied to all modelling results within the assessment area, as shown in Graph 1.

Graph 1 - NO_x Verification Factor



Monitoring of PM₁₀ concentrations is not undertaken within the assessment extents. The NO₂ verification factor was therefore used to adjust PM₁₀ model predictions in lieu of more accurate data in accordance with the guidance provided within DEFRA guidance¹¹.

¹¹ Local Air Quality Management Technical Guidance (TG16), DEFRA, 2021.



5. ASSESSMENT

The proposed development has the potential to cause the exposure of future residents to elevated pollution levels. Dispersion modelling was therefore undertaken with the inputs described in Section 4 to quantify air quality conditions at the site. Reference should be made to Figures 5 and 6 for graphical representations of the results.

As shown in Figure 5, annual mean NO₂ concentrations were predicted to be below the AQO of 40µg/m³ at all locations across the development. The maximum concentration at the site boundary was 36.03µg/m³. As such, future residents are not predicted to be exposed to NO₂ concentrations above the AQO.

As shown in Figure 6, annual mean PM₁₀ concentrations were predicted to be below the AQO of 40µg/m³ at all locations across the development. The maximum concentration at the site boundary was 17.75µg/m³. As such, future residents are not predicted to be exposed to PM₁₀ concentrations above the AQO.

Based on the assessment results, future residents are not predicted to be exposed to pollutant concentrations above the AQOs. The site is therefore considered to be suitable for residential use from an air quality perspective.



6. CONCLUSION

E3P was commissioned by Castle Green Homes Limited to undertake an Air Quality Assessment in support of a proposed residential development on land off Main Road, Rhosrobin, Wrexham.

The development has the potential to expose future residents to existing air quality issues due to the proximity of the site to the A483 and associated vehicle exhaust emissions. An Air Quality Assessment was therefore undertaken in order to determine baseline conditions and consider site suitability for the proposed end-use.

Dispersion modelling was undertaken in order to predict pollutant concentrations across the proposed development site as a result of emissions from the local highway network. Outputs were subsequently verified using local monitoring data obtained from WCBC.

The results of the dispersion modelling assessment indicated that predicted NO₂ and PM₁₀ concentrations were below the relevant AQOs at all locations across the development. The site is therefore considered suitable for the proposed use from an air quality perspective.

Based on the assessment results, air quality issues are not considered a constraint to planning consent for the development.

END OF REPORT



APPENDIX I

LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between E3P and the client as indicated in Section 1.4.
2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed it is correct. No attempt has been made to verify the information.
3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.
4. During the site walkover, reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover, no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.
5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.
6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.
7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials, this is for indicative purposes only and do not constitute or replace full and proper surveys.
8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
9. E3P cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by E3P is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by E3P in this connection without their explicit written agreement there to by E3P.
10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.



APPENDIX II

GLOSSARY

TERMS

AADT	Annual Average Daily Traffic
ADM	Atmospheric Dispersion Modelling
AQAP	Air Quality Action Plan
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Strategy
CERC	Cambridge Environmental Research Consultants
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
LA	Local Authority
LAQM	Local Air Quality Management
NB	Northbound
NGR	National Grid Reference
NO₂	Nitrogen dioxide
NO_x	Nitrogen oxide
PM₁₀	Particulate matter with an aerodynamic diameter of less than 10µm
SB	Southbound
WCBC	Wrexham County Borough Council
WUDP	Wrexham Unitary Development Plan
Z₀	Roughness length



APPENDIX III

DRAWINGS



Legend



Site Boundary

Title

Figure 1 - Site Location

Project

Air Quality Assessment
Main Road, Rhosrobin

Project Reference

14-931

Client

Castle Green Homes Limited

Contains Ordnance Survey Data
© Crown Copyright and Database Act 2019





Monitor

Figure 2 - Monitoring Locations

Air Quality Assessment
Main Road, Rhosrobin

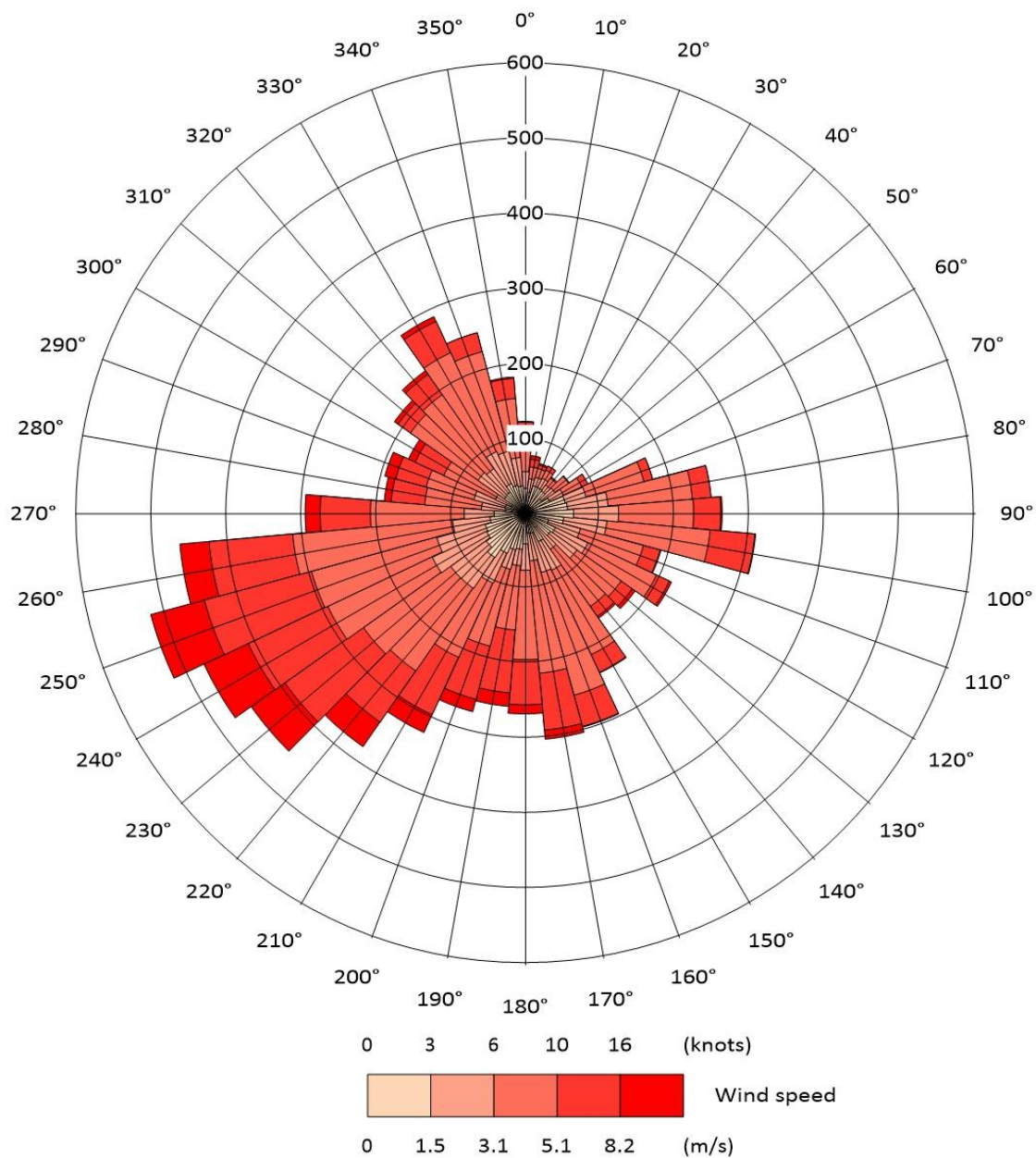
14-931

Castle Green

Contains Ordnance Survey Data
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Legend

Title

Figure 4 - Wind Rose of 2019
Shawbury Meteorological Station
Data

Project

Air Quality Assessment
Main Road, Rhosrobin

Project Reference

14-931

Client

Castle Green Homes Limited

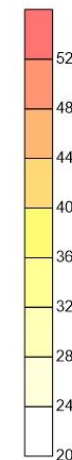




Legend



Site Boundary



Annual Mean NO₂
Concentrations
(µg/m³)

Title

Figure 5 - Predicted Annual Mean
NO₂ Concentrations (µg/m³)

Project

Air Quality Assessment
Main Road, Rhosrobin

Project Reference

14-931

Client

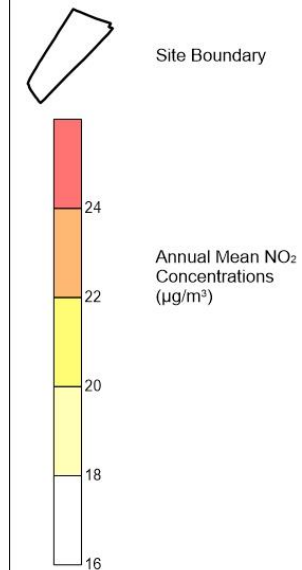
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Legend



Title

Figure 6 - Predicted Annual Mean PM₁₀ Concentrations (µg/m³)

Project

Air Quality Assessment
Main Road, Rhosrobin

Project Reference

14-931

Client

Castle Green Homes Limited

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