Further Information:
Land At Blythe Vale, Blythe Bridge

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Experts in air quality management & assessment

Document Control

Client	St. Modwen Homes	**Principal Contact**	Sam Rogers

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Report Prepared By:	Nicole Holland and Ricky Gellatly

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Air Quality Consultants Ltd
23 Coldharbour Road, Bristol BS6 7JT Tel: 0117 974 1086
119 Marylebone Road, London NW1 5PU Tel: 020 3873 4780
aqc@aqconsultants.co.uk

Registered Office: 23 Coldharbour Road, Bristol BS6 7JT
Companies House Registration No: 2814570

1 Introduction

1.1 This report addresses Planning Condition 33, applied by Staffordshire Moorlands District Council to the planning consent for the residential development of land at Blythe Vale, Blythe Bridge ('the development'). The report has been carried out by Air Quality Consultants Ltd. (AQC) on behalf of St. Modwen Homes.

1.2 Planning Condition 33 states that:

"*No development shall be commenced until:*

a) Further information to demonstrate that the adopted emission factors used in the submitted air quality assessment are representative of a worst-case scenario has been submitted to and approved in writing by the Local Planning Authority.

b) Proposals for a post development monitoring scheme, including the methodology and duration, for validating the predicted nitrogen dioxide (NO_2) concentrations are below Air Quality (AQ) objectives, at the nearest sensitive receptor(s), have been submitted to and approved in writing by the Local Planning Authority.

In each case, the required information or results of the post development monitoring scheme should indicate:

i. No breach of local AQ objectives for NO_2 at the nearest sensitive receptor, monitoring shall cease, and no further work is required,

ii. A potential breach of local AQ objectives for NO_2 at the nearest sensitive receptor, a further air quality assessment shall be undertaken to identify control measures that could be adopted to address these breaches. The approved pollution control measures shall be implemented in full and further monitoring undertaken to validate the effectiveness of these control measures and if necessary further measures shall be proposed, approved and implemented until no breach of local AQ objectives for NO_2 at the nearest sensitive receptor is predicted".

1.3 This report discusses the appropriateness of the emissions factors used in the air quality assessment (AQC, 2017) submitted in support of the development, including any worst case assumptions made, to discharge part (a) of Planning Condition 33.

2 Emission Factors

Air Quality Assessment Emission Factors

2.1 The air quality assessment conducted for the consented development (AQC, 2017) is based on dispersion modelling using the ADMS-Roads dispersion model (v4.1). This model requires the user to provide various input data, including vehicle emissions. Vehicle emissions have been calculated based on vehicle flow, composition and speed data using the Emission Factor Toolkit (EFT) (Version 7.0) published by Defra (2017).

Traffic Flows and Speeds

2.2 Traffic flows were provided by Phil Jones Associates (who undertook the Transport Assessment for the development) and also derived from the interactive web-based map provided by the Department for Transport (DfT, 2017); traffic speeds were estimated based on professional judgement, taking account of the road layout, speed limits and the proximity to a junction or roundabout. Table 1 summarises the traffic data used in the assessment and Figure 1 shows the road network that was included within the assessment model, including average speeds. The traffic data presented is based on 2018 flows (the earliest year of anticipated occupation of the development at the time of undertaking the assessment).

Table 1: Summary of Traffic Data Used in the Assessment in 2018

Road Link	2018 (Without Scheme) [a]		2018 (With Scheme) [b]	
	AADT	%HDV	AADT	%HDV
Uttoxeter Road East of Blythe Bridge	13,651	7.5	13,735	7.5
Uttoxeter Road into Blythe Bridge	3,795	6.1	3,825	6.0
A521 Uttoxeter Road East of Site Access	12,490	6.5	12,575	7.5
A521 Uttoxeter Road West of Site Access	12,490	6.5	12,950	6.2
A50 South of A521 Roundabout	30,785	23.2	30,834	23.2
A50 West of A521 Roundabout	41,168	19.5	41,579	19.4
A50 West of Catchems Corner	61,190	9.7	61,526	9.7
A50 West of A520	71,574	10.2	71,852	10.2

[a] Assuming that the development does not go ahead.

[b] Assuming that the development does go ahead.

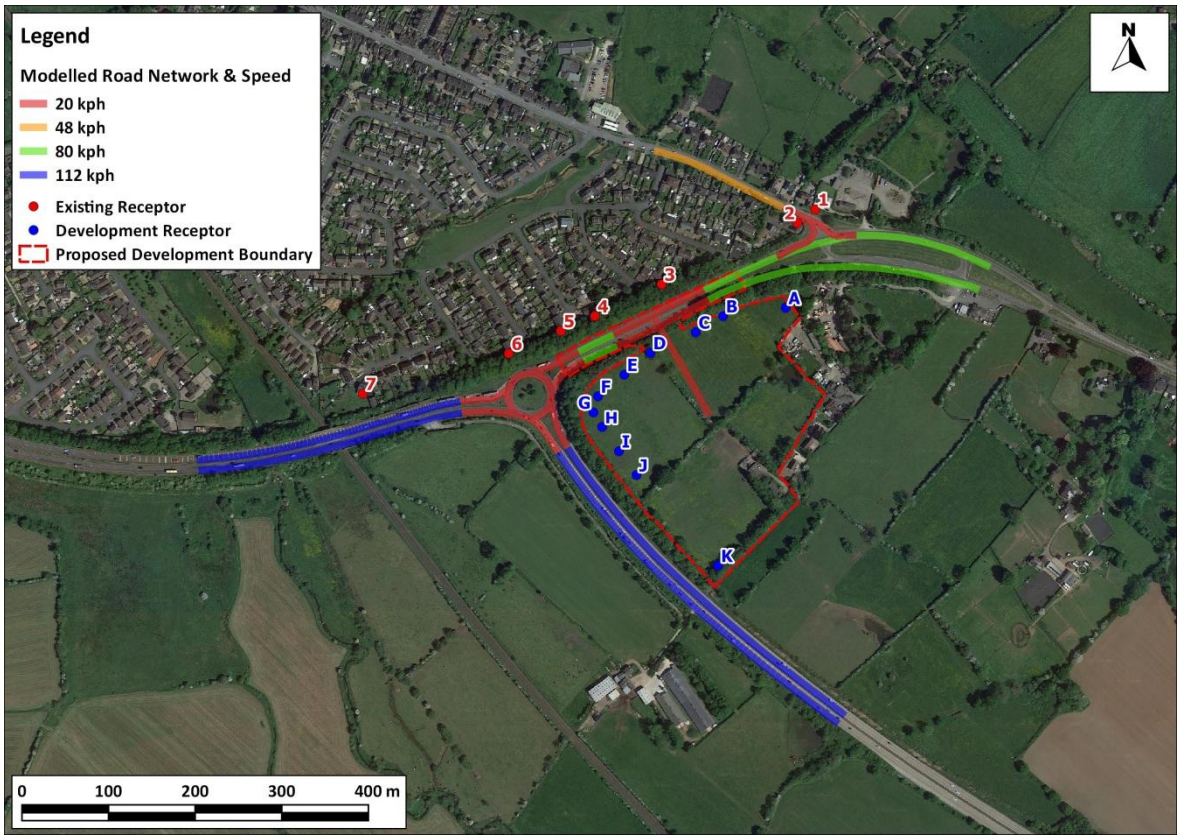

Figure 1: Modelled 'With Scheme' Road Network & Average Speed (kph)

Imagery © 2017 Google.

2.3 Defra's EFT emission factors follow a speed / emission curve, where emissions are high at low speeds, then reduce as speeds increase before plateauing and then increasing again at higher speeds. Table 2 presents 2018 NOx emission rates for traffic flows on the A521 westbound carriageway, assuming that the development is operational (this is provided as an example to demonstrate the speed / emission curve; all other roads modelled will follow a similar pattern).

2.4 Vehicle emissions along the roads adjacent to the site have been modelled assuming speeds of 112 kph (representing free-flowing dual carriageways), 80 kph (representing roads with a 50 mph speed limit with the development) and 20 kph (representing sections of road where congestion may occur and / or where vehicles will be required to slow as they approach a roundabout or junction). In reality, average speeds on the dual carriageway sections are likely to be lower than 112 kph, and average speeds at the roundabouts and junctions are likely to be higher than 20 kph. As demonstrated by Table 2, NOx emission rates at speeds of 20 kph and 112 kph are comparatively high when compared to intermediate speeds; thus, the assumption of these speeds for large sections of the modelled road network provides a conservative, worst-case approach to emissions calculations. Some road links have been modelled at 80 kph (which will provide a comparatively lower NOx emission rate) where this has been judged to be representative of actual road conditions.

Table 2: Defra EFT (Version 7.0) 2018 'With Scheme' NOx Emission Rates with Varying Vehicle Speeds (kph) for Traffic Flows on the A521 Westbound Carriageway [a]

Speed (kph)	NOx Emission Rate (g/km/s)
5	0.0553
10	0.0551
15	0.0469
20	0.0402
25	0.0358
30	0.0324
35	0.0298
40	0.0278
45	0.0261
50	0.0248
55	0.0237
60	0.0229
65	0.0223
70	0.0219
75	0.0218
80	0.0218
85	0.0221
90	0.0228
95	0.0237
100	0.0249
105	0.0265
110	0.0283

[a] Based on traffic flows along the A521 westbound carriageway (see Table 1).

Sensitivity Test for Nitrogen Oxides and Nitrogen Dioxide

2.5 The air quality assessment includes the application of a 'worst-case sensitivity test' to account for potential elevated nitrogen oxides emissions from some diesel vehicles. This sensitivity test has been carried out by applying the adjustments set out in Table 3 to the emission factors in the EFT (Version 7.0) using AQC's CURED (V2A) tool (AQC, 2016a). The justifications for these adjustments are given in AQC (2016b). The results from this sensitivity test are likely to over-predict emissions from vehicles in the future and thus provide a reasonable worst-case upper-bound to the assessment.

2.6 The conclusion that the overall impact of the development will be 'not significant' takes into account both predictions based on the 'official' Defra EFT emission factors (Version 7.0) and the emission factors that have been adjusted using AQC's CURED tool, but with a focus on the latter.

As such, the judgement of significance can be considered to have taken a conservative (worst-case) approach.

Table 3: Summary of Adjustments Made to Defra's EFT (V7.0)

Vehicle Type		Adjustment Applied to Emission Factors
All Petrol Vehicles		No adjustment
Light Duty Diesel Vehicles	**Euro 5 and earlier**	No adjustment
	Euro 6	Increased by 78%
Heavy Duty Diesel Vehicles	**Euro III and earlier**	No adjustment
	Euro IV and V	Set to equal Euro III values
	Euro VI	Set to equal 20% of Euro III emissions [a]

[a] Taking account of the speed-emission curves for different Euro classes as explained in AQC (2016b).

Future 'Completed Development' Assessment Year Worst-Case Assumptions

2.7 The air quality assessment also makes the worst-case assumption that the development would be complete and fully occupied in 2018; in reality, the development will not be complete and fully occupied until several years later. Air quality in the UK is expected to improve over the coming years as newer, less polluting vehicles replace older, more polluting vehicles on the road network. The latest evidence on trends in measured data suggests that vehicle emissions, and pollutant concentrations, are indeed reducing.

2.8 This predicted change in the composition of the vehicle fleet is reflected in the EFT (V7.0), assuming an improvement in vehicles emissions in future years. The assumption that the development is fully complete and operational by 2018 will have resulted not only in the assumption that a greater number of vehicles (and associated emissions) will be on the road in 2018 (when baseline air quality is expected to be comparatively poorer that in future years), but also in the application of higher emission factors than if a later year had been modelled.

Updated Emissions Factors: Defra's EFT (Version 8.0.1)

2.9 Since the original air quality assessment (AQC, 2017) was undertaken in October 2017, Defra has released an updated version of the EFT (Version 8.0.1) (Defra, 2018). A comparison of Defra's EFT Version 7.0 and EFT Version 8.0.1 NOx emission rates for traffic flows on the A521 westbound carriageway (assuming that the development is operational) for the speeds used in the model, are provided in Table 4 (this is provided as an example to demonstrate the relationship between the two EFT versions; all other roads modelled will follow a similar pattern).

Table 4: Defra EFT (Versions 7.0 and 8.0.1) 2018 'With Scheme' NOx Emission Rates with Varying Vehicle Speeds (kph) for Traffic Flows on the A521 Westbound Carriageway [a]

Speed (kph)	NOx Emission Rate (g/km/s)		Difference in NOx Emission Rate Between Versions	
	EFT Version 7.0	EFT Version 8.0.1	g/km/s	%
20	0.0402	0.04998	0.0097	+24.2
48	0.0253	0.03176	0.0065	+25.6
80	0.0218	0.02801	0.0062	+28.2
112	0.0288	0.03875	0.0099	+34.4

[a] Based on traffic flows long the A521 westbound carriageway (see Table 1).

2.10 Table 4 demonstrates that the EFT Version 8.0.1 NOx emission rates for the speeds used in the assessment model are higher than those from EFT Version 7.0, by 24.2 to 34.4%. However, because the model on which the original assessment was based was verified and adjusted using local monitoring data, it is unlikely that the model outputs would be substantially different if updated to use EFT Version 8.0.1. The use of the higher emissions rates in EFT Version 8.0.1, as compared to Version 7.0, would have resulted in higher predicted road-NOx concentrations at the monitoring sites used for the model verification, which would in turn have resulted in a lower adjustment factor being applied (the factor applied in the original assessment was 2.63); the application of this lower NOx adjustment factor would offset much of the difference between the two EFT versions, and resultant modelled concentrations would be very similar.

2.11 Furthermore, the nitrogen dioxide concentrations at identified sensitive receptors, both in the local area and within the development itself, are predicted to be below the annual mean objective (by at least 4.6 µg/m^3 at existing receptors and by at least 12.2 µg/m^3 at new receptors within the development), with impacts at all existing receptors predicted to be '*negligible*'. As such, even if a slight increase in nitrogen dioxide concentrations were predicted as a result of using EFT Version 8.0.1, it is highly unlikely that this would materially change the outcome of the assessment, i.e. concentrations would remain below the objective and the operational effects would be 'not significant'.

Conclusion

2.12 The suitability of the vehicle emission factors used in the air quality assessment undertaken for the now-approved residential development of land at Blythe Vale, Blythe Bridge has been considered.

2.13 The assessment applied a number of worst-case assumptions regarding emission factors, including the use of speeds which are associated with comparatively high NOx emission rates for the majority of the road network modelled, the application of a sensitivity test for nitrogen oxides and nitrogen dioxide emission factors, and the assumption that the development will be complete and fully occupied (including full traffic generation) by 2018.

2.14 Since the original air quality assessment was undertaken Defra has released an updated version of the EFT, which assumes higher NOx emissions rates. However, the difference between the Version 7.0 and Version 8.0.1 EFTs will be negated by the application of an adjustment factor as part of the verification process. Any remaining increase in pollutant concentrations would not materially change the outcome of the assessment (i.e. the conclusion that the effects of the development are 'not significant').

2.15 It is concluded that the emissions factors used in the original modelling are appropriate, and that a conservative and robust assessment has been undertaken that presents a realistic worst-case scenario.

3 References

AQC. (2016a). *CURED V2A*. Retrieved from http://www.aqconsultants.co.uk/getattachment/Resources/Download-Reports/CURED-V2A.zip.aspx

AQC. (2016b). *Emissions of Nitrogen Oxides from Modern Diesel Vehicles*. Retrieved from http://www.aqconsultants.co.uk/getattachment/Resources/Download-Reports/Emissions-of-Nitrogen-Oxides-from-Modern-Diesel-Vehicles-210116.pdf.aspx

AQC. (2017). *Air Quality Assessment: Land at Blythe Vale, Blythe Bridge.*

Defra. (2017). *Defra Air Quality Website*. Retrieved from http://laqm.defra.gov.uk/

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4 Glossary

AQ	Air Quality
AQC	Air Quality Consultants
EFT	Emission Factor Toolkit
NO_2	nitrogen dioxide
Objectives	A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date. There are also vegetation-based objectives for sulphur dioxide and nitrogen oxides