

NOISE ASSESSMENT

on behalf of

BARRATT HOMES AND BLOOR HOMES NORTH WEST

for the site at

LAND SOUTH OF HOLT ROAD, WREXHAM

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Summary

A noise assessment was undertaken to predict the potential impact of environmental noise sources at a proposed residential development at Land South of Holt Road, Wrexham. Computer noise modelling was utilised in addition to baseline noise measurements and the potential impact on the proposed dwellings was determined using guidance provided in Tan 11, BS 8233 and WHO Guidelines for Community Noise.

The assessment found that the majority of the site would fall under Tan 11 Noise Exposure Categories (NECs) A and B, while a small portion of the proposed housing at the north west perimeter of the site would fall under NEC C.

Mitigation proposals in the form of minimum glazing and ventilation specifications have been provided that would allow suitable internal noise levels across the site to be achieved.

It has been demonstrated that careful consideration to housing and the orientation of rear gardens, as well as the use of 1.8m high fences, would allow for external noise levels of 50 dBA L_{Aeq} and below to be achievable across the site.

The potential noise impact from the sports pitches to the south of the development were assessed and determined to be of low impact according to Sport England methodology.

The potential noise impact from increased traffic flows associated with the proposed development was assessed and the predicted impact was found to be negligible according to DMRB methodology.

It has been demonstrated that with the inclusion of the mitigation discussed, a suitable and commensurate level of protection against noise will be provided to the occupants of the proposed accommodation. The outline scheme is therefore considered acceptable in terms of noise impact and final details of the mitigation will be produced at the reserved matters phase.

Record of changes

Prepared By Michael Rickard MIOA

Reviewed By

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Signed



Signed



Date

11th December 2018

Date

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1 Introduction

- 1.1 Miller Goodall Ltd has, on behalf of Barratt Homes and Bloor Homes North West, undertaken a noise assessment in respect of the impact of environmental noise on a proposed residential development of up to 600 dwellings at Land South of Holt Road, Wrexham. This report has been produced to support a planning application for the site.

2 Site Description

- 2.1 The site is located at Land South of Holt Road, Wrexham. The site location is shown in Appendix 1 and 2.
- 2.2 To the north of the site is the A534 and beyond that, Wrexham Golf Club. To the north east directly adjacent to the site is a concrete batching plant which operates Monday to Saturday between 7am and 5pm. East of the site are fields and Clays Golf Course. The southern border of the site skirts around Bryn Estyn Court residential properties, which are served by Bryn Estyn Road, a quiet access road to the south of the site. On the other side of Bryn Estyn Road is The Erlas Centre and Victorian Walled Garden. To the south west of the site is Wrexham Rugby Club. Further south of the site are some more sports pitches and then more fields. There are some farm buildings directly adjacent to the site to north west. To the west and north west of the site are large areas of established residential use.

3 Proposed Development

- 3.1 The proposed development is an outline application for residential development of up to 600 dwellings with associated landscape works, public open space and on-site infrastructure, with all matters reserved except for access. The draft illustrative concept layout for the development is shown in Appendix 2.

4 Policy Context

4.1 Planning Policy Wales – December 2018

- 4.1.1 The Planning Policy Wales (PPW¹) discusses noise in chapter 6.7 'Air Quality and Soundscape'. According to PPW, "the key planning policy principle is to consider the effects which proposed developments may have on air or soundscape quality and the effects which existing air or soundscape quality may have on proposed developments". To achieve this, 'good design' may have to be followed "for example setting back buildings from roads to avoid canyon effects and using best practice in terms of acoustic design to ensure the appropriate and intended acoustic environment of completed developments".

¹ Planning Policy Wales, Edition 7, Welsh Government – July 2014

5 Local Authority Consultation

- 5.1 Paul Campini at WCBC was consulted on 30th May 2018 in respect of the methodology used in this assessment. The site survey was carried out prior to consultation due to time constraints, however our description of the work carried out, including survey times and locations, was agreed with WCBC retrospectively. The location of survey position P2 was further to the east than originally intended due to access not being available to the field in question. Survey locations used at the site are shown in Appendix 1.
- 5.2 The site is large and fairly contoured, and it was therefore agreed with WCBC that we would create a 3D noise model of the site in order to assess how the predicted noise levels would change across the whole area of the site. It was also agreed that we would include noise from Wrexham Rugby Club (WRC) in our noise model, based on similar noise source measurements that we have made at a football match (considered broadly comparable with rugby). It has since come to our attention that there are other sports pitches to the south of the site as well as the WRC pitches, so we have subsequently decided to also include one of these additional sports pitches in our assessment of sports pitch noise.
- 5.3 It was agreed with WCBC that noise levels at the site would be assessed in accordance with Tan 11 guidance, and that mitigation, if necessary, would be provided in order to achieve noise limits at the site in accordance with BS 8233:2014 and WHO, Guidelines for Community Noise:1999 guideline noise levels.
- 5.4 We did not discuss assessing the noise impact on existing housing due to increased traffic flows from the proposed site. Nevertheless traffic flow data was available and we have therefore carried out a basic DMRB assessment to demonstrate that future traffic flows will not cause a noise impact.

6 Acoustic Standards and Guidance

6.1 Planning Guidance (Wales), TAN11 - Noise²

- 6.1.1 The TAN11 guidance provides specific Noise Exposure Categories (NECs) for Residential Developments which aim to assist LA's to determine the suitability of areas for development. With regard to noise sensitive developments the guidance suggest that LA's should consider the compatibility of existing activities taking into account the noise exposure at the time of the application and any foreseeable increase in levels in the future. Development should not normally be allowed in areas which are exposed to unacceptably high levels of noise, particularly where these levels extend through the night.
- 6.1.2 The guidance provides specific advice on methods for mitigation of noise levels which may be proportionate and reasonable, including options which contains solutions for:
- Engineering
 - Layout
 - Administrative options

² Planning Guidance (Wales), Technical Advice Note (Wales) TAN11 – Noise –1997.

- 6.1.3 The TAN11 guidance puts a potential site into daytime (07:00 – 23:00) and night-time (23:00 – 07:00) period Noise Exposure Categories (NEC's) which affect the likelihood of planning permission being approved. The proposed development site is affected by road traffic noise, hence the 'Road Traffic Noise Sources' levels have been used for this assessment as presented in Table 1.

Table 1: Recommended Noise Exposure Categories For New Dwellings Near Existing Noise Sources

Category	Noise Levels Corresponding To The Noise Exposure Categories For New Dwellings $L_{Aeq,T}$ dB for Road Traffic Noise Sources		
	$L_{Aeq, 0700-2300}$	$L_{Aeq, 2300-0700}^3$	Guidance
A	< 55	< 45	Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as desirable.
B	55 - 63	45 - 57	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection.
C	63 - 72	57 - 66	Planning permission should not normally be granted. Where it is considered that permission should be given, for example, because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.
D	> 72	> 66	Planning permission should normally be refused.

- 6.1.4 The Welsh Government has committed to a detailed review of Technical Advice Note 11, which will be replaced with new guidance addressing air quality and soundscape. The draft plan aligns noise and soundscape policy in Wales and encourages greater integration between noise and air quality management activities by public bodies.

6.2 BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

- 6.2.1 This standard provides recommended guideline values for internal noise levels within dwellings which are similar in scope to guideline values contained within the World Health Organisation (WHO) document, Guidelines for Community Noise (1999)⁴. These guideline noise levels are shown in Table 2, below.

³ Night-time noise levels (23.00 - 07.00): sites where individual noise events regularly exceed 82 dB L_{Amax} (Slow time weighting) several times in any hour should be treated as being in NEC C, regardless of the $L_{Aeq,8h}$ (unless already NEC D).

⁴ World Health Organisation Guidelines for Community Noise, 1999

Table 2: BS 8233: 2014 guideline indoor ambient noise levels for dwellings

Location	Activity	07:00 to 23:00	23:00 to 07:00
Living Room	Resting	35 dB $L_{Aeq,16hr}$	-
Dining room/area	Dining	40 dB $L_{Aeq,16hr}$	-
Bedroom	Sleeping (daytime resting)	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$

6.2.2 BS 8233:2014 advises that:

“regular individual noise events...can cause sleep disturbance. A guideline value may be set in terms of SEL⁵ or $L_{Amax,F}$ depending on the character and number of events per night. Sporadic noise events could require separate values”.

6.2.3 BS 8233:2014 adopts guideline external noise values provided in WHO for external amenity areas such as gardens and patios. The standard states that it is “desirable” that the external noise does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,T}$ whilst recognising that development in higher noise areas such as urban areas or those close to the transport network may require a compromise between elevated noise levels and other factors that determine if development in such areas is warranted. In such circumstances, the development should be designed to achieve the lowest practicable noise levels in external amenity areas.

6.3 World Health Organisation (WHO) Guidelines for Community Noise 1999

6.3.1 The WHO Guidelines 1999 recommends that to avoid sleep disturbance, indoor night-time guideline noise values of 30 dB L_{Aeq} for continuous noise and 45 dB L_{AFmax} for individual noise events should be applicable. It is to be noted that the WHO Night Noise Guidelines for Europe 2009⁶ makes reference to research that indicates sleep disturbance from noise events at indoor levels as low as 42 dB L_{AFmax} . The number of individual noise events should also be taken into account and the WHO guidelines suggest that indoor noise levels from such events should not exceed approximately 45 dB L_{AFmax} more than 10 – 15 times per night.

6.3.2 The WHO document recommends that steady, continuous noise levels should not exceed 55 dB L_{Aeq} on balconies, terraces and outdoor living areas. It goes on to state that to protect the majority of individuals from moderate annoyance, external noise levels should not exceed 50 dB L_{Aeq} .

⁵ Sound exposure level or L_{AE}

⁶ WHO Night Noise Guidelines for Europe 2009

6.4 BS 4142: 2014 'Methods for rating and assessing industrial and commercial sound'

6.4.1 BS 4142: 2014⁷ provides guidance on the assessment of the likelihood of complaints relating to noise from industrial sources. It replaced the 1997 edition of the Standard in October 2014. The key aspects of the Standard are summarised below.

6.4.2 The standard presents a method of assessing potential noise impact by comparing the noise level due to industrial sources (the Rating Level) with that of the existing background noise level at the nearest noise sensitive receiver in the absence of the source (the Background Sound Level).

6.4.3 The Specific Noise Level - the noise level produced by the source in question at the assessment location - is determined and a correction applied for certain undesirable acoustic features such as tonality, impulsivity or intermittency. The corrected Specific Noise Level is referred to as the Rating Level.

6.4.4 In order to assess the noise impact, the Background Sound Level is arithmetically subtracted from the Rating Level. The standard states the following:

- *Typically, the greater this difference, the greater the magnitude of the impact,*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context,*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context,*
- *The lower the Rating Level is relative to the measured Background Sound Level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the Rating Level does not exceed the Background Sound Level, this is an indication of the specific sound source having a low impact, depending on the context.*

6.4.5 In addition to the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, the 2014 edition places emphasis upon an appreciation of the context, as follows:

An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context.

6.4.6 The 2014 edition of BS 4142 also introduces a requirement to consider and report the uncertainty in the data and associated calculations and to take reasonably practicable steps to reduce the level of uncertainty.

⁷ BS 4142:2014 Methods for rating and assessing industrial and commercial sound

6.5 Sport England: Artificial Grass Pitch (AGP) Acoustics – Planning Implications 2015

6.5.1 There are no specific guidance documents for sports pitch noise in Wales, however Sport England have produced a guidance document with the aim of:

- Increasing awareness of good design in sports facilities;
- Help key building professions, clients, user representatives and other stakeholders to follow best practice; and
- Encourage well designed sports facilities that meet the needs of sports and are a pleasure to use.

6.5.2 The guidance discusses the use of other guidance such as the World Health Organisation 'Guidelines for Community Noise', which states that to avoid 'moderate annoyance' during the daytime and evening the noise level should not exceed 50 dB $L_{Aeq(T)}$. However the guidance also states:

'Exceedance of the WHO guideline values does not necessarily imply significant noise impact and indeed it may be that significant impacts do not occur until much higher levels of noise exposure are reached'.

6.5.3 The guidance then discusses the comparison of the AGP noise against the existing noise climate and states:

'A 'slight' impact is considered for an increase less than 3 decibels'.

6.5.4 This increase is generally in line with acoustic principles that a 3 dB(A) increase is the minimum perceptible under normal conditions.

6.5.5 As part of drafting the guidance measurements were taken of noise levels during nine sports sessions on three separate AGP's with sports including; football, hockey and rugby, in order to obtain a 'typical ' noise level generated from a 'typical' AGP sports session.

6.5.6 The most significant source of noise from a typical AGP was voice noise levels and the measured data provided a 'typical' free-field noise level of 58 dB $L_{Aeq(1 \text{ hour})}$ at a distance of 10 m from the sideline halfway marking from an AGP.

6.5.7 The guidance recommends predicting the impact of the AGP based on the data provided within the guidance and topographical information about the site, along with the buildings and site layout. The guidance then recommends the determining noise criterion for AGP's proximity to residential properties to avoid moderate annoyance in the daytime and evenings as set by the WHO guidelines is 50 dB $L_{Aeq(1 \text{ hour})}$ upper noise limit external to residential properties with external living areas.

6.5.8 The guidance also then provides advice on mitigation of specific noise sources such as impact noise on fence panels and strike boards.

6.6 Calculation of Road Traffic Noise and Design Manual for Roads and Bridges

- 6.6.1 With respect to changes in road traffic noise levels, the documents 'Calculation of Road Traffic Noise' (CRTN)⁸ and the 'Design Manual for Roads and Bridges (DMRB)⁹ which was updated in November 2011 are both relevant. Both of these documents contain guidance on predicting and assessing changes in road traffic noise due to factors such as increased traffic volumes, changes to the local road network, etc.
- 6.6.2 Guidance and a methodology for calculating changes in road traffic noise are detailed in CRTN. This methodology combines data on road traffic flows, mean traffic speeds and traffic composition in terms of percentage of Heavy Goods Vehicles (HGV), road and site layouts in order to calculate and predict road traffic noise at a selected location. A methodology for the calculation of hourly road traffic noise is also presented. The $L_{A10(18 \text{ hour})}$ parameter has historically shown a good correlation with community response to road traffic noise and is often referred to as the 'UK traffic noise index'.
- 6.6.3 DMRB Vol 7 Section 3 Part 7 is accepted as the standard methodology within the United Kingdom for evaluating the noise impacts of road traffic resulting from road projects. DMRB allocates an assessment method according to risk, the process of which utilises 3 levels of assessment:
- i. Scoping;
 - ii. Simple;
 - iii. Detailed.
- 6.6.4 The assessment approach is designed to be proportionate to minimise unnecessary work, the level of assessment required dependant on the potential for impacts to occur. For example, a detailed assessment may be appropriate if the daytime noise level exhibits a permanent change in magnitude as a result of the new road scheme of 1 dB $L_{A10(18 \text{ hour})}$ in the short term (i.e. the opening year) or a 3 dB $L_{A10(18 \text{ hour})}$ change in the long term (typically 15 years after opening). A change in road traffic noise of 1 dB $L_{A10(18 \text{ hour})}$ in the short term is the smallest that is considered perceptible; a change of 3 dB $L_{A10(18 \text{ hour})}$ change in the long term is considered perceptible.
- 6.6.5 This guidance provides a classification of magnitude, in terms of changes in road traffic noise, as presented in table 3.2 of the document, reproduced below as Table 3.

⁸ Calculation of Road Traffic Noise, DoT, 1988

⁹ Design Manual for Roads and Bridges, Volume 11 Section 3 Environmental assessment techniques, Part 7 HD 213/11 Revision 1, Noise and vibration, 2011

Table 3: DMRB classification of magnitude of noise impacts in the long term

Change in Noise Level dB $L_{A10(18 \text{ hour})}$	Magnitude of Noise Impact
0	No change
0.1 – 2.9	Negligible
3.0 – 4.9	Minor
5.0 – 9.9	Moderate
10+	Major

- 6.6.6 According to the guidance, a change in noise level of 1 dB $L_{A10(18 \text{ hour})}$ is equivalent to a 25% increase or 20% decrease in traffic flow (assuming other factors remain unchanged). A change of 3 dB $L_{A10(18 \text{ hour})}$ is equivalent to a 100% increase or 50% decrease in traffic flow.

7 Noise Survey

7.1 Measurements of Existing Noise Sources

- 7.1.1 Noise measurements were undertaken at locations consistent with the proposed development in accordance with BS 7445-1: 2003¹⁰ by Steve Maslivec of Miller Goodall Ltd. The calibration of the sound level meter was checked before and after measurements with negligible deviation (<0.1 dB). Details of the equipment used are shown in Table 4 below.

¹⁰ BS 7445-1: 2003 Description and measurement of environmental noise - Part 1: Guide to quantities and procedures

Table 4: Noise monitoring equipment

Equipment Description	Type Number	Manufacturer	Serial No.	Date Calibrated	Calibration Certification Number
Class 1 ^{11,12} Integrating Real Time 1/3 Octave Sound Analyser	NOR 140	Norsonic	1406815	12/01/17	474629844
Microphone	NOR 1225	Norsonic	264687	15/12/16	474629844
Class 1 Calibrator ¹³	NOR 1251	Norsonic	34123	05/07/17	02777/1
Class 1 ^{14,15} Integrating Real Time 1/3 Octave Sound Analyser	NOR 140	Norsonic	1406017	23/05/17	03238/2
Microphone	NOR 1225	Norsonic	151206	23/05/17	03238/2
Class 1 Calibrator ¹⁶	Type 4231	Brüel & Kjær	2478249	18/05/17	03238/1
Outdoor microphone housing	NOR 1217	Norsonic	12175146	N/a	N/a

7.1.2 Specific, background and ambient noise monitoring was undertaken at the times specified in Table 5, below. Weather conditions were determined both at the start and on completion of the survey. It is considered that meteorological conditions were appropriate for environmental noise measurements.

¹¹ IEC 61672-1 (2002) Electroacoustics – Sound level meters Part 1: Specifications

¹² IEC 61260 (1995) Electroacoustics – Octave-band and fractional-octave-band filters

¹³ IEC 60942 (2003) Electroacoustics – Sound calibrators

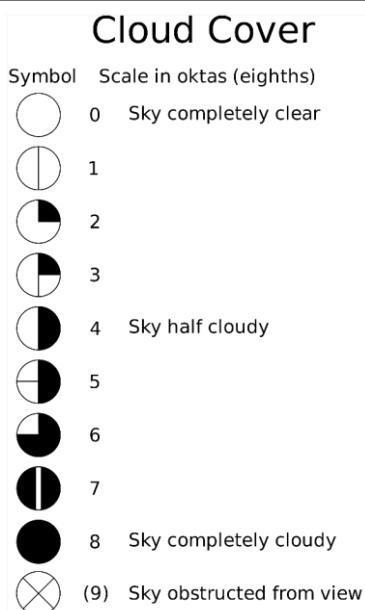
¹⁴ IEC 61672-1 (2002) Electroacoustics – Sound level meters Part 1: Specifications

¹⁵ IEC 61260 (1995) Electroacoustics – Octave-band and fractional-octave-band filters

¹⁶ IEC 60942 (2003) Electroacoustics – Sound calibrators

Table 5: Dates, times and weather conditions during noise measurements

Measurement Locations	Date/Time	Weather conditions		
		Description	At Start of Survey	On Completion
P1	25/05/18, 06:05 to 25/05/18, 09:30	Temperature:	10 °C	15 °C
		Precipitation:	Dry	Dry
		Cloud cover (oktas – see opposite):	2	2
		Any fog/snow/ice?	No	No
		Any damp roads/wet ground?	No	Slight
		Wind speed:	< 5 m/s	< 5 m/s
		Wind direction:	NW	NW
		Any conditions that may cause temp. inversion (e.g. calm nights with no cloud):	No	No



7.1.3 Measurements were taken at times considered to be representative of the periods during which the proposed residential accommodation would be subject to the highest levels of ambient noise. Measurements were made under free-field conditions at a height of 1.5 m above the ground.

7.1.4 The measurement locations are detailed below and shown in Appendix 1.

- P1 - South west area of site (approximately 20 m north of Bryn Estyn Road).
- P2 - North east area of site (approximately 170 m due south of A534).
- P3 - North east area of site (approximately 210 m due south of A534).
- P4 - North east boundary of site (approximately 75 m southwest of concrete batching site).

7.1.5 Noise levels at P1 were monitored continuously throughout the survey duration. Noise levels at P2 and P3 were alternated between every 15 minutes, with some occasional additional monitoring at P4 to measure noise from the concrete batching plant.

7.1.6 The noise sources within the vicinity of the measurement locations are summarised in Table 6, below:

Table 6: Description of noise sources affecting the site

Measurement Locations	Noise Sources
P1	Bird song, road traffic on A534
P2	Bird song, road traffic on A534
P3	Bird song, road traffic on A534
P4	Bird song, road traffic on A534 and concrete tipping (tipping not dominant)

7.2 Monitoring Results

7.2.1 A summary of the broadband measurement data is provided in Table 7, below. All data are sound pressure levels in dB re 20 μ Pa.

Table 7: Summary of noise measurements

Measurement Location	Measurement Periods	$L_{Aeq,5min}$ (dB)	$L_{AFmax,5min}$ (dB)	$L_{AF90,5min}$ (dB)
P1	05:35 – 07:00 (night-time)	46 - 52	52 - 65	42 - 45
	07:00 – 09:45 (daytime)	46 - 51	54 - 65	43 - 48
P2	06:02 – 06:17; 06:37 – 06:52 (night-time)	54 - 57	60 - 63	51 - 54
	07:12 – 07:27; 08:01 – 08:16; 08:34 – 08:49 (daytime)	56 - 58	61 - 69	53 - 55
P3	06:21 – 06:36; 06:54 – 07:09; (night-time)	53 - 55	59 - 63	50 - 53
	07:28 – 07:43; 08:18 – 08:33; 08:51 – 09:06 (daytime)	53 - 57	58 - 71	51 - 55
P4	07:44 – 07:59 (concrete batching in operation)	56 - 57	60 - 65	55
	09:13 – 09:28 (concrete batching not in operation)	53 - 55	62 - 70	50 - 52

- 7.2.2 Noise from the concrete batching plant was inaudible at the areas of proposed housing and therefore further assessment of this potential noise source was determined to be unnecessary.
- 7.2.3 Each measurement period consisted of sequential 5 minute samples which therefore allowed the variation in noise level over time to be assessed. This data was subsequently utilised within the noise model to calibrate octave-band L_{eq} and L_{max} noise levels from existing noise sources (mainly the A534) across the proposed development site.
- 7.2.4 The 1 second noise levels have not been presented in this report but are kept on file for future reference.

8 Impact of Existing Noise Sources on the Development

8.1 Computer Modelling

- 8.1.1 Predictions of existing noise levels on the site have also been undertaken using the CadnaA noise modelling package. Specific model parameters were applied as follows:
- Propagation of noise using algorithms within ISO 9613: 1993 *Acoustics - Attenuation of sound during propagation outdoors*. Roads were modelled as line sources at a height of 0.5 m above ground level and calibrated using spectral data measured during the survey.
 - Default ground absorption $G = 0.5$ (equivalent to grassed areas and consistent with the dominant ground cover at the site).
 - Ground attenuation: spectral all sources
 - No adverse meteorological effects
 - Two orders of reflection
 - Topographical data was obtained using NextMap Britain 2 m contours for the site and surrounding assessment area.

8.2 Validation of the Noise Model

- 8.2.1 Noise level receptor points were incorporated into the CadnaA model at the noise survey measurement locations to calibrate the model using the measured octave band L_{eq} and L_{Fmax} noise levels.

8.3 Data Inputs for Sport Pitches to the South

- 8.3.1 As a worst-case assumption, our assessment of noise from the rugby club and other pitches assumes that both rugby pitches and one of the sports pitches directly south of the site are all in use at the same time. The pitch areas have been modelled as rectangular area sources using noise spectrum data that we have obtained from measurements of a football match (considered broadly comparable with rugby). The pitches were calibrated so as to produce free-field noise levels of 58 dB L_{Aeq} at a distance of 10 m from the side-line at the half way mark, which is in line with Sport England guidelines for typical noise levels for sports pitch activities like rugby/football/hockey etc.

8.4 Noise Model Predictions

8.4.1 Four scenarios were modelled using the indicative master plan provided:

- Daytime L_{Aeq} noise levels affecting the site
- Night-time L_{Aeq} noise levels affecting the site
- Night-time L_{AFmax} noise levels affecting the site
- Rugby pitch L_{Aeq} noise levels affecting the site

8.4.2 Screen shots from the modelling exercise are provided in Appendix 3.

8.4.3 As planning for the site is at outline stage, we have not included individual houses and perimeter fencing in the baseline noise model. The noise model therefore provides indicative noise levels across the site that can be considered worst-case, because as houses are introduced to the site, they will provide significant screening to other houses within the site, as well as reducing noise levels on their own facades that are facing away from the roads to the north. As the masterplan is developed and individual plots with houses and fences are located within the site, the mitigation requirements – which are already low – are likely to be even further reduced across the site.

8.4.4 The noise modelling demonstrates the drop-off in noise levels with increasing distance from the roads to the north. Some housing to the south east of the site would be able to utilize openable windows for providing background ventilation during the daytime without internal noise levels being exceeded; however for the remainder of the site, particularly towards the north east corner, guideline noise levels would not be achieved via open windows and therefore some degree of mitigation in the form of minimum glazing and ventilation specifications will need to be provided.

8.4.5 The model also indicates that approximately the top third of the designated housing areas would experience external noise levels that are above the 55 dB L_{Aeq} limit during the day recommended by WHO for external amenity areas – although the inclusion of houses and perimeter fencing at the site would be expected to mitigate these levels to within the WHO guideline limits (see 8.4.3 above).

8.4.6 Noise from the rugby/sports pitches is shown to be below the 50 dBA guideline noise level suggested in Sport England even at the southernmost housing area of the site closest to the pitches, and is generally well below measured levels due to road noise at the site. Noise from the sports pitches is therefore considered unlikely to cause any impact at housing on the proposed site.

8.5 Predicted External Noise Levels Assessed to Tan 11

8.5.1 The north west corner of the site is predicted to have the highest daytime and night time L_{Aeq} noise levels. Appendix 3 provides predicted noise level contours for comparison against the TAN 11 noise bandings and illustrates which Noise Exposure Category (NEC) the site lies within.

8.5.2 For daytime periods (07:00hrs to 23:00hrs) the southern half of the proposed development site is predicted to be within NEC A with the majority of the northern half falling within NEC B. A small portion of the northwest housing area is predicted to fall into NEC C.

8.5.3 For night time periods (23:00hrs to 07:00hrs), the bandings are very similar but with more of the northwest region of the site falling into NEC C.

8.6 Mitigation for Good Acoustic Design (Internal Levels)

8.6.1 In order to assess the potential glazing and ventilation requirements for dwellings, noise ingress calculations were undertaken based on the methodology in BS EN 12354-3¹⁷. The following assumptions were made regarding the internal rooms:

- Cavity masonry external walls
- Pitched tiled roofs with insulation and plasterboard ceilings
- Room dimensions: 3m (L) x 4m (W) x 2.8m (H)
- 'Normal' internal surface finishes e.g. carpeted with curtains etc.
- Glazed area of 1.5 m² per room.

8.6.2 The external noise levels are highest at the proposed housing areas to the north of the site. Our calculations for determining suitable mitigation are therefore based mainly on worst-case noise levels to the north of the site. For comparison, we have also carried out calculations for houses to the south of the site overlooking Bryn Estyn Road in order to show the decreasing need for mitigation towards the south of the site. Noise ingress calculations are summarized in Table 8, below:

Table 8: Predicted internal noise levels

Description	External Noise Levels		Predicted Internal Noise Levels		BS 8233 Criteria		Exceedance of Criteria		Proposed Glazing and Ventilation
	$L_{Aeq,T}$ dB	L_{AFmax} dB	$L_{Aeq,T}$ dB	L_{AFmax} dB	$L_{Aeq,T}$ dB	L_{AFmax} dB	$L_{Aeq,T}$ dB	L_{AFmax} dB	
North of site (living rooms) daytime	65	-	35	-	35	-	0	-	Type 1
North of site (bedrooms) night-time	64	68	29	38	30	45	-1	-7	Type 2
South of site (living rooms) daytime	51	-	26	-	35	-	-9	-	Type 3*
South of site (bedrooms) night-time	52	54	27	26	30	45	-3	-19	Type 3*

* Only a nominal glazing and ventilation specification required (see Type 3 description below)

- **Type 1** - Glazing with minimum weighted sound reduction index of 27 dB $R_w + C_{tr}$ (e.g. 4/12/4); ventilators with a minimum combined element normalised sound level difference of 33 dB $D_{ne,W} + C_{tr}$
- **Type 2** - Glazing with minimum weighted sound reduction index of 27 dB $R_w + C_{tr}$ (e.g. 4/12/4); ventilators with a minimum combined element normalised sound level difference of 38 dB $D_{ne,W} + C_{tr}$
- **Type 3** - Glazing with minimum weighted sound reduction index of 27 dB $R_w + C_{tr}$ (e.g. 4/12/4); ventilators with a minimum combined element normalised sound level difference of 29 dB $D_{ne,W} + C_{tr}$

¹⁷ BS EN 12354-3:2000 Building acoustics. Estimation of acoustic performance in buildings from the performance of elements - Airborne sound insulation against outdoor sound

8.6.3 It can be seen from Table 8 that rooms on the noisiest elevations to the north are predicted to satisfy the internal noise level requirements with glazing with a sound reduction index of $27 \text{ dB } R_w + C_{tr}$; this could be achieved using double glazing with a 4/12/4 configuration. Background ventilation could be provided by trickle ventilators with a minimum element normalised sound level difference of at least $33 \text{ dB } D_{ne,w} + C_{tr}$ for living rooms and $38 \text{ dB } D_{ne,w} + C_{tr}$ for bedrooms.

8.6.4 Proposals for glazing and ventilation options would need to be reviewed as the final master plan of the site is developed at the reserved matters stage.

8.7 Mitigation for Good Acoustic Design (External Levels)

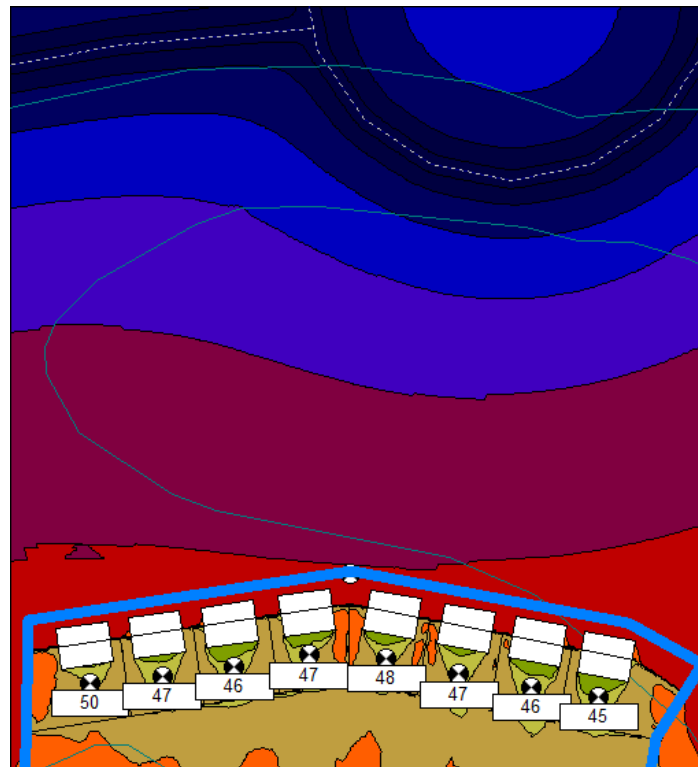
8.7.1 The proposed landscape buffer zones to the north are contributing to the existing mitigation at the site due to the increased distance between housing and roads to the north.

8.7.2 The predicted daytime noise levels across the open site are currently between around $65 \text{ dB } L_{Aeq}$ at the very northwest corner of the housing areas and approximately $50 \text{ dB } L_{Aeq}$ at the southeast corner.

8.7.3 Our calculations indicate that noise levels of $50 \text{ dB } L_{Aeq}$ would be achievable at the houses along the northwest of the site if careful consideration to plot layouts and use of 1.8m high fences is utilized in these areas. For example houses should be oriented with rear gardens facing away from the roads to the north, so that the houses themselves as well as garden fencing can provide effective noise screening to the garden areas. In a similar way, external noise levels across the wider site would also benefit from these mitigation measures and would be able to achieve external levels well below $50 \text{ dB } L_{Aeq}$ in gardens.

8.7.4 In order to provide significant mitigation, garden fences should be constructed from continuous, imperforate material with a minimum mass of 12 kg/m^2 and extend from the ground to a minimum height of 1.8 m with no gaps. In the case of timber fencing, close-boarded or overlapped timber panelling would be suitable in this regard; hit-and-miss fencing would not. Alternatively, a proprietary acoustic fence with a minimum weighted sound reduction index of $25 \text{ dB } R_w$ would be appropriate.

8.7.5 Calculations based on the mitigation to the northwest corner of the site as discussed above were carried out based on indicative house layouts, shown in Figure 1.

Figure 1: Mitigation of external daytime noise levels (rear garden orientation and 1.8m high fencing)

9 Impact of Road Traffic Noise Associated With the Development on Surrounding Area

9.1 Road Traffic Data

- 9.1.1 Road traffic data was provided by the transport consultants for the project, CBO Transport Ltd. This was in the form of 18 hour AAWT flows for Holt Road, the A5156 and the A534 for the years 2018 (pre-development) and 2027 (year of completion).
- 9.1.2 In addition to the baseline traffic with assumed future growth, predicted traffic flows associated with the proposed development were also provided by CBO Transport Ltd. The 2027 traffic flows presented are therefore the total predicted future traffic flows including traffic associated with the proposed development.
- 9.1.3 Road traffic flows associated with the south of the site have been scoped out of our assessment based on the advice of CBO Transport Ltd. Bryn Estyn Road is not a through route and only serves as an access to existing property.

9.2 Assessment of Impact to DMRB

9.2.1 The impact in terms of the predicted change in $L_{A10,18hr}$ noise levels is assessed in Table 9.

Table 9: Road Traffic Noise Assessment

Road	2018 pre-development 18hr AAWT (total vehicles*)	2027 post-completion 18hr AAWT (total vehicles*)	% increase	Difference dB $L_{A10,18hr}$	Magnitude of Long-term Noise Impact to DMRB
Holt Road	13277	16196	22%	+ 0.9	Negligible
A5156	26498	30798	16%	+ 0.7	Negligible
A534	25915	29859	15%	+ 0.6	Negligible

* % HGVs on assessment roads for 2017 and 2027 remain the same

9.2.2 The DMRB assessment indicates a negligible adverse impact from increased traffic flows associated with the development.

9.2.3 The 2027 flow numbers include a 10.6 % increase of traffic from 2018 prior to traffic flows from the proposed site being added. The percentage increase in traffic flows from traffic associated with the proposed site would therefore be approximately 10 % lower than those shown in the table above, and the magnitude of impact in terms of decibel noise increase would therefore be lower than that shown in the table. The assessment is considered worst-case for this reason.

10 Construction Noise and Vibration Impacts

10.1 It is common for the control of construction noise, vibration and dust emission to be addressed by the application of Best Practicable Means (BPM) and detailed within a Construction and Environmental Management Plan (CEMP). This document is prepared for the specific development in question and normally controlled via planning condition.

10.2 Prior to commencement of works, a quantitative noise impact assessment using guidance in BS 5228¹⁸ on site may also be required but in our experience is usually unnecessary, providing a robust CEMP is in place and agreed upon by the Local Authority.

¹⁸ BS 5228 Noise and Vibration Control on Construction and Open Sites - Part 1: Noise: 2009+A1:2014

11 Conclusions

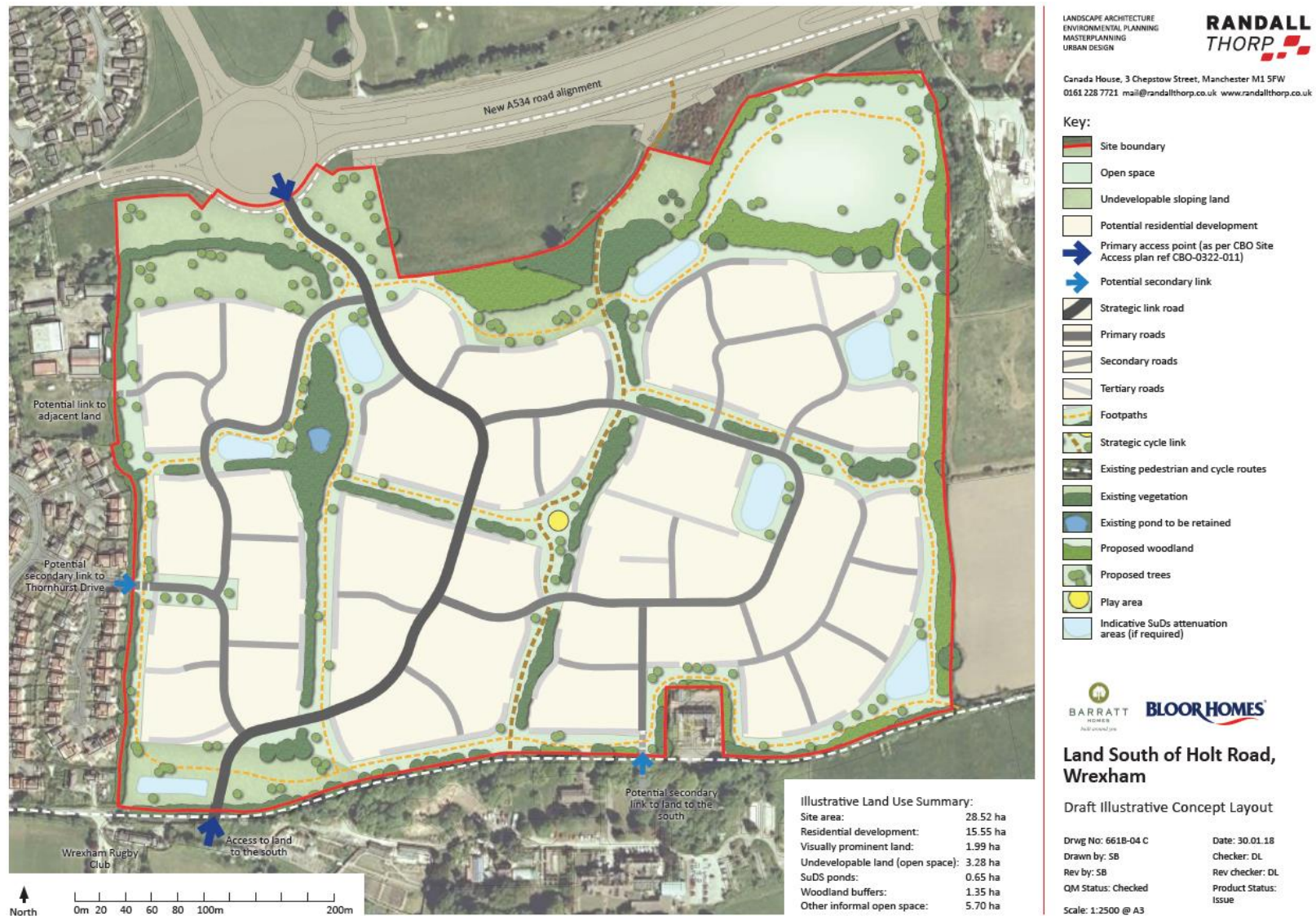
- 11.1 A noise assessment was undertaken to predict the potential impact of environmental noise sources at a proposed residential development at Land South of Holt Road, Wrexham. Computer noise modelling was utilised in addition to baseline noise measurements and the potential impact on the proposed dwellings was determined using guidance provided in Tan 11, BS 8233 and WHO Guidelines for Community Noise.
- 11.2 The assessment found that the majority of the site would fall under Tan 11 Noise Exposure Categories (NECs) A and B, while a small portion of the proposed housing at the north west perimeter of the site would fall under NEC C.
- 11.3 Initial calculations indicate that some central areas of housing would be able to utilize open window ventilation in living rooms during the daytime without an exceedance of guideline noise levels. Mitigation proposals in the form of minimum glazing and ventilation specifications have been provided that would allow suitable internal noise levels across the site to be achieved. The report notes that in reality, the mitigation requirements will be significantly reduced as the masterplan is developed and housing and fencing locations are determined due to the noise screening effects these will provide.
- 11.4 External noise levels during the daytime are generally predicted to be up to around 65 dB L_{Aeq} at the northwest corner of the site and approximately 50 dB L_{Aeq} at the southeast corner. It has been demonstrated that careful consideration to housing and the orientation of rear gardens, as well as the use of 1.8m high fences, would allow for external noise levels of 50 dBA L_{Aeq} and below to be achievable across the site.
- 11.5 The potential noise impact from the sports pitches to the south of the development were assessed and determined to be of low impact according to Sport England methodology.
- 11.6 The potential noise impact from increased traffic flows associated with the proposed development was assessed and it was found that in all cases, predicted increases in noise levels in 2027 (completion date) would be below + 1 dB and therefore the predicted impact according to DMRB is negligible.
- 11.7 It has been demonstrated that with the inclusion of the mitigation discussed, a suitable and commensurate level of protection against noise will be provided to the occupants of the proposed accommodation. The outline scheme is therefore considered acceptable in terms of noise impact and final details of the mitigation will be produced at the reserved matters phase.

APPENDICES

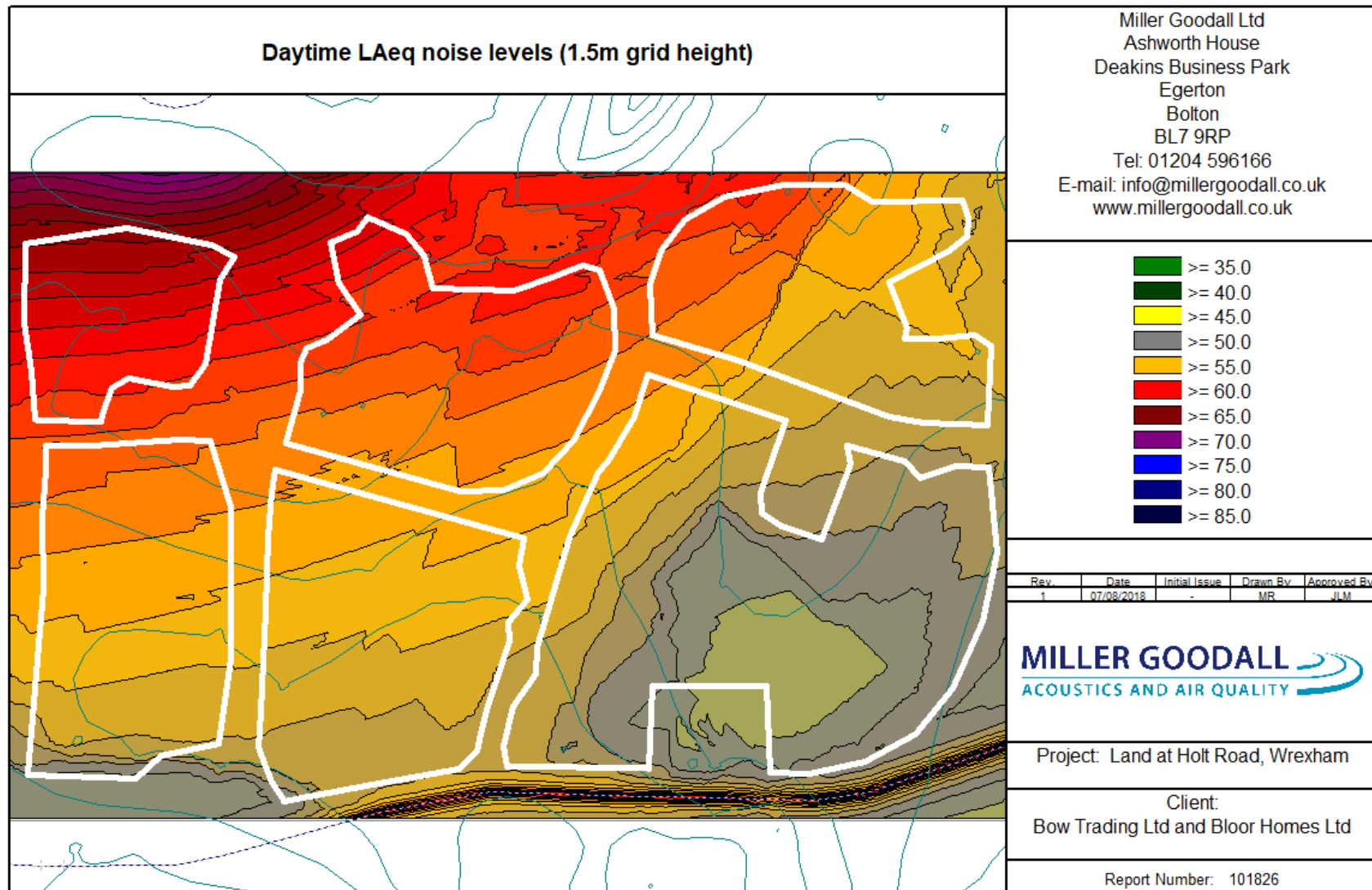
Appendix 1: Survey Measurement Positions



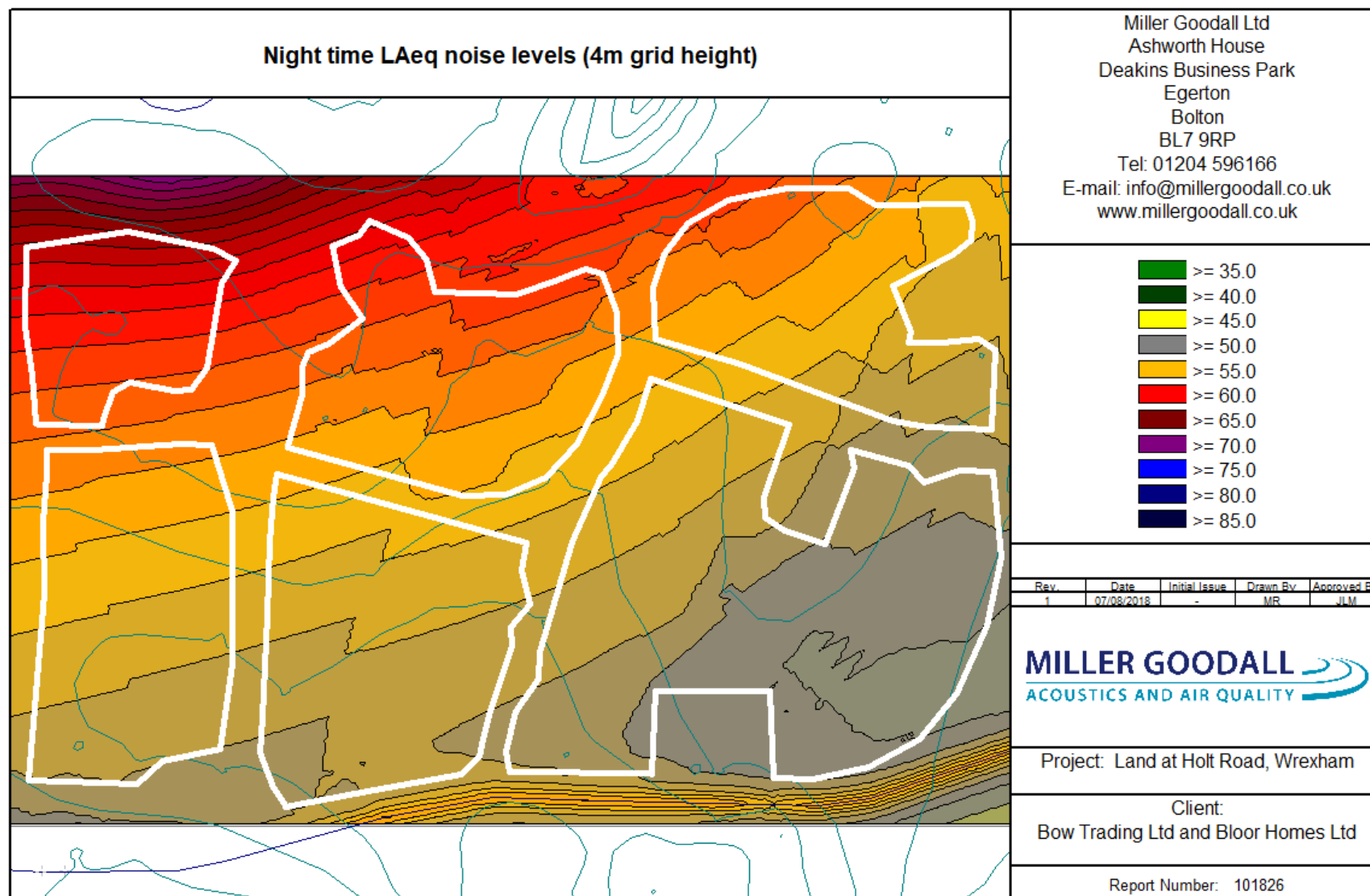
Appendix 2: Draft Site Layout



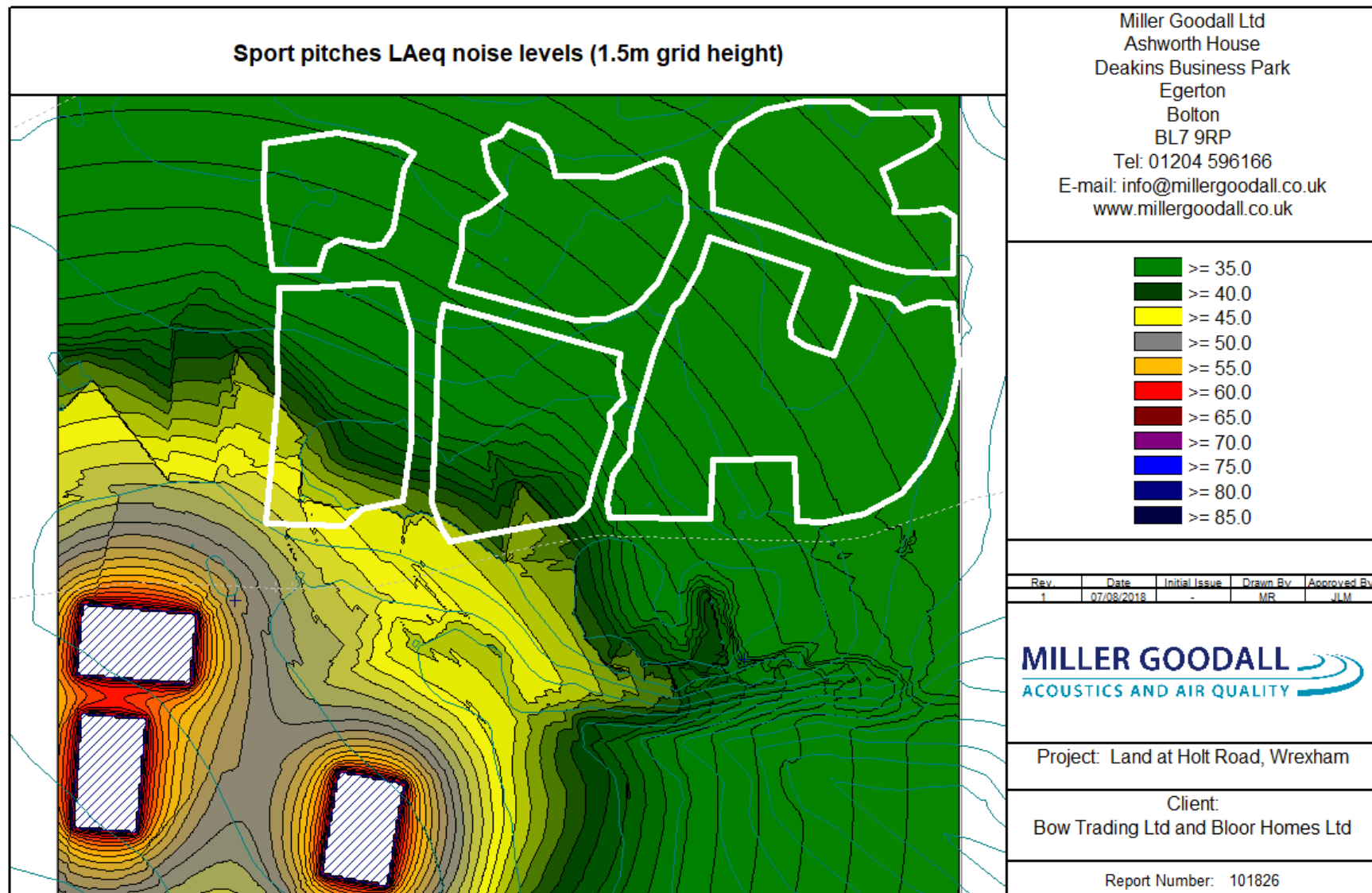
Appendix 3a: Daytime noise levels (housing areas delineated with white lines)



Appendix 3b: Night time noise levels (housing areas delineated with white lines)



Appendix 3c: Sport pitch noise levels (housing areas delineated with white lines)



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Glossary of Terms

Decibel (dB) The unit used to quantify sound pressure levels; it is derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 μPa , the threshold of normal hearing is in the region of 0 dB, and 140 dB is the threshold of pain. A change of 1 dB is usually only perceptible under controlled conditions.

dB L_A Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB L_A broadly agree with an individual's assessment of loudness. A change of 3 dB L_A is the minimum perceptible under normal conditions, and a change of 10 dB L_A corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB L_A ; normal conversation about 60 dB L_A at 1 meter; heavy road traffic about 80 dB L_A at 10 meters; the level near a pneumatic drill about 100 dB L_A .

$L_{A90,T}$ The A weighted noise level exceeded for 90% of the specified measurement period (T). In BS 4142: 1997 it is used to define background noise level.

$L_{Aeq,T}$ The equivalent continuous sound level. The sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). $L_{Aeq,T}$ is used to describe many types of noise and can be measured directly with an integrating sound level meter.

L_{Amax} The highest A weighted noise level recorded during the time period. It is usually used to describe the highest noise level that occurred during the event.

$L_{A10(18 \text{ hour})}$ Often referred to as the UK road traffic noise index, this is the arithmetic average of the values of L_{A10} hourly for each of the 18 one hour periods between 06:00 and 00:00.

NOEL No observed effect level: the level of noise exposure below which no effect at all on health or quality of life can be detected.

LOAEL Lowest observed adverse effect level: the level of noise exposure above which adverse effects on health or quality of life can be detected.

SOAEL Significant observed adverse effect level: the level of noise exposure above which significant adverse effects on health or quality of life can be detected.

R_w Single number rating used to describe the sound insulation of building elements and is defined in BS EN ISO 10140-2: 2010 (formerly BSEN ISO 140-3:1995). It is derived by measurement under laboratory conditions and does not take into account the effects of flanking transmissions.

$D_{ne,w}$ The weighted element-normalized level difference is a single figure rating used to describe the sound insulation of small elements within a larger construction and is defined in BS EN ISO 10140-2:2010 (BSEN ISO 140-10:1991). It is most often used to rate the sound insulation performance of ventilator units e.g. trickle vents.

C_{tr} A single-number spectrum adaptation term used to characterise the sound insulation rating with respect to urban traffic. It is defined in ISO 717-1:20-13.

