

**PROPOSED RESIDENTIAL DEVELOPMENT AT WREXHAM ROAD, HOLT:
ROAD TRAFFIC NOISE ASSESSMENT**

**On behalf of:
Macbryde Homes Ltd**

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1.0 INTRODUCTION

- 1.1 Hepworth Acoustics Ltd was commissioned by Macbryde Homes Ltd to carry out an assessment of the impact of road traffic noise on a proposed residential development on land at Wrexham Road, Holt.
- 1.2 The proposed development land is located on the south side of Wrexham Road and extends south-eastwards to Francis Lane which is a no-through road. The development land is fairly level and is essentially a single grassed field which was formerly used as a sports pitch. The A534, which is busy in the daytime but considerably less so at night, runs to the south of the site. Wrexham Road has a 30mph speed limit and there is a shallow speed ramp near the site. On the other side of Wrexham Road is a garden centre.
- 1.3 The land already has outline planning permission for residential development (Ref. HOL P/2013/0823) which was granted in 2016, subject to conditions. Condition 9 requires that a noise survey is carried out 'to determine noise levels for both day and night' and a report prepared including a scheme of any necessary noise mitigation measures. It is assumed that the noise survey and mitigation is required in respect of traffic noise from the A534 to the south of the site and from Wrexham Road at the topmost part of the site.
- 1.4 Thus, as the principle of residential development of the site has already been established by the outline planning consent, the purpose of the noise assessment described in this report is to recommend an appropriate scheme of noise mitigation that is commensurate with the level of traffic noise on the site.
- 1.5 The proposed development is for a total of 24 dwellings with public open space (and a M.U.G.A) in the southern part of the site. The proposed layout is shown in Figure 1.
- 1.6 The noise assessment has included:
 - i. An inspection of the development site and environs;
 - ii. Measurement of road traffic noise levels from the A534 and Wrexham Road during representative periods of the daytime and night/early morning;
 - iii. Assessment of the potential noise impact on the residential development; and

- iv. Recommendation of appropriate noise mitigation measures for the proposed houses where necessary.

- 1.7 The author of this report has the following qualifications:- BSc(Hons) in Environmental Science; the Institute of Acoustics' 'Diploma in Acoustics and Noise Control'; and MSc in Environmental Acoustics. He has 30 years of experience in the assessment and control of environmental noise and is a Fellow of the Institute of Acoustics.
- 1.8 The various noise units and indices referred to in this report are described in Appendix I. All noise levels mentioned in the text have been rounded to the nearest decibel, as fractions of decibels are imperceptible.

2.0 ROAD TRAFFIC NOISE SURVEY & ASSESSMENT

Traffic Noise Survey

- 2.1 A road traffic noise survey has been carried out at sample locations on the development land to quantify noise from the A534 and Wrexham Road.
- 2.2 On arrival at the site it was found that the main noise on the development land is traffic noise from the A534. This was most apparent in the south-west area of the site. Also, at the topmost part of the site there was some local traffic noise from Wrexham Road.
- 2.3 The site was found to be not sufficiently secure to be able to install unattended auto-logging noise monitoring instrumentation. Therefore, attended traffic noise measurements were undertaken for a representative daytime period based upon the approach of the shortened measurement method of 'Calculation of Road Traffic Noise' (as described below) and also for a representative night/early morning period.
- 2.4 The daytime traffic noise measurements were taken between 13:05 and 16:28 hours on Tuesday 22nd October 2019. The noise measurements were taken as a number of 15-minutes samples during the survey period at three sample locations as described below and indicated in Figure 1.
- Location 1 – Towards SE end of site in approximate location of proposed Plot 12. (Traffic noise from A534)
 - Location 2 – Towards SE end of site in approximate location of proposed Plot 10. (Traffic noise from A534)
 - Location 3 – NW end of site in approximate location of proposed Plot 21. (Traffic noise from Wrexham Road)
- 2.5 Night-time/early morning noise measurements were taken at the same three locations in the early hours of Wednesday 23rd October 2019 between 03:44 and 07:00 i.e. to include any early morning commercial traffic. The noise measurements were taken in 15-minutes samples during the survey period.
- 2.6 The noise measurements were carried out using a Rion NA-27 Sound Level Meter which has current independent calibration certification. Also, the calibration of the sound level meter was checked

before and after the noise measurements using a field acoustic calibrator. No significant variation in the calibrated noise level occurred.

- 2.7 The noise measurements were taken in 'free-field' conditions and at a microphone height of approximately 1.5m above the ground. Frequency analysis was also carried out.
- 2.8 Weather conditions during the survey were suitable for noise monitoring and are described in Appendix II.
- 2.9 As noted above, the daytime noise survey was based on the 'shortened measurement method' described in the Department of Transport document '*Calculation of Road Traffic Noise*' (CRTN), 1988. The memorandum was prepared to enable entitlement under the *Noise Insulation Regulations* 1975 to be determined, but as is stated in the document, the guidance is equally appropriate to the calculation of traffic noise for land use planning purposes.
- 2.10 The CRTN shortened measurement method involves taking noise measurements over representative time periods within any three consecutive hours between 10:00 and 17:00. By using the L_{A10} (3 hour), as the arithmetic mean of the measured L_{A10} values, the $L_{A10,18h}$ value can then be calculated. The correction to obtain the $L_{A10,18h}$ value from the $L_{A10,3h}$ level is -1 dB.
- 2.11 The $L_{A10,18hr}$ values have then been converted into the equivalent $L_{Aeq,16hr}$ values by applying a correction of -2 dB.
- 2.12 The measured night-time L_{Aeq} values have been averaged logarithmically at each location to obtain a value which has been taken as being representative of the night-time $L_{Aeq,8hr}$ traffic noise exposure level.
- 2.13 During the traffic noise survey at Location 3, it was noted that there was little noise from the garden centre opposite. A delivery was made in the afternoon and at night there was a steady sound of distant mechanical plant at a low level. Any such noise from the garden centre will be mitigated adequately by the sound insulation measures that are recommended (in Section 4) for the nearest houses to Wrexham Road in respect of traffic noise.
- 2.14 The full results of the traffic noise survey are shown in Appendix II and the daytime and night-time traffic noise exposure levels are shown in Table 1.

Table 1: Calculated road traffic noise exposure levels (dB)

Location	Daytime $L_{Aeq,16h}$	Night-time $L_{Aeq,8hr}$
1. Towards SE end at position of proposed Plot 12.	55	49
2. Towards SE end at position of proposed Plot 10.	54	50
3. 4m from northern boundary. Proposed Plot 21.	61	50

2.15 The short-term peaks of noise measured at night due to traffic were in the range of 59 - 63 dB L_{Amax} at Location 1; 61 - 66 dB L_{Amax} at Location 2; and 68 - 73 dB L_{Amax} at Location 3.

2.16 The implications of the road traffic noise exposure values are discussed below.

Comments on Road Traffic Noise Exposure Levels

2.17 The results of the traffic noise survey have been assessed in accordance with the guidance in 'Technical Advice Note (Wales) 11 – Noise', 1997 (TAN 11) and CL-01-15 updates. TAN 11 sets out Noise Exposure Categories (NECs) for proposed residential development land that is exposed to different types of noise, and their suitability for residential use. The NECs for land exposed to road traffic noise (which are 'free field' values) are shown in Table 2.

2.18 Thus, the traffic noise levels measured at the Wrexham Road site shown in Table 1 need to be compared with the values shown below in Table 2.

Table 2: TAN 11 Road Traffic Noise Exposure Categories

	Noise Exposure Category (NEC)			
	A	B	C	D
Daytime (0700-2300 hrs)	<55	55-63	63-72	>72
Night-time (2300-0700 hrs)	<45*	45-57*	57-66	>66

[* sites where noise events regularly exceed 82 dB L_{Amax} several times in any hour at night should be treated as being in Category C]

Category A - Noise need not be considered as a determining factor in granting planning permission.

Category B - Noise should be taken into account and steps taken to ensure an adequate level of protection against noise.

Category C - Planning permission should not normally be granted. Where development is permitted, steps should be taken to ensure a commensurate level of protection against noise.

Category D - Planning permission should normally be refused.

- 2.19 At Locations 1 and 2 on the Wrexham Road site the daytime traffic noise exposure levels (shown in Table 1) fall into the boundary of NEC A/B of TAN 11. At Location 3, daytime traffic noise exposure level falls into NEC B.
- 2.20 The night-time traffic noise exposure levels fall into NEC B of TAN 11 at all survey locations.
- 2.21 Thus, whilst the traffic noise exposure levels are suitable for residential development, the noise levels in NEC B areas need to be taken into account and, where necessary, appropriate noise mitigation measures implemented.
- 2.22 Short-term peaks of noise at night in L_{Amax} due to passing traffic were found to be relatively modest at Locations 1 and 2, due to the distance to the A534. At Location 3 short-term peaks of noise at night due to passing traffic on Wrexham Road were higher at 68 - 73 dB L_{Amax} .
- 2.23 Therefore, we conclude that, implementation of an adequate scheme of noise mitigation measures is necessary for certain areas of the Wrexham Road development. Appropriate acoustic design goals for the houses are discussed in Section 3.0 and our recommendations for noise mitigation are set out in Section 4.0.

3.0 ACOUSTIC DESIGN CRITERIA

- 3.1 The most relevant national guidance on appropriate acoustic design goals for residential development is set out in BS8233: 2014, *Guidance on sound insulation and noise reduction for buildings*, which carries the full weight of an adopted British Standard. The design criteria recommended in BS8233 for daytime periods (07:00 – 23:00 hours) and night-time periods (23:00 – 07:00 hours) are summarised in Table 3:

Table 3: BS8233 recommended acoustic design criteria

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

- 3.2 BS 8233 also states that, “where development is considered necessary or desirable ... the internal target levels [i.e. those in Table 3 above] may be relaxed by up to 5dB and reasonable internal conditions still achieved”.
- 3.3 BS 8233 states that if there is a reliance on closed windows to meet the guide values, “there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level”.
- 3.4 BS8233 also recognises that regular individual noise events at night can cause sleep disturbance. Peaks of noise from individual events are usually described in terms of L_{Amax} values and these can be highly variable and unpredictable such that for design purposes it is usual to take into account the findings of research described in WHO *Community Noise Guidelines* that states “for a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{Amax} more than 10-15 times per night”.
- 3.5 For this development we therefore recommend the following noise criteria be adopted with windows closed and trickle ventilation provided:
- Daytime noise below 35 dB L_{Aeq} inside living rooms and bedrooms; and
 - night-time noise levels not exceeding 30 dB L_{Aeq} and generally not exceeding 45 dB L_{Amax} in bedrooms.

- 3.6 Meeting the above adopted noise criteria will provide a good standard of protection of residential amenity for future residents of the proposed development.
- 3.7 For traditional outdoor amenity spaces such as private rear gardens BS8233 states that 'it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments'. However, the standard also recognises that these guideline values are not achievable in all circumstances where development might be desirable, particularly for development sites adjoining the 'strategic transport network'. In such cases (i.e. where noise levels would be above 55 dB L_{Aeq} even with mitigation in place) BS8233 states that the development should be designed to minimise noise levels as far as is practicable 'but should not be prohibited'. For this site we recommend that traffic noise levels are controlled to within 55 dB $L_{Aeq,16hr}$ in rear gardens of the houses.
- 3.8 On this basis, our recommendations for noise mitigation are described in Section 4.

4.0 NOISE MITIGATION MEASURES

Gardens

- 4.1 The highest levels of traffic noise in the daytime were measured close to Wrexham Road. The site layout drawing shows that there will only be one rear garden (Plot 1) near to Wrexham Road. Other rear gardens will be behind the houses and thus shielded effectively from traffic noise by the houses themselves.
- 4.2 We recommend that a solid brick wall, or proprietary acoustic timber fence, is installed for the rear garden of Plot 1, as indicated in Figure 2. The wall/fence should be at least 1.8m high. If acoustic fencing is used it should be constructed of boards of at least 20mm thickness, with a minimum surface density of 12kg/m². The fencing should have double-rebated boards or joint cover strips to ensure that there are no gaps at joints. We calculate that such a wall/fence would reduce traffic noise in the garden to within 55 dB $L_{Aeq(16\text{ hr})}$.
- 4.3 We would also recommend that a similar wall or acoustic fence is installed to the sides of the rear gardens of Plots 19 and 24.
- 4.4 In the southern area of the site we recommend that a solid wall or acoustic fence of 1.8m height is installed for the rear garden of Plot 12, as indicated in Figure 2. Also, we recommend that acoustic fencing of 1.8m height is installed to the west sides of the rear gardens of Plots 10 and 18.

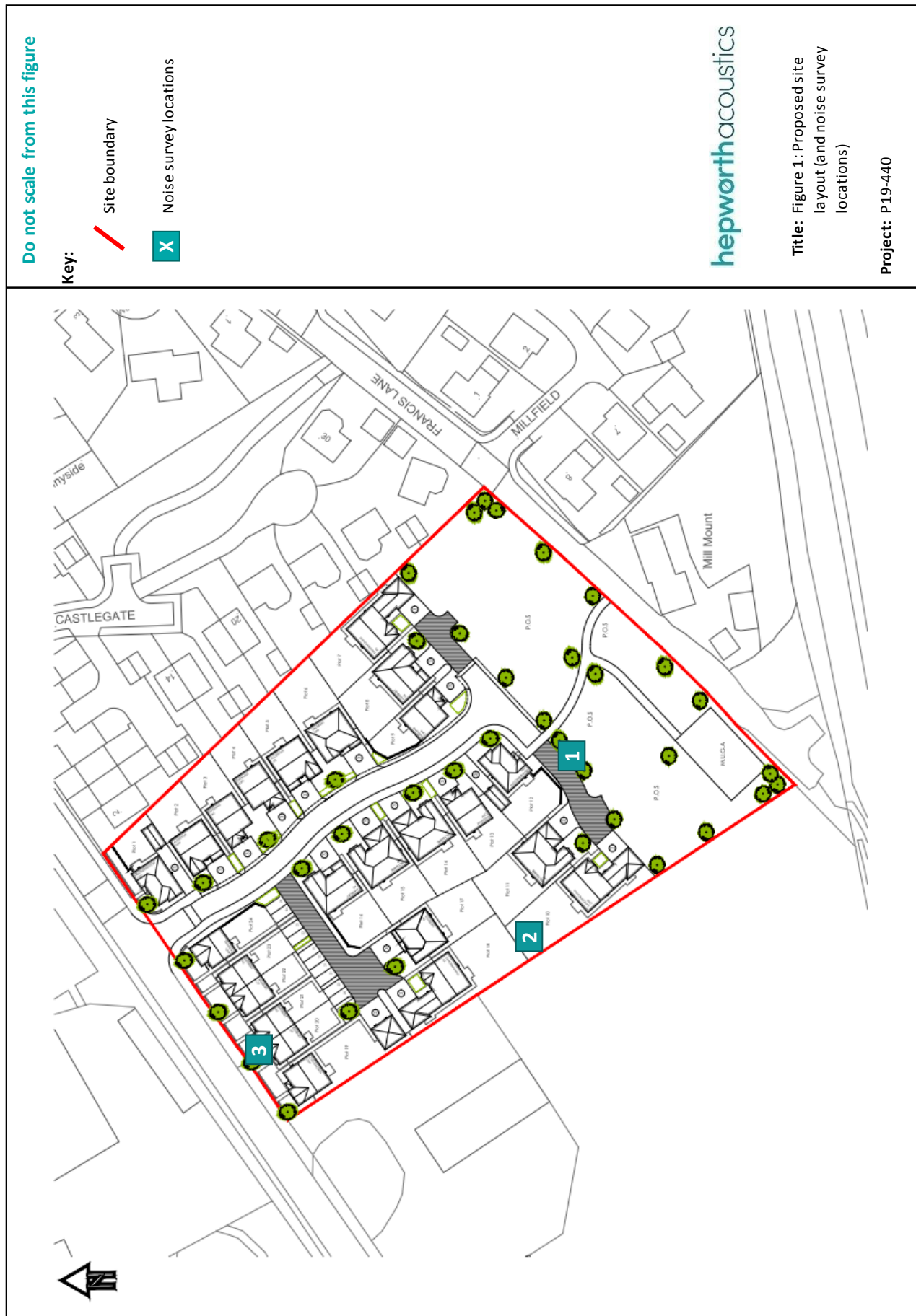
Sound Insulation of Houses

- 4.5 Windows of standard thermal double glazing (4mm glass – 4mm glass) have a typical sound reduction performance of 25 dB $R_w + C_{tr}$ (R_{tra}). Therefore, where traffic noise levels exceed 60 dB $L_{Aeq,16hr}$ during the daytime and/or 55 dB $L_{Aeq,8hr}$ and/or 70 dB L_{Amax} at night, higher specification glazing will be necessary.
- 4.6 From the noise survey results higher specification glazing will only be necessary for some living rooms and bedroom windows of the houses nearest to Wrexham Road.
- 4.7 We recommend double glazing with a sound reduction performance of 30 dB $R_w + C_{tr}$ for living rooms and bedrooms in exposed elevations of the houses nearest to Wrexham Road as indicated in Figure 2.

- 4.8 Typically, 30 dB $R_w + C_{tr}$ would be provided with double-glazing of 6mm glass – nominal cavity – 6.4mm acoustic laminated glass (e.g. Saint Gobain ‘Stadip Silence’).
- 4.9 Standard thermal double-glazing (4mm glass – 4mm glass) will be adequate for all other houses/elevations.
- 4.10 However, for habitable rooms where enhanced glazing is required, specialist acoustic vents will be necessary instead of standard window frame slot vents. Various types are commercially available but we would recommend types such as the Greenwood EAR42W 3-part system, comprising humidity sensitive indoor unit, acoustic sleeve, and outdoor acoustic canopy or wall mounted Rytons AAC125HP units, both of which have a good acoustic performance rating of over 40 dB $D_{n,e,w}$.
- 4.11 Also, in respect of traffic noise from the A534, we would recommend that acoustic vents are provided for some bedroom windows of houses in the south-west area of the site, as indicated in Figure 2.

5.0 SUMMARY

- 5.1 The impact of road traffic noise has been assessed for the residential development proposed at Wrexham Road, Holt.
- 5.2 The assessment has included the measurement of road traffic noise levels from the A534 and Wrexham Road on the site and calculation of the daytime and night-time traffic noise exposure levels.
- 5.3 Standard acoustic design criteria have been adopted from British Standard 8233:2014 that will ensure the protection of residential amenity. However, to achieve these criteria it will be necessary to implement noise mitigation measures for some houses, particularly those nearest to Wrexham Road.
- 5.4 An appropriate noise mitigation scheme for the development has been described in this report.





Appendix I: Noise Units & Indices

Sound and the decibel

A sound wave is a small fluctuation of atmospheric pressure. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. In order to cope with this wide range of pressure variations, a logarithmic scale is used to convert the values into manageable numbers. Although it might seem unusual to use a logarithmic scale to measure a physical phenomenon, it has been found that human hearing also responds to sound in an approximately logarithmic fashion. The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120dB (threshold of pain).

Due to the logarithmic nature of decibels, when two noises of the same level are combined together, the total noise level is (under normal circumstances) 3 dB(A) higher than each of the individual noise levels e.g. 60 dB(A) plus 60 dB(A) = 63 dB(A). In terms of perceived 'loudness', a 3 dB(A) variation in noise level is a relatively small (but nevertheless just noticeable) change. An increase in noise level of 10 dB(A) generally corresponds to a doubling of perceived loudness. Likewise, a reduction in noise level of 10 dB(A) generally corresponds to a halving of perceived loudness.

The ear is not equally sensitive to sound at all frequencies. It is less sensitive to sound at low and very high frequencies, compared with the frequencies in between. Therefore, when measuring a sound made up of different frequencies, it is often useful to 'weight' each frequency appropriately, so that the measurement correlates better with what a person would actually hear. This is usually achieved by using an electronic filter called the 'A' weighting, which is built into sound level meters. Noise levels measured using the 'A' weighting are denoted dB(A) or dBA.

Frequency and Hertz (Hz)

As well as the loudness of a sound, the frequency content of a sound is also very important. Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or hertz (Hz). Sometimes large frequency values are written as kiloHertz (kHz), where 1 kHz = 1000 Hz.

Young people with normal hearing can hear frequencies in the range 20 Hz to 20 kHz. However, the upper frequency limit gradually reduces as a person gets older.

Glossary of Terms

When a noise level is constant and does not fluctuate, it can be described adequately by measuring the dB(A) level. However, when the noise level varies with time, the measured dB(A) level will vary as well. In this case it is therefore not possible to represent the noise climate with a simple dB(A) value. In order to describe noise where the level is continuously varying, a number of other indices can be used. The indices used in this report are described below.

L_{Aeq} This is the A-weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period. In other words, L_{Aeq} is the level of a continuous noise which has the same total (A-weighted) energy as the real fluctuating noise, measured over the same time period. It is increasingly being used as the preferred parameter for all forms of environmental noise.

L_{Amax} This is the maximum A-weighted noise level that was recorded during the monitoring period.

L_{A10} This is the A-weighted noise level exceeded for 10% of the time period. L_{A10} is usually used as a measure of traffic noise.

L_{A90} This is the A-weighted noise level exceeded for 90% of the time period. L_{A90} is used as a measure of background noise.

Appendix II: Traffic Noise Survey Results

Date(s): Daytime – Tuesday 22nd October 2019
 Night – early hours of Wednesday 23rd October 2019

Equipment: Rion NA-27 'Type 1' sound analyser (serial no. 10632001) with tripod, Castle GA607 calibrator, Kestrel 2000 thermometer/anemometer.

Weather: Daytime - Dry, mild 12-14 °C , mainly overcast 7/8 cloud. SW breeze 1-3m/s.
 Night – Dry, cold, clear night 5°C, calm to slight S breeze 0-1m/s.

All levels in dB(A)

Location 1: Towards SE end of field. Approx. position of proposed Plot 12

Daytime

Time		Measured Noise Levels (dB)				Comments on Noise Sources
Start	End	L _{Amax}	L _{A10}	L _{Aeq}	L _{A90}	
13:05	13:20	64.1	57.8	54.3	46.6	Traffic noise from A534, birds, distant aircraft.
13:56	14:11	(79.1)	57.7	(56.4)	49.1	Traffic noise from A534, birds, (low light aircraft = L _{Amax})..
14:50	15:05	66.2	59.3	55.6	48.4	Traffic noise from A534, birds.
15:40	15:55	63.4	57.4	54.8	49.9	Traffic noise from A534, birds.

Average L_{A10} = 58.1 dB L_{A10,3hr}

L_{A10, 18 hr} = L_{A10,3hr} - 1 = 57.1

L_{Aeq,16hr} = L_{A10, 18 hr} - 2 = 55.1

Night

Time		Measured Noise Levels (dB)				Comments on Noise Sources
Start	End	L _{Amax}	L _{A10}	L _{Aeq}	L _{A90}	
03:44	03:59	62.6	45.2	44.2	33.1	Occasional traffic on A534, distant geese to south, distant aircraft.
04:39	04:54	63.1	52.8	47.9	34.7	Occasional traffic on A534, distant geese.
05:36	05:51	59.3	52.1	48.8	41.1	Intermittent traffic on A534, distant geese.
06:32	06:47	62.2	55.1	51.8	44.5	A534 traffic.

(Log.) Average L_{Aeq} = 49.0 dB(A)

Location 2: SE end of field to W side. Approx. position of proposed Plot 10 near boundary hedge.

Daytime

Time		Measured Noise Levels (dB)				Comments on Noise Sources
Start	End	L _{Amax}	L _{A10}	L _{Aeq}	L _{A90}	
13:21	13:36	62.9	56.4	53.2	47.1	A534 traffic, birds.
14:13	14:28	62.4	55.8	52.8	47.6	A534 traffic, birds.
15:06	15:21	65.0	58.8	55.2	49.7	A534 traffic, birds. Distant aircraft.
15:56	16:11	62.1	57.5	54.8	49.9	A534 traffic, birds, light aircraft.

Average L_{A10} = 57.1 dB L_{A10,3hr}

L_{A10, 18 hr} = L_{A10,3hr} - 1 = 56.1

L_{Aeq,16hr} = L_{A10, 18 hr} - 2 = 54.1

Night

Time		Measured Noise Levels (dB)				Comments on Noise Sources
Start	End	L _{Amax}	L _{A10}	L _{Aeq}	L _{A90}	
04:00	04:15	63.8	45.8	44.9	33.3	Occasional traffic on A534, distant geese
04:56	05:11	60.7	53.6	48.6	36.6	Intermittent traffic on A534, distant geese
05:53	06:06	65.8	53.2	48.9	40.2	Traffic, horn, faint v. distant plant to SW.
06:49	07:00	62.1	56.3	53.0	46.8	Traffic, distant aircraft, bird.

(Log.) Average L_{Aeq} = 49.8 dB(A)

Location 3: NW end of site, 4m from site boundary. Approx. position of proposed Plot 21**Daytime**

Time		Measured Noise Levels (dB)				Comments on Noise Sources
Start	End	L _{Amax}	L _{A10}	L _{Aeq}	L _{A90}	
13:39	13:54	71.2	63.5	59.2	49.3	Passing traffic, distant helicopter.
14:31	14:46	76.3	62.9	59.0	47.3	Passing traffic, occasional minor sounds from garden centre.
15:23	15:38	-	63.8	60.7	49.3	Passing traffic, occasional minor sounds from garden centre.
16:13	16:28	72.0	64.6	60.0	48.4	Passing traffic, birds.

Average L_{A10} = 63.7 dB L_{A10,3hr}

L_{A10, 18 hr} = L_{A10,3hr} - 1 = 62.7

L_{Aeq,16hr} = L_{A10, 18 hr} - 2 = 60.7

Night

Time		Measured Noise Levels (dB)				Comments on Noise Sources
Start	End	L _{Amax}	L _{A10}	L _{Aeq}	L _{A90}	
04:18	04:33	68.2	45.7	46.6	32.9	Distant traffic, 2 cars passed, faint steady plant from garden centre.
05:16	05:31	73.0	48.9	49.3	37.0	Distant traffic, occasional passing cars, faint steady plant from garden centre.
06:10	06:25	72.4	52.0	52.7	41.4	Distant traffic, occasional passing cars, passing lorry.

(Log.) Average L_{Aeq} = 50.2 dB(A)