Lye Lane, Bricket Wood, AL2 3TF

Outline Planning Noise Assessment

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1. INTRODUCTION

MRP Planning are involved in the proposed development of approximately 125 residential dwellings on land off Lye Lane, Bricket Wood, AL2 3TF. The site is around 6.5Ha and is currently occupied by Bricket Lodge Sport & Country Club.

An outline application is to be made based on the proposed Concept Plan.

Spectrum has carried out an initial site noise risk assessment at the site to establish any constraints and potential requirements for mitigation there may be and to inform the design parameters of the development going forward.

This report presents the outline planning noise assessment, which includes the initial site noise risk assessment, and is prepared in support of the outline planning application.

2. SITE DESCRIPTION

The proposed development site is located on land off Lye Lane, Bricket Wood, AL2 3TF.

The site is bounded to the south by the M25, to the north by residential uses, and to the east and west by wooded areas.

The proposed development site is occupied by Bricket Lodge Sport & Country Club and comprises two distinct areas: a wooded area to the south of the site, bounding the M25; and a largely brownfield area in the northern half of the site used for paintball activities, with a number of residential and other buildings to the west on Lye Lane.

The proposal involves the construction of around 125 dwelling houses in the northern half of the site, including public open space / playground. The wooded area in the southern half of the site is to remain.

Drawings showing the site location and Concept Plan are presented in Appendix A.

3. RELEVANT POLICY AND GUIDANCE

3.1 NATIONAL PLANNING POLICY FRAMEWORK (NPPF)

The National Planning Policy Framework (NPPF)[1] sets out the Government's planning policies for England and how these should be applied by establishing a framework within which locally prepared plans for development can be produced.

The NPPF requires (174) that '*planning policies and decisions should contribute to and enhance the natural and local environment by:* […] *preventing new and existing development from contribution to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of* […] *noise pollution* […]*.'*

[1] *National Planning Policy Framework, MHCLG, July 2021*

In relation to noise (185) '*Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*

> *'a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life[2];*
>
> *'b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason'*

Planning policies and decisions should also (187) *'ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed'.*

Throughout the NPPF reference is made to other policies, such as the Noise Policy Statement for England (NPSE), which should also be applied as appropriate.

3.2 NOISE POLICY STATEMENT FOR ENGLAND (NPSE)

The Noise Policy Statement for England (NPSE)[3] sets out the long term vision of government noise policy which is to *'Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.'*

The aims of the NPSE are to (2.23-2.25):

- avoid significant adverse impacts on health and quality of life;
- mitigate and minimise adverse impacts on health and quality of life; and
- where possible, contribute to the improvement of health and quality of life

These aims are developed by reference (2.20-2.21) to the concepts of:

- NOEL (No Observed Effect Level). This is the level below which no effect can be detected.
- LOAEL (Lowest Observed Adverse Effect Level). This is the level above which adverse effects on health and quality of life can be detected.
- SOAEL (Significant Observed Adverse Effect Level). This is the level above which significant adverse effects on health and quality of life occur.

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[2] *See Explanatory Note to the Noise Policy Statement for England, paragraphs 2.23 and 2.24 , DEFRA,15 March 2010.*

[3] *Noise Policy Statement for England (NPSE), DEFRA, 15 March 2010*

It recognises that there is no universally applicable objective threshold for these concepts. Consequently, the NOEL, LOAEL and SOAEL are likely to be different for different noise sources and receptors and at different times (2.22).

Situations of significant adverse effect (SOAEL) should be avoided (2.23). Where the impact is between LOAEL and SOAEL reasonable steps should be taken to minimise and mitigate adverse effects on health and quality of life, but does not mean that such adverse effects cannot occur (2.24). It is also implied that situations of NOEL would be acceptable in noise terms.

3.3 PLANNING PRACTICE GUIDANCE (PPG)

Planning Practice Guidance on Noise[4] (PPG-N) sets out government guidance on '*how planning can manage potential noise impacts in new development'*.

Whilst it does advise that noise can override other planning concerns, *'where justified'*, it states that *'it is important to look at noise in the context of the wider characteristics of a development proposal, its likely users and its surroundings, as these can have an important effect on whether noise is likely to pose a concern.' (002)*

It also details the hierarchy of noise exposure, including the thresholds LOAEL and SOAEL, based on the likely average response, referred to within NPSE[5]. The noise exposure categories are summarised below.

- No Observed Adverse Effect: Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response.
- Observed Adverse Effect: Noise can be heard and causes small changes in behaviour, attitude or other physiological response.
- Significant Observed Adverse Effect: The noise causes a material change in behaviour, attitude or other physiological response.
- Unacceptable Adverse Effect: Extensive and regular changes in behaviour, attitude or other physiological response, and/or an inability to mitigate effect of noise leading to psychological stress.

The guidance advises, in accordance with the first and second aims of the NPSE, that where there is no observed effect or no observed adverse effect, no specific measures are required to manage the acoustic environment; where there is an observed adverse effect, consideration needs to be given to mitigating and minimising those effects; where there is significant adverse effects, the planning process should be used to avoid these effects occurring; where there are unacceptable adverse effects, the situation should be prevented.

In establishing values for LOAELs and SOAELs, which represent the onset levels of adverse effects and significant adverse effects, respectively, the guidance advises because of the subjective nature of noise, there is no simple relationship between noise level and its impact. It will instead depend on a number of factors in a particular situation. These will include:

- The source, its absolute level and the time of day.

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[4] *PPG - Noise, MHCLG, 22 July 2019*

[5] *Explanatory Note to the Noise Policy Statement for England, paragraphs 2.19 and 2.20, DEFRA,15 March 2010)*

- For intermittent sources, the number and duration of events;
- The spectral frequency content of the noise

And also other factors will need to be considered in many cases, which are more fully described and detailed within the full PPG guidance, but include matters such as:

- The cumulative impacts with other sources
- Whether internal effects can be completely removed for example by closing windows (relevant with new residential development subject to ventilation being developed)
- Whether existing noise sensitive locations already experience high noise levels,
- Where Noise Action Plans, and, in particular Important Areas are identified nearby.
- The effect on wildlife especially on nationally designated sites.
- The use of external amenity spaces intrinsic to an overall design and including private gardens.
- The potential effect of a new residential or other sensitive development being located close to an existing noisy business or site, and for noise mitigation to be considered.
- Whether there are nearby areas of tranquility relatively undisturbed by noise from human caused sources that undermine the intrinsic character of the area and likely already valued for their tranquillity.

It should be observed that the PPG guidance does not provide any detail on the how such assessment including these factors, should be carried out. However, reference is made to documents published by other organisations, such as:

- *BS 8233:2014 – Guidance on sound insulation and noise reduction for buildings (British Standards Institute 2014);*
- *Guidelines for Environmental Noise Impact Assessment (Institute of Environmental Management and Assessment, 2014);*
- *ProPG: Planning & Noise – Professional Practice Guidance on Planning & Noise – New Residential Development (Association of Noise Consultants, Institute of Acoustics and Chartered Institute of Environmental Health, May 2017).*

This should not be considered an exhaustive list, however, as reference may also be made to other existing British Standards, where relevant, and to scientific exposure-response studies or reviews relating to noise and its effects on human and, where appropriate, animal populations.

3.4 GUIDELINES FOR COMMUNITY NOISE - WORLD HEALTH ORGANIZATION (WHO), 1999

Guidelines for Community Noise (GCN) was published in 1999 with the aim of informing legislation and guidance produced at the national and regional levels for the purposes of minimising any potential adverse health effects resulting from noise in the community. It presents guideline noise level criteria for the avoidance of adverse effects such as sleep disturbance and annoyance in a range of specific environments. The preface to WHO states that community noise includes road, rail and air traffic, industries, construction and public work, and the neighbourhood.

New guidance from WHO titled Environmental Noise Guidelines for the European Region (ENG) was published in 2018. The document takes a very different approach to guidance set out in the previous

document (GCN) by identifying separate thresholds for specific sources rather than for community noise as a whole. Consequently, much of the earlier guidance set out in GCN is now absent from ENG. While ENG was intended to supersede GCN, it recognises this absence and states that *'indoor guideline values and any values not covered by the current guidelines (such as industrial noise and shopping areas) should remain valid.'*

It is recommended that all WHO guidance should be noted but that it should not be relied upon in assessments without reference to other relevant detailed guidance, especially that in British Standards. These may align better with Planning Practice Guidance[6] in England.

3.5 BS 8233:2014 GUIDANCE ON SOUND INSULATION AND NOISE REDUCTION FOR BUILDINGS

BS 8233:2014[7] '*provides guidance for the control of noise in and around buildings. It is applicable to the design of new buildings, or refurbished buildings undergoing a change of use*'. '*The Standard is not*[8] *intended to be used routinely where noise sources are brought to existing noise sensitive buildings'*.

For residential use dwellings (7.7.1), *'the main considerations, for bedrooms, are the acoustic effect on sleep; and for other rooms, the acoustic effect on resting, listening and communicating*' *(7.7.1).*

Internal noise criteria are advised relating to sources of external noise *'"without a specific character", previously termed "anonymous noise". (…). For simplicity, only noise without character is considered. Noise has a specific character if it contains features such as a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content, in which case lower noise limits might be appropriate'.(7.7.1)*

'For steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guideline values', which are set out in Table 1.

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

Table 1: Indoor ambient noise levels for dwellings

There are a number of notes to the table. These include:

Note 4: Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values.

[6] *PPG - Noise, MHCLG, 6 March 2014*

[7] *BS 8233:2014 Guidance on sound insulation and noise reduction for buildings*

[8] *The word 'not' is omitted from the text in the Standard. The Institute of Acoustics advised 'not' to be added following a meeting of their London Branch in March 2015.*

BS 8233 does not give guidance on what might constitute a guideline value. However, as the standard does cross reference WHO, we suggest that the guideline value of L_{AFmax} 45dB, inside bedrooms, should not be exceeded during the night more than 10-15 times, which reflects the WHO position.

'Note 5: If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the facade insulation or the resulting noise level. If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment'.

'Note 7: Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved'.

'For traditional external areas that are used for amenity space, such as gardens and patios, 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, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited'. (7.7.3.2)

Although small balconies in flats or apartments used only for drying washing or growing pot plants should not have noise limits*, 'the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space' (7.7.3.2).*

3.6 PROFESSIONAL PRACTICE GUIDANCE ON PLANNING & NOISE (PROPG)

ProPG was published in May 2017 and was produced jointly by the Association of Noise Consultants, the Institute of Acoustics, and the Chartered Institute of Environmental Health, with the aim of providing *'guidance on a recommended approach to the management of noise within the planning system in England.'*

'The approach encourages early consideration of noise issues, facilitates straightforward accelerated decision making for lower risk sites, and assists proper consideration of noise issues where the acoustic environment is challenging.' (2.2)

ProPG recommends a two-stage approach (2.3):

- *'Stage 1 – an initial noise risk assessment of the proposed development site; and*
- *Stage 2 – a systematic consideration of four key elements.'*

The Stage 1 assessment aims to provide and early indication of the risk of adverse effects from noise where no subsequent mitigation is included in the development proposal. The approach is *'considered to support wider Government planning and noise policy and guidance.' (2.11)*

Table 2 summarises the Stage 1 noise risk hierarchy presented in Figure 1 of the ProPG. The noise level ranges given in the table have been interpreted from the more fluid representation presented in the ProPG document. This will align more clearly with potential noise modelling outputs, such as noise contour plots, which may be used as the basis of a Stage 1 assessment. However, these ranges are indicative only and should not be interpreted as fixed thresholds.

Risk of adverse effect without mitigation	Indicative daytime noise levels, $L_{Aeq,16hr}$ (dB)	Indicative night time noise levels, $L_{Aeq,8hr}$ (dB)	ProPG pre-planning application advice
High	> 70	> 60	*'High noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice.'*
Medium	60 – 70	50 – 60	*'As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development.'*
Low	50 – 60	40 – 50	*'At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.'*
Negligible	< 50	< 40	*'These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds.'*

Table 2: ProPG Stage 1 Initial Site Noise Risk Assessment

Notes:

a. *Indicative noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures.*
b. *Indicative noise levels are the combined free-field noise level from all sources of transport noise and may also include industrial/commercial noise where this is present but is "not dominant".*
c. *LAeq,16hr is for daytime 0700 – 2300, LAeq,8hr is for night-time 2300 – 0700.*
d. *An indication that there may be more than 10 noise events at night (2300 – 0700) with Lamax,F > 60 dB means the site should not be regarded as negligible risk.*

The Stage 2 assessment comprises four key elements, to be undertaken in parallel, which are based on existing National Policy, Guidelines and Standards, and are summarised as follows (2.4):

- *'Element 1 – demonstrating a "Good Acoustic Design Process";*
- *Element 2 – observing internal "Noise Level Guidelines";*
- *Element 3 – undertaking an "External Amenity Area Noise Assessment"; and*
- *Element 4 – consideration of "Other Relevant Issues".'*

It should be noted that 'good acoustic design' is not limited to Element 1 but is instead an overarching principle that extends across ProPG's recommended 2-stage approach to the management of noise within the planning system. The approach set out within Elements 2 and 3, is based on existing guidance set out within BS 8233:2014 and WHO. The approach within element 4 considers compliance with relevant national and local policy and considers the acoustic design in relation to any unintended adverse impacts the design may have caused, as well as any wider planning objectives, among other potential considerations. It is noted, however, that *'Not all of the issues listed above will arise in every planning application and some may already have been addressed as an inherent part of good acoustic design.' (2.57)*

3.7 ACOUSTICS VENTILATION AND OVERHEATING RESIDENTIAL DESIGN GUIDE (AVO)

AVO was first published in January 2020 and was produced jointly by the Association of Noise Consultants and Institute of Acoustics with the aim of assisting *'acoustics practitioners as well as all those involved in the planning, development, design and commissioning of new dwellings. It recommends an approach to acoustic assessments for new residential development that take due regard of the interdependence of provisions for acoustics, ventilation, and overheating.' (1.4)*

AVO clarifies that *'it is important to differentiate between the need to provide 'purge ventilation' as required occasionally under ADF (i.e. to remove smoke from burnt food etc.); against the provision of ventilation to help control overheating, which is not covered by The Building Regulations.' (2.4)* It also clarifies that there is no specific acoustic criterion that need be met for purge ventilation.

Additionally, AVO makes a clear distinction between the acoustic requirements as they relate to whole dwelling ventilation rates ('ADF ventilation condition'), which applies for the entire time, and to ventilative cooling to mitigate overheating ('overheating condition'), which applies only part of the time. It states, *'desirable internal noise standards within Table 4 of BS 8233:2014 should be achieved when providing adequate ventilation as defined by ADF whole dwelling ventilation. However, it is considered reasonable to allow higher levels of internal ambient noise from transport sources when higher rates of ventilation are required in relation to the overheating condition.' (3.9)*

Where mitigation of a potential overheating condition is to rely on opening windows, AVO advises a 'two-level noise assessment procedure'.

Level 1 is a 'Site Risk Assessment' based on a sliding scale of external noise levels from transportation noise sources, which categorises the site in terms of negligible, low, medium, or high risk of adverse effect during the overheating condition, without mitigation. The scale ranges from $L_{Aeq,T}$ 50dB/45dB (day/night) to $L_{Aeq,T}$ 65dB/55dB (day/night); however, these values are not to be taken as fixed thresholds. Where there is negligible risk, no further assessment is required. Where the risk is low or medium, a Level 2 assessment may optionally be considered. Where there is a high risk, a Level 2 assessment is recommended. Although no scale is provided for individual noise events, AVO advises that where L_{AFmax} 78dB is normally exceeded at night, a Level 2 assessment is recommended.

Level 2 is an ‘Assessment of Adverse Effect’, which is based on a sliding scale of internal ambient noise levels from transportation noise sources relating to the overheating condition. The guidance for the Level 2 assessment is copied in Table 3. It should be noted that the values in the table should not be regarded as fixed thresholds and that the potential for adverse effect will also depend on how frequently and for what duration the overheating condition occurs.

Internal ambient noise level			Examples of Outcomes	
$L_{Aeq,T}$ during 07:00-23:00	$L_{Aeq,8h}$ during 23:00-07:00	Individual noise events during 23:00-07:00		
> 50dB	> 42dB	Normally exceeds 65dB L_{AFmax}	Noise causes a material change in behaviour e.g. having to keep windows closed most of the time	Avoiding certain activities during periods of intrusion. Having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.
			Increasing likelihood of impact on reliable speech communication during the day or sleep disturbance at night	At higher noise levels, more significant behavioural change is expected and may only be considered suitable if occurring for limited periods. As noise levels increase, small behaviour changes are expected e.g. turning up the volume on the television; speaking a little more loudly; having to close windows for certain activities, for example ones which require a high level of concentration. Potential for some reported sleep disturbance. Affects the acoustic environment inside the dwelling such that there is a perceived change in quality of life. At lower noise levels, limited behavioural change is expected unless conditions are prevalent for most of the time.
≤ 35dB	≤ 30dB	Do not normally exceed L_{AFmax} 45dB more than 10 times a night	Noise can be heard, but does not cause any change in behaviour	Noise can be heard, but does not cause any change in behaviour, attitude, or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.

Table 3: Guidance for Level 2 assessment of noise from transportation noise sources relating to overheating condition (copied from AVO)

4. AMBIENT NOISE SURVEY

4.1 METHODOLOGY

The ambient noise survey consisted of measuring noise levels close to roads near the boundary of the proposed development site in order to establish the incident noise levels emanating from surrounding activity.

Unattended measurements were carried out from Friday 14th to Thursday 20th January 2022. Additional attended measurements were carried out on Friday 14th January 2022 during the day.

Noise measurement parameters consisted of equivalent continuous (L_{Aeq}) noise levels and maximum (L_{Amax}) noise levels as well as statistical noise levels (termed Ln, where n is the percentage of time the level is exceeded during the measurement period). Both overall and 1/1 octave band measurements were stored for later analysis.

The following equipment was used:

- Bruel & Kjaer Type 2250 Sound Level Meter s/n 3024398
- Bruel & Kjaer Type 4189 Microphone s/n 3147720
- Bruel & Kjaer Type 4231 Acoustic Calibrator s/n 3021283
- Bruel & Kjaer Type 2270 Sound Level Meter s/n 3003731
- Bruel & Kjaer Type 4189 Microphone s/n 2888222
- Bruel & Kjaer Type 4231 Acoustic Calibrator s/n 3009564

Before and after the survey, the sound level meter was field-calibrated in accordance with the manufacturer's guidelines, and no significant drift was observed. The meter, microphone and field calibrator are laboratory calibrated biennially in accordance with UKAS procedures or to traceable National Standards.

A plan showing the noise monitoring locations (NML) is presented in Appendix B.

4.2 RESULTS

The results of the ambient noise measurements are presented in Appendix B, including comments on the observed acoustic environment, and summarised in Table 4.

Noise Measurement Location (NML)	Ambient noise level L_{Aeq} (dB)		Night typical L_{Amax} (dB)
	Day	Night	
NML 1: Southern boundary, 26m from M25	78	73	82
NML 2: South west corner of site	62	-	-
NML 3: 2.5m from Lye Lane at north west corner of site	60	-	-

Table 4: Summary of results of ambient noise survey results

The L_{Aeq} levels are the log average of all the measured 5-minute values, which is considered to be representative of the long-term typical levels at the NMLs. The L_{Amax} level shown is highest of the 10th highest measured levels from each night time period, which is considered to be representative of the levels

that would not typically be exceeded (more that 10-15 times) over the full night time period, as per WHO guidance.

Noise levels affecting the site are dominated by road traffic movements on the M25 during both the day and night time periods.

5. INITIAL SITE NOISE RISK ASSESSMENT

5.1 NOISE MODEL

To establish the noise levels affecting the site as a whole, a computer-based noise model has been created. The particular prediction model that has been used for this analysis is Bruel & Kjaer's Type 7810 'Predictor' software. This acoustic model implements the procedures set out in ISO 9613-2:1996 "Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation to determine noise levels", and is Quality Assured to all parts of ISO 17534:2015 "Acoustics – Software for the calculation of sound outdoors". The Predictor model takes account of the following features in its calculation procedure:

- Source sound power level (for point, line and area sources)
- Reflection from nearby structures and source directivity
- Distance from noise source (geometric spreading)
- Atmospheric absorption
- Acoustic screening of intervening structures and topography
- Ground absorption
- Ground effects (which includes the height of ground relative to the noise source)

Roads have been modelled as line sources, which have been validated by comparing the results of the model simulation with the measured data. The results of the simulation are within 1dB of the measured results at each of the NMLs with respect to the nearest road source, both for the day and night time models. Therefore, the validated model can be used to accurately calculate the propagation of noise across the proposed development site.

The results of the noise model simulations are presented in Appendix C in the form of noise contour plots. The contour values are based on the ProPG Stage 1 indicative noise risk categories summarised in Table 2. The coloured areas between the contours represent the noise risk at the site as follows:

Green = Negligible
Yellow = Low
Red = Medium
Purple = High

5.2 ASSESSMENT

The initial site noise risk assessment provides an indication of noise risk prior to consideration of any potential mitigation measures. The noise risk assessment can be used to inform the subsequent design constraints at the site and assist in the early consideration site mitigation supporting good acoustic design.

The results of the noise model indicate that during the day the risk is low at the northern half of the site, increasing to medium at the southern end, closer to the M25. During the night, the model shows a medium risk across the whole site.

A medium level of noise risk indicates that careful consideration of noise mitigation needs to be given during the design process to ensure acceptable noise levels are achieved. This will typically include consideration of design aspects such as site layout, orientation, and screening, to maximise any acoustic screening effects to sensitive dwelling facades and external amenity areas. Additionally, acoustically uprated façade elements (i.e. glazing and ventilation) will likely be required to reduce internal ambient noise to acceptable levels for resting and sleeping purposes.

In this case, the most effective mitigation measure to reduce noise levels across the site has been determined to be 3m high acoustic screen installed along the southern boundary of the proposed residential area, bounding the wooded area to the south.

The above mitigation has been tested in a revised model, which also includes the Concept Plan showing an illustrative layout for the proposed dwellings.

Noise contour plots for this model are presented in Appendix C and use the same risk-based colour scheme described above.

The results show that the risk level is reduced to low across the whole site during the day with just a few southern façade locations remaining at the medium risk level during the night. Noise levels in gardens during the day would be below the 55dB guideline level, and this would also be achieved in the play area.

Further consideration of the likely requirements for additional, more localised mitigation is given in the following section.

6. OUTLINE PLANNING NOISE ASSESSMENT

The extent and location of the proposed residential area and acoustic screening included has been carefully considered in relation to setback distances from nearby transportation noise sources established as part of the Initial Site Noise Risk Assessment. This will in part contribute to the good acoustic design of the development. Further details to be considered as the design develops are provided in the following sections.

As there are no detailed plot layouts to review at this stage, the following outline assessment is based on the highest incident noise levels that would occur at the outer edges of the proposed residential area, assuming the 3m high acoustic screen recommended above is installed.

6.1 NOISE INGRESS TO HABITABLE ROOMS (WHOLE DWELLING VENTILATION CONDITION)

Table 5 summarises the results of the noise model at the most noise exposed façade of the illustrative residential site layout.

Floor level	Day $L_{Aeq,16hr}$	Night $L_{Aeq,8hr}$	Night L_{AFmax}
Ground floor (1.5m)	57	-	-
First floor (4m)	64	59	66

Table 5: Summary noise levels at most noise exposed façade

Calculations of the noise intrusion into a sample of sensitive habitable rooms have been carried out using the method set out in BS 8233:2014.

Incident noise levels have been taken from the results of the noise model, as summarised in Table 5, above.

In this analysis we have assumed that there are 2 window vents in bedrooms and 4 window vents in living rooms. The precise number is to be determined by the mechanical consultant for the project. It is important to note that the noise levels experienced in rooms is affected by the number of vents. If the number of vents installed is higher than we have assumed, then the vent acoustic specification will need to be increased to ensure that the indoor noise target is still achieved.

Sound insulation data for the external walls has been taken from BS 8233:1999. Sound insulation data for windows and ventilation systems has been taken from manufacturers' data.

The calculations assume typical internal finishes for habitable rooms, based on reverberation times that Spectrum have measured in a range of occupied dwellings at other sites. Room geometries and volumes have been assumed based on typical worst-case assumptions.

The detailed calculations are presented in Appendix D and summarised in Table 5.

Sample room	Period	External noise levels (dB)		Internal noise levels (dB)	
		Incident L_{Aeq}	Typical incident L_{Amax}	L_{Aeq}	Typical L_{Amax}
Living room	Day	57	-	35	-
Bedroom	Day	64	-	33	-
Bedroom	Night	59	66	29	39

Table 6: Calculated indoor ambient noise levels

The results in Table 6 indicate that the criteria for desirable internal noise levels set out in BS 8233 can be achieved at this site.

The calculated noise levels summarised in Table 6 are based on the following mitigation to the external facades.

- Glazing with an acoustic performance specification of R_w 29dB and R_w+C_{tr} 25dB (e.g. Generic 4/6-16/4)
- Trickle vents in ground floor living rooms with an acoustic performance specification of $D_{n,e,w}$ 33dB and $D_{n,e,w}+C_{tr}$ 32dB (e.g. Greenwood 4000 SBW (Hit and miss))
- Trickle vents in first floor bedrooms with an acoustic performance specification of $D_{n,e,w}$ 42dB and $D_{n,e,w}+C_{tr}$ 40dB (e.g. Greenwood 2500EAW.AC1 (Acoustic trickle))

Glazing is specified using the weighted sound reduction index, R_w, with a correction applied to account for the acoustic character of road traffic noise, C_{tr}. Vents are specified using the normalised element weighted sound level difference, $D_{n,e,w}$, also corrected for traffic noise, C_{tr}. The acoustic specifications should be met both with and without the traffic noise correction term.

It should be noted that the Concept Plan is illustrative only and may be subject to further revision. The results indicated above demonstrate that acceptable internal noise levels can be achieved at this site for the purposes of the outline planning application. However, the final façade mitigation scheme should be reviewed once further details of the scheme are known, including plot layouts and elevations, as the final requirements will depend on various factors such as glazing areas, room volumes, internal layout, façade construction type, and ventilation strategy.

6.2 NOISE INGRESS TO HABITABLE ROOMS (OVERHEATING CONDITION)

It is not known at this stage what the potential for overheating is at the proposed development or whether there would be a requirement to provide mitigation in terms of ventilative cooling. An overheating assessment is beyond the scope of this report and in any case would be carried out at a later stage when the proposed plot types, orientations, and layouts are known, among other detailed design factors.

However, as set out in Section 3.7, the AVO Guide provides guidance on the risk of adverse effects occurring during an overheating condition where open windows are used as mitigation. Generally, higher noise levels than those advised as being desirable in BS 8233 may be acceptable, but this will depend on both the level and duration of exposure during any overheating condition. As noise levels increase, the associated noise impact would lead more quickly to an observed adverse effect, so higher levels may only be considered suitable if occurring for limited periods.

With windows open, and assuming a 13dB reduction from outside to inside, internal ambient noise levels would be up to L_{Aeq} 51dB during the day and L_{Aeq} 46dB during the night, with L_{AFmax} events not regularly exceeding 53dB at night. At these levels, AVO advises that *'Noise causes a material change in behaviour e.g. having to keep windows closed most of the time'.* If it is shown that there is potential for overheating at the proposed development, alternative cooling strategies would need to be considered such that residents would not need to open their windows to mitigate this condition.

6.3 NOISE IN OUTDOOR LIVING SPACES

As set out in Section 3.5, BS 8233 suggests guidelines for noise levels in external spaces that are used for amenity space, such as gardens and patios: '*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.*'

The noise contour plots in Appendix E show the noise levels in external amenity areas based on the illustrative layout of the Concept Plan. The results show that there would be no gardens exceeding L_{Aeq} 55dB. Accordingly, it is considered that acceptable noise levels in external amenity spaces can be achieved at this site, subject to detailed design, and with the recommended 3m high acoustic screen in place.

7. CONCLUSIONS

MRP Planning are involved in the proposed residential scheme to be located on land of Lye Lane, Bricket Wood.

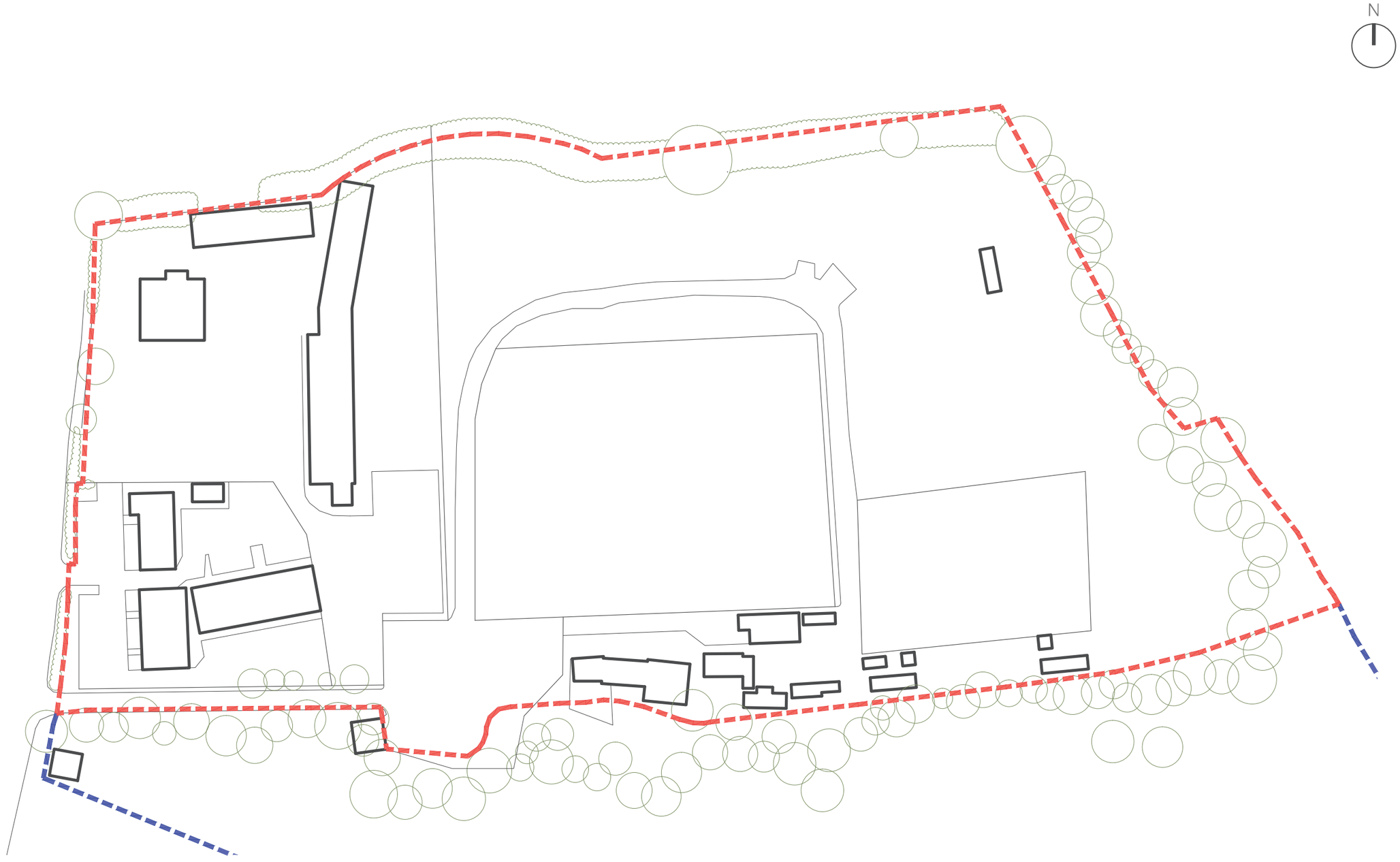
An initial site noise risk assessment has been carried out to establish any constraints and potential requirements for mitigation there may be at the site and to inform the design parameters of the development going forward.

As noise levels vary across the site, zones of varying noise risk have been identified, based on the indicative risk category levels set out in ProPG.

The proposed Concept Plan provides an illustrative site layout for the proposed development. This outline planning noise assessment has been carried out based on the illustrative Concept Plan and the recommended 3m high acoustic screen. The assessment demonstrates that acceptable internal and external noise levels can be achieved at this site in accordance with the criteria set out in BS 8233. Final details of any mitigation to be installed, however, would be subject to detailed design.

APPENDIX A

Site plans



This plan has been created by tracing the Google aerial photo. The red / blue line is based on the ordnance survey map download

Existing Site Plan - 1:1000@A3

Bricket Lodge

Tom Gristwood Architects e: tom@tomgristwoodarchitects.com t: 01367 615585

Proposed development site

Development site	3.2ha
Woodland	3.3ha

Development site

Approx 125 units (density 39 per ha)
Mix predominately 2 & 3 bed Units.
40% Affordable units - of which min 40% Social Housing for rent

Toddler Play area + direct contribution to Woodbury Field Play Area.

Highway improvements inc West Riding - Oak Ave Junct. Footpath improvements linking to Bricket Wood

Retain and strengthen hedge to Lye Lane
Planted zone to N & E site boundary

Woodland

Public Access to Woodland area

Restoration of woodland habitat

New footpaths / bridleway
/ cycle route to Park Street Lane

Proposed Development Site
1:1250

Existing Site
1:2500

A. 22-10-21 Initial layout

adpractice ltd
2 Mill Walk, Wheathampstead, Herts. AL4 8DT
+44 (0)1582 834361
enq@adpractice.co.uk
www.adpractice.co.uk

Client:- Bricket Lodge Residential Property Investments

Job:- Bricket Lodge, Sport & Country Club and Paintball Site
Lye Lane
Bricket Wood

Detail:- Development Proposals - Masterplan

Scale:-	Date:-	Drawn by:-
As Shown	Feb 2021	

Drawing No:-	Rev:-
2503 - 01	A

Concept Plan - 1:1000@A3

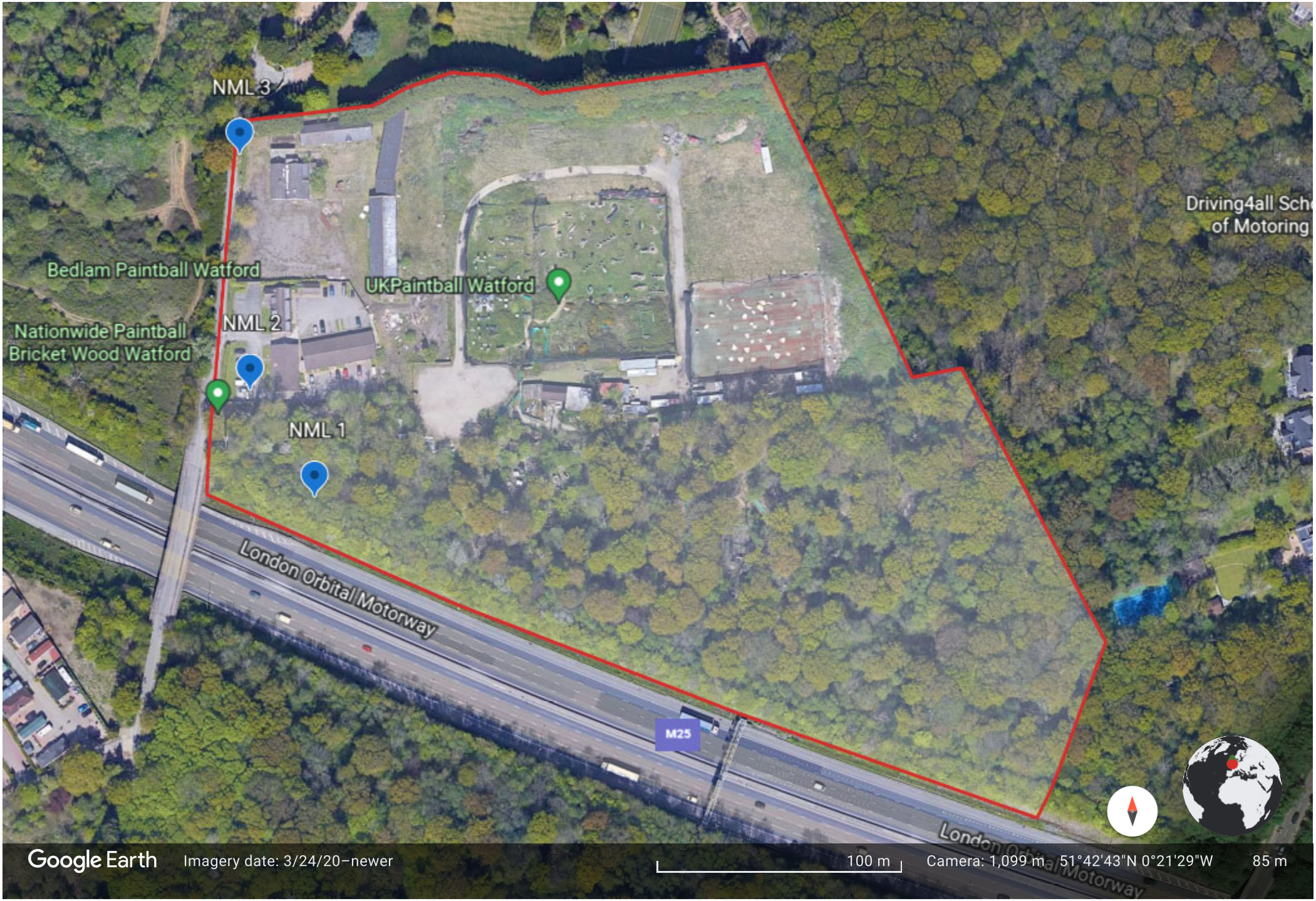
Bricket Lodge

Tom Gristwood Architects e: tom@tomgristwoodarchitects.com t: 01367 615585

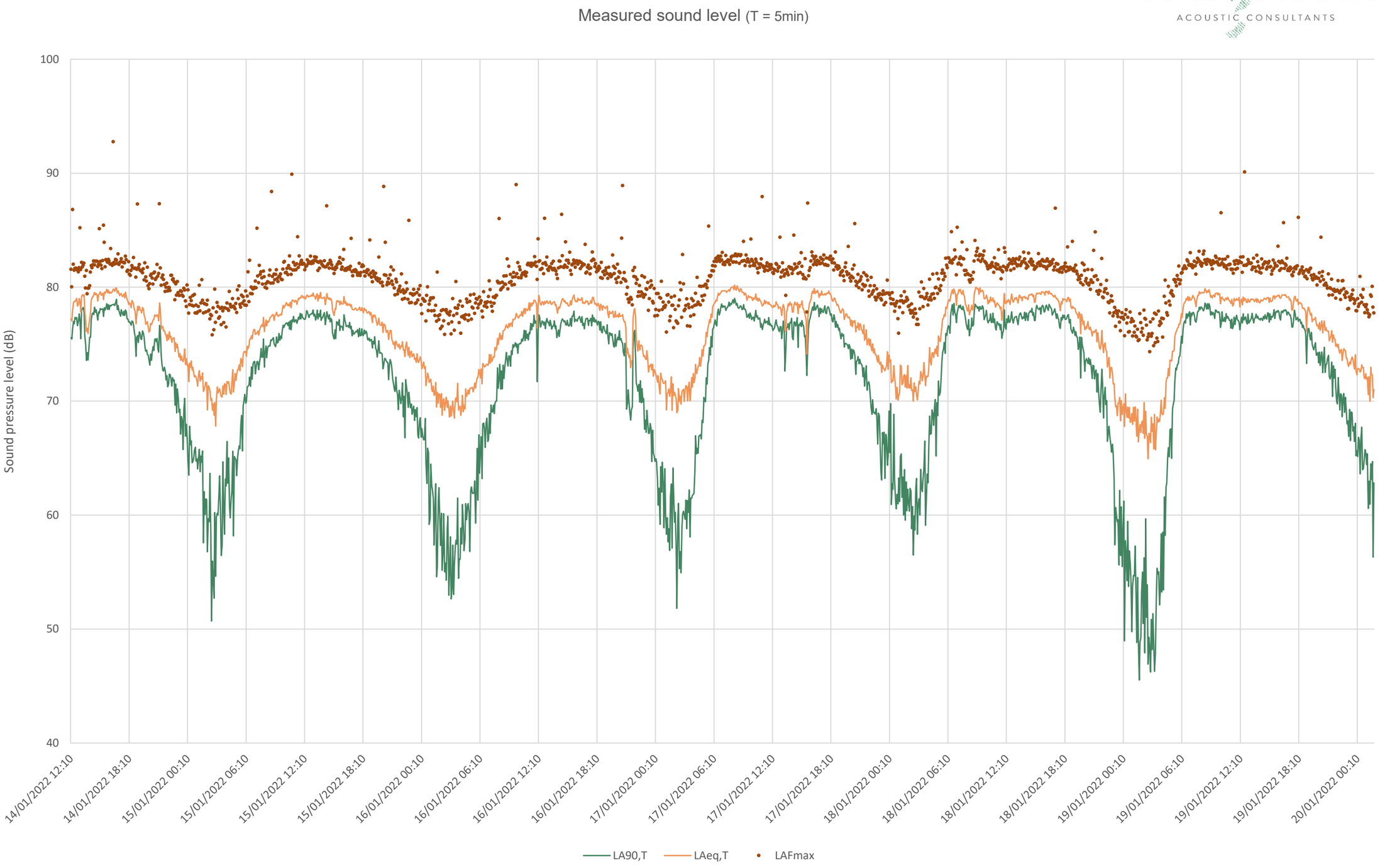
APPENDIX B

Noise monitoring locations and results

Noise Monitoring Locations (NMLs)



NML 1: Southern boundary, 26m from M25



Day and night sound level totals

Project	Lye Lane, Bricket Wood
Project number	21456
Date	24/01/2021

Monitoring location	NML 1: Southern boundary, 26m from M25
Analysis	Day and night totals

	Periods (hh:mm:ss)		LAeq		LAFmax	Leq Day 16hr								Leq Night 8hr								LFmax Night (10th highest)							
	Day	Night	Day (16hr)	Night (8hr)	Night	63	125	250	500	1k	2k	4k	8k	63	125	250	500	1k	2k	4k	8k	63	125	250	500	1k	2k	4k	8k
Highest	16:00:00	8:00:00	78	75	82	74	70	67	72	77	71	59	45	71	67	63	70	73	66	54	41	84	86	81	80	81	74	62	56
Lowest	16:00:00	8:00:00	78	72	79	71	68	64	70	76	70	58	44	67	64	59	65	70	64	52	38	81	76	72	76	77	73	62	53
Totals	90:50:00	42:55:00	78	73	81	73	69	66	71	76	71	58	45	70	66	62	68	71	65	53	40								

	Periods (hh:mm:ss)		LAeq		LAFmax	Leq Day 16hr								Leq Night 8hr								LFmax Night (10th highest)							
Date	Day	Night	Day (16hr)	Night (8hr)	10	63	125	250	500	1k	2k	4k	8k	63	125	250	500	1k	2k	4k	8k	63	125	250	500	1k	2k	4k	8k
14/01/2022	10:50:00	8:00:00	78	73	80	74	70	66	71	76	71	58	45	69	65	61	67	71	65	53	40	80	80	72	77	78	73	63	56
15/01/2022	16:00:00	8:00:00	78	72	79	71	69	65	70	76	71	58	44	67	64	59	65	70	64	52	38	80	86	74	75	78	73	61	49
16/01/2022	16:00:00	8:00:00	78	74	82	71	68	64	70	76	70	58	44	70	66	62	69	72	66	54	41	84	86	81	80	81	74	62	56
17/01/2022	16:00:00	8:00:00	78	75	82	74	70	66	72	77	70	58	45	71	67	63	70	73	66	54	41	82	77	76	77	81	75	63	53
18/01/2022	16:00:00	8:00:00	78	73	82	74	70	67	72	77	71	59	45	70	65	62	67	71	65	53	40	81	80	81	79	79	73	63	57
19/01/2022	16:00:00	2:55:00	78	73	79	74	70	67	72	77	70	58	45	69	65	61	67	71	64	53	39	81	76	72	76	77	73	62	53
20/01/2022	0:00:00	0:00:00																											

Comments:

Environmental Noise Record Sheet

Project:	Lye Lane, Bricket Wood
Project number:	21456
Date:	14/01/2022

Noise monitoring location:	2: South west corner of site
Plant operating condition:	n/a
Instrumentation:	B&K 2270/1
Calibration times:	12:50, 14:50. No significant drift.

Date/time			Weather			Noise Level (dB)						Comments
Date	Start time	Duration (min:sec)	Wind speed (m/s)	Wind direction	Cloud (%)	LAF10.0	LAF50.0	LAF90.0	LAFmax	LAFmin	LAeq	(Including description of noise (eg whine, hiss, rumble, impact, vehicle rain, vegetation, or animal noise)
14/01/22	12:55	15:00	< 1	N	0	64	63	62	70	58	63	Road traffic (M25 dominant), jet planes, light aircraft.
14/01/22	13:36	15:00	< 1	N	0	62	60	59	70	57	61	Road traffic (M25 dominant), jet planes, light aircraft.
14/01/22	14:11	15:00	< 1	N	0	64	63	62	77	59	63	Road traffic (M25 dominant), jet planes, light aircraft.

Date/time			Weather			Leq Octave Band Pressure Level (dB)										Comments
Date	Start time	Duration (min:sec)	Wind speed (m/s)	Wind direction	Cloud (%)	31.5	63	125	250	500	1k	2k	4k	8k	dB(A)	(Including description of noise (eg whine, hiss, rumble, impact, vehicle rain, vegetation, or animal noise)
14/01/22	12:55	15:00	< 1	N	0	69	70	64	57	57	61	55	44	33	63	Road traffic (M25 dominant), jet planes, light aircraft.
14/01/22	13:36	15:00	< 1	N	0	71	71	62	54	54	59	52	43	34	61	Road traffic (M25 dominant), jet planes, light aircraft.
14/01/22	14:11	15:00	< 1	N	0	69	70	64	57	57	61	55	45	35	63	Road traffic (M25 dominant), jet planes, light aircraft.

Date/time			Weather			LF50 Octave Band Pressure Level (dB)										Comments
Date	Start time	Duration (min:sec)	Wind speed (m/s)	Wind direction	Cloud (%)	31.5	63	125	250	500	1k	2k	4k	8k	dB(A)	(Including description of noise (eg whine, hiss, rumble, impact, vehicle rain, vegetation, or animal noise)
14/01/22	12:55	15:00	< 1	N	0	68	69	63	56	57	61	55	43	29	63	Road traffic (M25 dominant), jet planes, light aircraft.
14/01/22	13:36	15:00	< 1	N	0	70	70	61	54	54	58	52	41	28	60	Road traffic (M25 dominant), jet planes, light aircraft.
14/01/22	14:11	15:00	< 1	N	0	68	69	63	56	57	61	55	43	29	63	Road traffic (M25 dominant), jet planes, light aircraft.

Environmental Noise Record Sheet

Project:	Lye Lane, Bricket Wood
Project number:	21456
Date:	14/01/2022

Noise monitoring location:	3: 2.5m from Lye Lane at north west corner of site
Plant operating condition:	n/a
Instrumentation:	B&K 2270/1
Calibration times:	12:50, 14:50. No significant drift.

Date/time			Weather			Noise Level (dB)						Comments
Date	Start time	Duration (min:sec)	Wind speed (m/s)	Wind direction	Cloud (%)	LAF10.0	LAF50.0	LAF90.0	LAFmax	LAFmin	LAeq	(Including description of noise (eg whine, hiss, rumble, impact, vehicle rain, vegetation, or animal noise)
14/01/22	13:18	15:00	< 1	N	0	58	55	52	81	49	59	Road traffic (M25 and occasional vehicles on Lye Lane), jet planes, light aircraft.
14/01/22	13:53	15:00	< 1	N	0	62	54	53	84	51	61	Road traffic (M25 and occasional vehicles on Lye Lane), jet planes, light aircraft.
14/01/22	14:30	15:00	< 1	N	0	62	55	54	81	51	61	Road traffic (M25 and occasional vehicles on Lye Lane), jet planes, light aircraft.

Date/time			Weather			Leq Octave Band Pressure Level (dB)										Comments
Date	Start time	Duration (min:sec)	Wind speed (m/s)	Wind direction	Cloud (%)	31.5	63	125	250	500	1k	2k	4k	8k	dB(A)	(Including description of noise (eg whine, hiss, rumble, impact, vehicle rain, vegetation, or animal noise)
14/01/22	13:18	15:00	< 1	N	0	66	67	60	55	54	57	51	42	37	59	Road traffic (M25 and occasional vehicles on Lye Lane), jet planes, light aircraft.
14/01/22	13:53	15:00	< 1	N	0	66	67	62	56	55	59	53	47	40	61	Road traffic (M25 and occasional vehicles on Lye Lane), jet planes, light aircraft.
14/01/22	14:30	15:00	< 1	N	0	68	66	62	59	57	58	53	45	40	61	Road traffic (M25 and occasional vehicles on Lye Lane), jet planes, light aircraft.

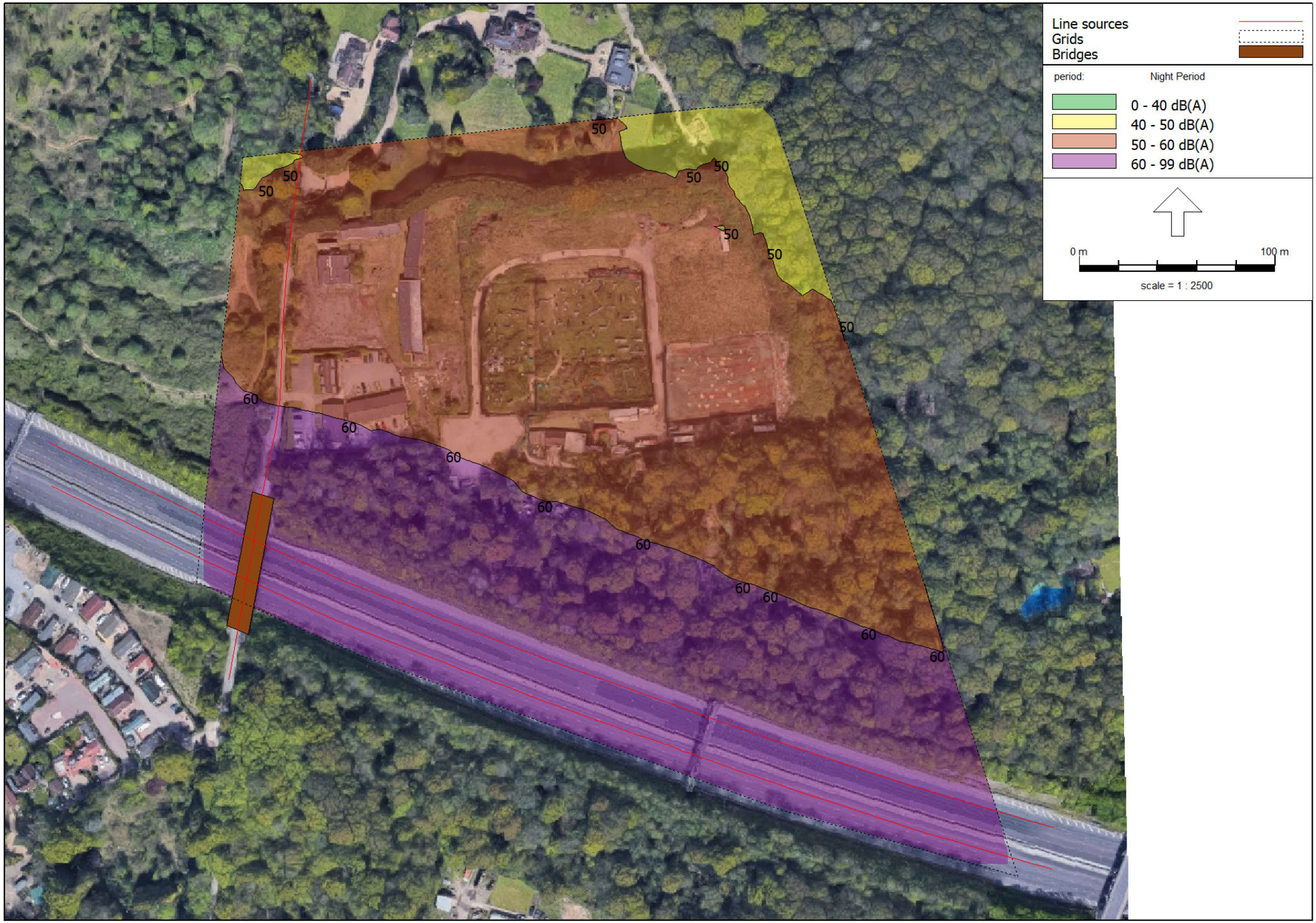
Date/time			Weather			LF50 Octave Band Pressure Level (dB)										Comments
Date	Start time	Duration (min:sec)	Wind speed (m/s)	Wind direction	Cloud (%)	31.5	63	125	250	500	1k	2k	4k	8k	dB(A)	(Including description of noise (eg whine, hiss, rumble, impact, vehicle rain, vegetation, or animal noise)
14/01/22	13:18	15:00	< 1	N	0	65	65	58	50	49	52	44	30	19	55	Road traffic (M25 and occasional vehicles on Lye Lane), jet planes, light aircraft.
14/01/22	13:53	15:00	< 1	N	0	64	65	58	49	48	52	45	31	22	54	Road traffic (M25 and occasional vehicles on Lye Lane), jet planes, light aircraft.
14/01/22	14:30	15:00	< 1	N	0	64	65	59	48	49	53	46	32	22	55	Road traffic (M25 and occasional vehicles on Lye Lane), jet planes, light aircraft.

APPENDIX C

Noise model results (noise risk categories)

Day
1 Feb 2022, 19:47

Spectrum Acoustics, UK



Night
1 Feb 2022, 19:50

Spectrum Acoustics, UK

Day - mitigation option 3
2 Feb 2022, 12:18

Spectrum Acoustics, UK

Night - mitigation option 3
2 Feb 2022, 12:20

Spectrum Acoustics, UK

APPENDIX D

Noise ingress calculations

Calculated Indoor Ambient Noise Levels (as per BS 8233:2014 Annex G)

Project:	Lye Lane, Bricket Wood
Project number:	21456
Date:	03/03/2022
Plot:	Most noise exposed
Room:	LKD (typical)

Daytime ($L_{Aeq,16hr}$)	Unit	Value	Description	Term	Octave band centre frequency 63	125	250	500	1k	2k	4k	8k	Broadband term	
EXTERNAL NOISE LEVEL														
External noise level			Façade 1	$L_{eq,1}$	63	56	50	53	56	47	32	20	$L_{Aeq,1}$	57 dB
Façade correction factor				C	0	0	0	0	0	0	0	0		
INCIDENT FAÇADE NOISE LEVEL														
Incident noise level			Façade 1	$L_{eq,ff}$	63	56	50	53	56	47	32	20	$L_{Aeq,ff}$	57 dB
ROOM DATA														
Room description and reverberation time	Volume	36	Living Room	RT_{60}	0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3		s
FAÇADE ELEMENTS (Façade 1)														
Glazing	Area	3.6	Generic 4/6-16/4	Rw	20	21	17	25	35	37	31	36	Rw / Rw+Ctr	29 / 25 dB
Wall	Area	15.6	Brick and block external wall	Rw	34	40	44	45	51	56	60	63	Rw / Rw+Ctr	50 / 47 dB
Vent	No. off.	4	Greenwood 4000 SBW (Hit and miss)	Dn,e	32	38	37	34	30	34	37	46	Dn,e,w / Dn,e,w+Ctr	33 / 32 dB
None			--											

RESULTS

Total calculated indoor noise level	$L_{eq,2}$	44	35	32	29	33	20	4	-	$L_{Aeq,2}$ 35 dB

Calculated Indoor Ambient Noise Levels (as per BS 8233:2014 Annex G)

Project:	Lye Lane, Bricket Wood
Project number:	21456
Date:	03/03/2022
Plot:	Most noise exposed
Room:	Bedroom (typical)

Daytime ($L_{Aeq,16hr}$)	Unit	Value	Description	Term	Octave band centre frequency 63	125	250	500	1k	2k	4k	8k	Broadband term	
EXTERNAL NOISE LEVEL														
External noise level			Façade 1	$L_{eq,1}$	63	57	55	60	62	54	39	18	$L_{Aeq,1}$	64 dB
Façade correction factor				C	0	0	0	0	0	0	0	0		
INCIDENT FAÇADE NOISE LEVEL														
Incident noise level			Façade 1	$L_{eq,ff}$	63	57	55	60	62	54	39	18	$L_{Aeq,ff}$	64 dB
ROOM DATA														
Room description and reverberation time	Volume	18	Bedroom	RT_{60}	0.4	0.5	0.4	0.4	0.3	0.3	0.3	0.2		s
FAÇADE ELEMENTS (Façade 1)														
Glazing	Area	1.2	Generic 4/6-16/4	Rw	20	21	17	25	35	37	31	36	Rw / Rw+Ctr	29 / 25 dB
Wall	Area	12	Brick and block external wall	Rw	34	40	44	45	51	56	60	63	Rw / Rw+Ctr	50 / 47 dB
Vent	No. off.	2	Greenwood 2500EAW.AC1 (Acoustic trickle)	Dn,e	32	41	39	36	43	44	45	44	Dn,e,w / Dn,e,w+Ctr	42 / 40 dB
None			--											
RESULTS														
Total calculated indoor noise level				$L_{eq,2}$	42	33	33	33	27	17	4	-	$L_{Aeq,2}$	33 dB

Calculated Indoor Ambient Noise Levels (as per BS 8233:2014 Annex G)

Project:	Lye Lane, Bricket Wood
Project number:	21456
Date:	03/03/2022
Plot:	Most noise exposed
Room:	Bedroom (typical)

Night time ($L_{Aeq,8hr}$)					Octave band centre frequency									
	Unit	Value	Description	Term	63	125	250	500	1k	2k	4k	8k	Broadband term	
EXTERNAL NOISE LEVEL														
External noise level			Façade 1	$L_{eq,1}$	59	53	51	56	57	49	34	13	$L_{Aeq,1}$	**59 dB**
Façade correction factor				C	0	0	0	0	0	0	0	0		
INCIDENT FAÇADE NOISE LEVEL														
Incident noise level			Façade 1	$L_{eq,ff}$	59	53	51	56	57	49	34	13	$L_{Aeq,ff}$	**59 dB**
ROOM DATA														
Room description and reverberation time	Volume	18	Bedroom	RT_{60}	0.4	0.5	0.4	0.4	0.3	0.3	0.3	0.2		**s**
FAÇADE ELEMENTS (Façade 1)														
Glazing	Area	1.2	Generic 4/6-16/4	Rw	20	21	17	25	35	37	31	36	**Rw / Rw+Ctr**	**29 / 25 dB**
Wall	Area	12	Brick and block external wall	Rw	34	40	44	45	51	56	60	63	**Rw / Rw+Ctr**	**50 / 47 dB**
Vent	No. off.	2	Greenwood 2500EAW.AC1 (Acoustic trickle)	Dn,e	32	41	39	36	43	44	45	44	**Dn,e,w / Dn,e,w+Ctr**	**42 / 40 dB**
None			--											
RESULTS														
Total calculated indoor noise level				$L_{eq,2}$	**38**	**29**	**29**	**30**	**22**	**12**	**-**	**-**	$L_{Aeq,2}$	**29 dB**

Calculated Indoor Ambient Noise Levels (as per BS 8233:2014 Annex G)

Project:	Lye Lane, Bricket Wood
Project number:	21456
Date:	03/03/2022
Plot:	Most noise exposed
Room:	Bedroom (typical)

Night time (L_{AMax})					Octave band centre frequency									
	Unit	Value	Description	Term	63	125	250	500	1k	2k	4k	8k	Broadband term	
EXTERNAL NOISE LEVEL														
External noise level			Façade 1	$L_{Max,1}$	64	62	66	65	62	53	41	28	$L_{AMax,1}$	**66 dB**
Façade correction factor				C	0	0	0	0	0	0	0	0		
INCIDENT FAÇADE NOISE LEVEL														
Incident noise level			Façade 1	$L_{Max,ff}$	64	62	66	65	62	53	41	28	$L_{AMax,ff}$	**66 dB**
ROOM DATA														
Room description and reverberation time	Volume	18	Bedroom	RT_{60}	0.4	0.5	0.4	0.4	0.3	0.3	0.3	0.2		**s**
FAÇADE ELEMENTS (Façade 1)														
Glazing	Area	1.2	Generic 4/6-16/4	Rw	20	21	17	25	35	37	31	36	**Rw / Rw+Ctr**	**29 / 25 dB**
Wall	Area	12	Brick and block external wall	Rw	34	40	44	45	51	56	60	63	**Rw / Rw+Ctr**	**50 / 47 dB**
Vent	No. off.	2	Greenwood 2500EAW.AC1 (Acoustic trickle)	Dn,e	32	41	39	36	43	44	45	44	**Dn,e,w / Dn,e,w+Ctr**	**42 / 40 dB**
None			--											
RESULTS														
Total calculated indoor noise level				**$L_{Max,2}$**	**43**	**38**	**45**	**39**	**27**	**17**	**6**	**-**	**$L_{AMax,2}$**	**39 dB**

APPENDIX E

Noise model results (external amenity)

Day - mitigation option 3
8 Mar 2022, 10:57

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