Burkill Eco-House

Queens Lane
Arundel
BN18 9JN

Planning Noise Assessment Report

On behalf of

Kate Burkill

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Executive Summary

Noise Solutions Ltd (NSL) has been commissioned to provide a noise assessment relating to workshops at the proposed house on Queens Lane in Arundel.

The assessment shows that noise from the use of woodworking equipment is likely to result in rating levels below the existing daytime background sound level, and no worse than a negligible noise impact is therefore expected.

Based on the findings of this assessment, noise should not be grounds for refusal of planning permission for the proposed development.

1.0 Introduction

1.1. Noise Solutions Ltd (NSL) has been commissioned to undertake a noise assessment relating to workshops at the proposed house at Queens Lane in Arundel.

1.2. This report presents the results of an environmental noise survey, the applicable polices and guidance, and a noise impact assessment to support a planning application.

1.3. An assessment has been made of the potential noise breakout from the workshops to the nearest existing residential properties.

1.4. To assist with the understanding of this report a brief glossary of acoustic terms can be found in **Appendix A**. A more in-depth glossary of acoustic terms can be assessed at the following web address http://www.acoustic-glossary.co.uk/.

2.0 Site description and details of proposals

2.1. The site is at the south west end of Queens Lane, approximately 200m north east of the A27 Arundel Bypass, with agricultural buildings to the southwest and existing houses to the north and east.

2.2. The proposals for a new home at Queens Lane in Arundel incorporate woodworking workshops for the sole use of the occupants on a hobbyist basis and would therefore be used less intensively than a commercial workshop.

2.3. **Appendix B** contains an aerial photograph showing the site and surrounding area.

2.4. Plans and elevations of the proposals are shown in **Appendix C.**

2.5. The nearest affected noise-sensitive properties to the site are to the east (Receptor R1) and north at 23 Fitzalan Mews (Receptor R2). These are also indicated in **Appendix B**.

2.6. While the houses at 7 and 8 Fitzalan Road are marginally (less than 5m) closer to the site they are screened from it by the telephone exchange building.

3.0 Noise policy

Noise Policy Statement for England

3.1. The Noise Policy Statement for England (NPSE[1]), published in March 2010, sets out the long-term vision of Government noise policy. The Noise Policy aims, as presented in this document, are: "*Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*

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

3.2. The NPSE makes reference to the concepts of NOEL (No Observed Effect Level) and LOAEL (Lowest Observed Adverse Effect Level) as used in toxicology but applied to noise impacts. It also introduces the concept of SOAEL (Significant Observed Adverse Effect Level) which is described as the level above which significant adverse effects on health and quality of life occur.

3.3. The first aim of the NPSE is to avoid significant adverse effects, taking into account the guiding principles of sustainable development (as referenced in Section 1.8 of the NPSE). The second aim seeks to provide guidance on the situation that exists when the potential noise impact falls between the LOAEL and the SOAEL, in which case: *"...all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development."*

3.4. Importantly, the NPSE goes on to state that: "This does not mean that such adverse effects cannot occur."

3.5. The NPSE does not provide a noise-based measure to define SOAEL, acknowledging that the SOAEL is likely to vary depending on the noise source, the receptor and the time in question. NPSE advises that: *"Not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available."*

3.6. It is therefore likely that other guidance will need to be referenced when applying objective standards for the assessment of noise, particularly in reference to the SOAEL, whilst also taking into account the specific circumstances of a proposed development.

[1] Noise Policy Statement for England, Defra, March 2010

National Planning Policy Framework

3.7. A new edition of NPPF was published in December 2023 and came into effect immediately. The original National Planning Policy Framework (NPPF[2]) was published in March 2012, with subsequent revisions made periodically - this document replaced the existing Planning Policy Guidance Note 24 (PPG 24) "Planning and Noise." The December 2023 revised edition contains no new directions or guidance with respect to noise. The paragraph references quoted below relate to the December 2023 edition.

3.8. Paragraph 180 of the NPPF states that the planning system should contribute to and enhance the natural and local environment by, (amongst others) *"preventing new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, water or noise pollution or land instability."*

3.9. The NPPF goes on to state in Paragraph 191:

" planning policies and decisions 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 quality of life;
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 ...

3.10. The NPPF document does not refer to any other documents or British Standards regarding noise other than the Noise Policy Statement for England (NPSE[3]).

3.11. Paragraph 2 of the NPPF states that *"planning law requires that applications for planning permission must be determined in accordance with the development plan unless material considerations indicate otherwise."*

3.12. Paragraph 12 of the NPPF states that *"The presumption in favour of sustainable development does not change the statutory status of the development plan as the starting point for decision making. Where a planning application conflicts with an up-to-date development plan (including any neighbourhood plans that form part of the development plan), permission should not usually be granted. Local planning authorities may take decisions that depart from an up-to-date development plan, but only if material considerations in a particular case indicate that the plan should not be followed".*

3.13. Paragraph 123 states that *"Planning policies and decisions should promote an effective use of land in meeting the need for homes and other uses, while safeguarding and improving the environment and ensuring safe and healthy living conditions. Strategic policies should set out*

[2] National Planning Policy Framework, DCLG, March 2012
[3] Noise Policy Statement for England, DEFRA, March 2010

a clear strategy for accommodating objectively assessed needs, in a way that makes as much use as possible of previously-developed or 'brownfield' land".

Planning Practice Guidance – Noise

3.14. An updated Planning Practice Guidance (PPG[4]) for noise was published on 22 July 2019 and provides additional guidance and elaboration on the NPPF. It advises that when plan-making and decision-taking, the Local Planning Authority should consider the acoustic environment in relation to:

- Whether or not a significant adverse effect is occurring or likely to occur;
- Whether or not an adverse effect is occurring or likely to occur; and
- Whether or not a good standard of amenity can be achieved.

3.15. This guidance introduced the concepts of NOAEL (No Observed Adverse Effect Level), and UAEL (Unacceptable Adverse Effect Level). NOAEL differs from NOEL in that it represents a situation where the acoustic character of an area can be slightly affected (but not such that there is a perceived change in the quality of life). UAEL represents a situation where noise is 'very disruptive' and should be 'prevented' (as opposed to SOAEL, which represents a situation where noise is 'disruptive', and should be 'avoided').

3.16. As exposure increases above the LOAEL, the noise begins to have an adverse effect and consideration needs to be given to mitigating and minimising those effects, taking account of the economic and social benefits being derived from the activity causing the noise. As the noise exposure increases, it will then at some point cross the SOAEL boundary.

3.17. The LOAEL is described in PPG[5] as the level above which *"noise starts to cause small changes in behaviour and attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard"*.

3.18. PPG identifies the SOAEL as the level above which *"noise causes a material change in behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present."*

[4] Planning Practice Guidance – Noise, https://www.gov.uk/guidance/noise--2, 22 July 2019
[5] Paragraph: 005 Reference ID: 30-005-20190722

3.19. In line with the Explanatory Note of the NPSE, the PPG goes on to reference the LOAEL and SOAEL in relation to noise impact. It also provides examples of outcomes that could be expected for a given perception level of noise, plus actions that may be required to bring about a desired outcome. However, in line with the NPSE, no objective noise levels are provided for LOAEL or SOAEL although the PPG[6] acknowledges that *"...the subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation."*

3.20. The relevant guidance in the PPG in relation to the adverse effect levels is summarized below:

Table 1 PPG Noise effects table

Response	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not Present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not Intrusive	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.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and Intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum

[6] Paragraph: 006 Reference ID: 30-006-20190722

Response	Examples of Outcomes	Increasing Effect Level	Action
Significant Observed Adverse Effect Level			
Present and Disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, 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.	Significant Observed Adverse Effect	Avoid
Present and very Disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

3.21. The Planning Practice Guidance[7] states the following in relation to mitigation measures:

> *"For noise sensitive developments, mitigation measures can include avoiding noisy locations in the first place; designing the development to reduce the impact of noise from adjoining activities or the local environment; incorporating noise barriers; and optimising the sound insulation provided by the building envelope."*

Local Policy

3.22. The NPPF is very clear in that local authorities must update their local plans (one year from publication of the NPPF) and that if the local plan contains policies which do not closely align with the aims of the NPPF, then a decision must be made based on an assessment which shows compliance with the NPPF. Therefore, it is of paramount importance that local authorities have updated local plans which closely align with the aims in the NPPF.

4.0 Acoustic Standards and Guidance

Pre-application advice

4.1. In pre-application advice Arun District Council has advised the following:

> *ALP Policy QE DM1 requires new noise generating development to demonstrate that there are no suitable alternative locations for the development, to provide a noise report which*

[7] Paragraph: 010 Reference ID: 30-010-20190722

assesses the likely impact of the proposed development upon the noise environment, and to demonstrate that the development will not impact upon areas identified and valued for their tranquillity.

... if an application to this effect were to be submitted, the following would be required:

...

- Noise Impact Assessment.

The proposed dwellings feature 2 No. large workshops at ground-floor level. This is not a typical feature of residential units. We would need evidence that the workshops would not give rise to an undue level of noise for neighbouring properties, and a statement confirming that these facilities would not be used as a formal and/or separate commercial use. The facilities would need to be confirmed as ancillary uses to the main residence as indicated in the pre-application statement, and consideration would likely need to be had for controlling their use. Namely, conditions restricting their function to be ancillary to the occupiers and not for commercial purposes, and perhaps hours of use (not during typical sleeping hours). ...

4.2. The appropriate Standard for assessing workshop noise emissions to nearby residential properties is BS 4142:2014+A1:2019.

BS 4142:2014 + A1:2019 Methods for Rating and Measuring Industrial and Commercial Sound

4.3. BS 4142:2014+A1:2019 describes a method for rating and assessing sound of an industrial or commercial nature, which includes:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;

4.4. The industrial or commercial sound is assessed outside a dwelling or premises used for residential purposes, upon which sound is incident.

4.5. The procedure contained in BS 4142:2014 + A1:2019 is to quantify the "specific sound level", which is the measured or predicted level of sound from the source in question over a one hour period for the daytime and a 15-minute period for the night-time. Daytime is defined in the standard as 07:00 to 23:00 hours, and night-time as 23:00 to 07:00 hours.

4.6. The specific sound level is converted to a rating level by adding penalties on a sliding scale to account for either potentially tonal or impulsive elements. The standard sets out objective methods for determining the presence of tones or impulsive elements, but notes that it is acceptable to subjectively determine these effects.

4.7. The penalty for tonal elements is between 0dB and 6dB, and the standard notes: "Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible."

4.8. The penalty for impulsive elements is between 0dB and 9dB, and the standard notes: "Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible."

4.9. The background sound level should be established in terms of the L_{A90} noise index. The standard states that the background sound level should be measured over a period of sufficient length to obtain a representative value. This should not normally be less than 15-minute intervals. The standard states that: "A representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value."

4.10. The assessment outcome results from a comparison of the rating level with the background sound level. The standard states:

> *a) Typically, the greater this difference, the greater the magnitude of the impact.*
>
> *b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
>
> *c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
>
> *d) 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.*
>
> *Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact."*

The standard goes on to note that: "Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."

4.11. 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."

4.12. BS 4142:2014 + A1:2019 requires uncertainties in the assessment to be considered, and where the uncertainty is likely to affect the outcome of the assessment, steps should be taken to reduce the uncertainty.

5.0 Existing noise climate

5.1. An environmental noise survey was undertaken to establish the typical environmental sound levels at the houses nearest to the development site. As the measurement equipment could not be made suitably secure close to the nearest receptors an unattended survey was made at an alternative location nearby, with additional measurements made on the site to establish the difference in the acoustic environmental between the two positions.

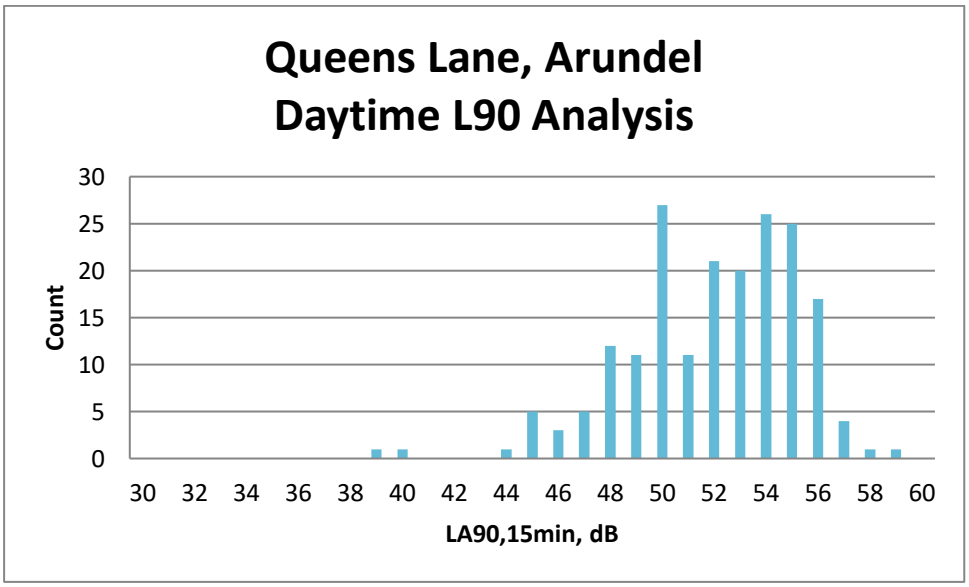
5.2. The results of the environmental sound survey are summarised in Table 2 below. The full set of measurement results and details of the survey methodology are presented in **Appendix C**.

Table 2 Summary of survey results

Measurement period	Range of recorded sound pressure levels (dB)			
	$L_{Aeq(15mins)}$	$L_{Amax(15mins)}$	$L_{A10(15mins)}$	$L_{A90(15mins)}$
Daytime (07.00 – 23.00 hours)	56-72	72-104	50-73	39-59
Night-time (23.00 – 07.00 hours)	35-72	52-99	37-68	31-50

Background sound levels

Figure 1 Histogram of daytime L_{A90} background sound pressure levels



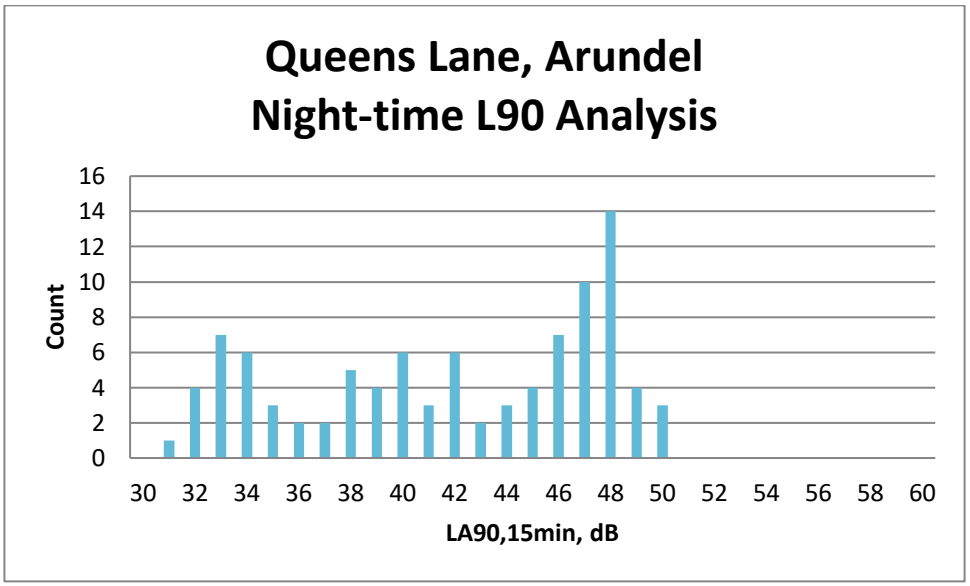
5.3. Additional statistical analysis has been undertaken. As shown in Table 3, the mean, median, and modal values have been calculated:

Table 3 Statistical analysis of $L_{A90,15min}$ levels during the daytime period

dB, L_{A90} daytime period	
Mean	52
Mode	50
Median	52

5.4. From reviewing the above histogram, 44dB has been selected to be representative of the background sound level in this area.

Figure 2 Histogram of night-time L_{A90} background sound pressure levels



5.5. Additional statistical analysis has been undertaken. As shown in Table 4, the mean, median, and modal values have been calculated:

Table 4 Statistical analysis of $L_{A90,15min}$ levels during the night-time period

dB, L_{A90} night-time period	
Mean	42
Mode	48
Median	42

5.6. From reviewing the above histogram, 33dB has been selected to be representative of the night-time background sound level in this area.

5.7. Therefore, the following values are considered as representative of the existing background sound pressure levels at nearby noise sensitive premises:

- 44dB L_{A90} during the daytime period;
- 33dB L_{A90} during the night-time period; and

5.8. It can be seen in **Appendix D** that the background sound levels at the attended measurement position were higher than at the unattended measurement position and the use of the data gathered at the latter location may therefore be considered a robust representation for the purposes of the assessment.

5.9. Elevated noise levels from Saturday morning to Sunday afternoon are attributed to Storm Bert which generated high winds and heavy rain through that period. By considering background

sound levels from the lower end of the range of values these abnormal levels have effectively be excluded from the assessment.

6.0 Activity noise assessment

6.1. Two workshops are proposed, as shown in the drawings in **Appendix C**: a hand tool workshop and a machine workshop.

6.2. Noise breakout sound levels have been predicted at the nearest existing residential properties, as indicated in **Appendix B**.

Likely noise levels within workshops

6.3. The hand tool workshop will not contain any noisy equipment and internal sound levels would therefore be generally low, but would be elevated for short periods, for example when hammers are used. As such activities will be of short duration the internal reverberant sound level is likely to be no higher than 70dB $L_{Aeq\ 1hr}$. The predictions used in the following assessment includes a +9dB BS 4142:2014 feature correction, comprising +3dB for intermittency and +6dB for potentially-audible impulsivity at the neighbouring receptors.

6.4. It is understood that the equipment within the machine workshop will include a table saw, a band saw, a planer thicknesser and a router. The noise generated by each item of equipment will depend on the specific make and model of the equipment, while the internal "average" (dB $L_{Aeq\ 1hr}$) sound level will also be influenced by the duration of operation of each piece of equipment during a typical period.

6.5. NSL has previously measured noise levels within commercial premises with similar equipment and measured sound pressure levels of up to 85dBA at 1m from the noisiest activities, resulting in a reverberant sound level of 85dB $L_{Aeq\ 1hr.}$ The smaller scale nature of the proposed workshops mean noise levels are likely to be lower, since the equipment will not be used so intensively and rarely will different pieces of equipment be used at the same time. The following assessment will therefore tend to overestimate the resulting sound level at the receptors and result in a robust and cautious assessment of the likely noise impact.

6.6. The noise predictions for the machine workshop include a +7dB BS 4142:2014 feature correction, comprising +3dB for intermittency and +4dB for potentially-audible tonality at the neighbouring receptors.

Proposed construction of building fabric

6.7. The walls of the proposed buildings are to be constructed using an Insulated Concrete Formwork (ICF) system, comprising prefabricated inner and outer skins into which concrete is

poured. The typical systems being considered incorporate concrete cores 150-159mm thick. A construction of this type is likely to provide an airborne sound insulation of around 49dB R_w.

6.8. Other building elements comprise doors, windows, the roof of the detached workshop and rooflights. Typical sound insulation values for these elements are:

- Windows and rooflights – triple-glazed, aluminium clad timber – typical sound insulation at least 30dB R_w;
- Doors – triple-glazed, aluminium clad timber – typical sound insulation at least 30dB R_w;
- Roof – cladding roof with approximately 300mm thick PIR thermal insulation and two layers of plasterboard internally – typical sound insulation 39dB R_w.

Predicted break-out sound levels and assessment

6.9. The predicted noise levels at the nearest receptors have been calculated in **Appendix E** and are summarised in Table 5.

6.10. It should be noted that there are unlikely to be noisy activities taking place in more than one of the workshops at any time, so it is appropriate to assess the worst-case of the results rather than combined potential noise levels from all three.

Table 5 Predicted sound levels at Receptors

Source	Predicted sound levels at noise-sensitive receptors			
	R1		R2	
	SPL, dB $L_{Aeq\ 1hr}$	Rating level, dB $L_{Ar\ 1hr}$	SPL, dB $L_{Aeq\ 1hr}$	Rating level, dB $L_{Ar\ 1hr}$
Hand tools workshop	16	25	-14	-5
Machine workshop	20	27	13	20

6.11. Table 6 presents the initial assessment of the likely noise impact at the worst-affected receptor, for the worst-case activities, in accordance with the BS 4142:2014+A1:2019 methodology.

Table 6 Assessment of predicted external noise levels at Receptor R1, activities in machine workshop

Results	Daytime (07.00-23.00)	Relevant Clauses of BS 4142:2014	Commentary
Background Sound level	L_{A90} = 44dB	8.1, 8.2	Representative typical background sound level during typical delivery period, determined from a range of measurements
Reference interval	1 hour	7.2	
Specific Sound Level	$L_{Aeq,T}$ = 20dB	7.3.6	Calculations presented in **Appendix E** (worst-case tabulated)
Acoustic Feature Correction	+7dB	9.2	+4dB tonality, +3dB intermittency
Rating Level	27dB		
Excess of Rating Level over background sound level	(27-44) dB = -17dB		
Context	Workshops will be used on a non-commercial basis and will therefore be utilised less intensively than a commercial premises		
Assessment of impact:	No impact		

6.12. The assessment indicates that, at worst, noisy activities within the workshops would be significantly below the existing representative background sound level and would therefore result in no adverse noise impact.

6.13. The following context must also be taken into consideration when determining the potential daytime impact that may be experienced:

- The assessment is reported for the worst-affected premises. The impact on all other residential windows will be lower due to distance and/or screening losses.
- The assessment has assumed the worst-case scenario in terms of the levels of noise produced.
- Robust penalties have been added to the individual noise sources.

7.0 Uncertainties

7.1. Where possible uncertainty in the above assessments has been minimised by taking the following steps:

- The meter and calibrator used have a traceable laboratory calibration and were field calibrated before and after the measurements.
- Uncertainty in the calculated impacts has been reduced by the use of well-established calculation methods.
- Care was taken to establish the likely typical background sound level by the use of attended and short-duration attended noise surveys.

8.0 Summary

8.1. Noise Solutions Ltd (NSL) has been commissioned to provide a noise assessment relating to workshops at the proposed house on Queens Lane in Arundel.

8.2. An environmental noise survey has been undertaken to establish the existing prevailing noise levels at the nearest noise sensitive receptors.

8.3. The results of the survey were used to undertake assessments of the likely noise impact from activities within the workshops, using the methodology set out in BS 4142:2014+A1:2019.

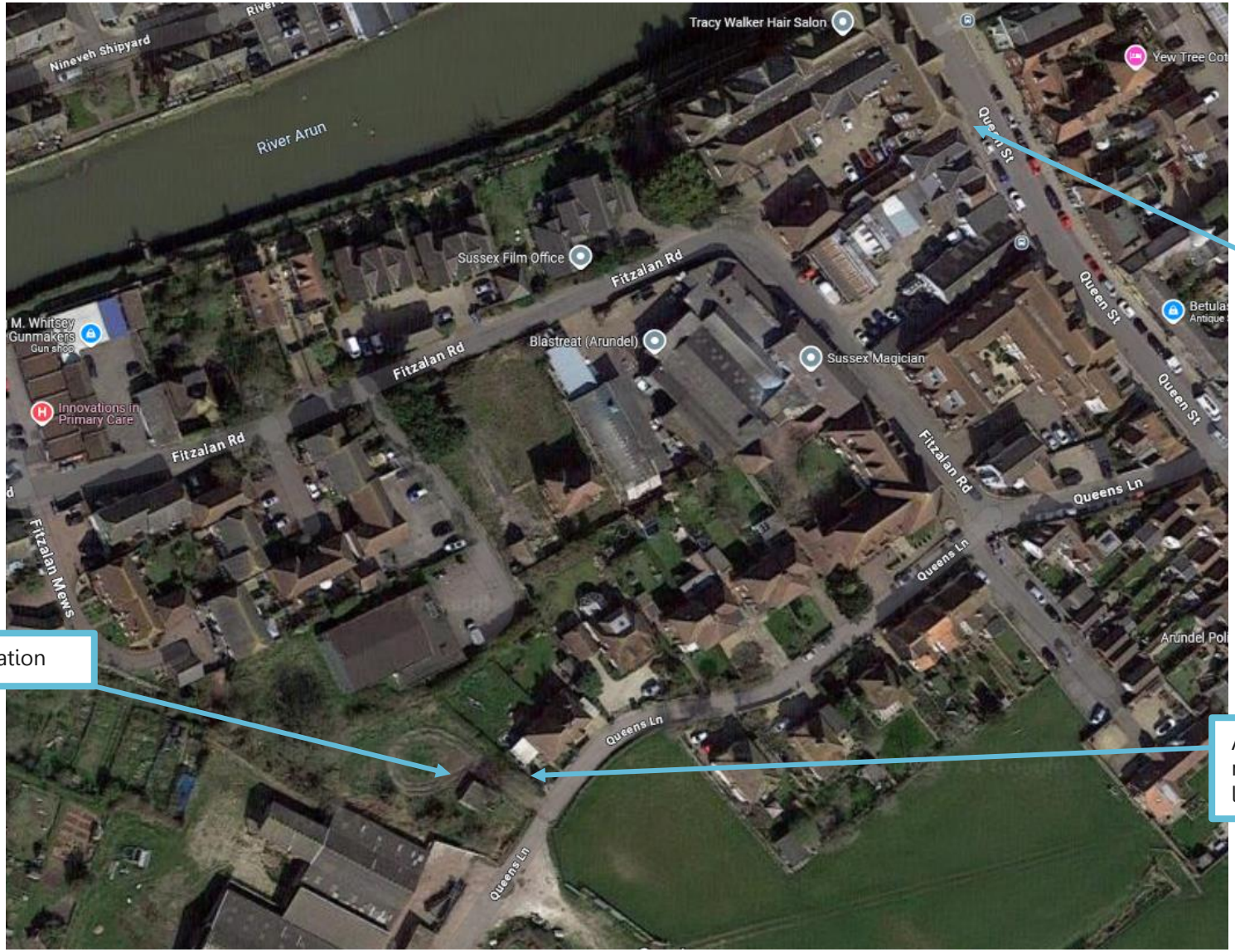
8.4. The assessment shows that noise from the use of woodworking equipment is likely to result in rating levels below the existing daytime background sound level, and no adverse noise impact is therefore expected.

8.5. Based on the findings of this assessment, noise should not be grounds for refusal of planning permission for the proposed development.

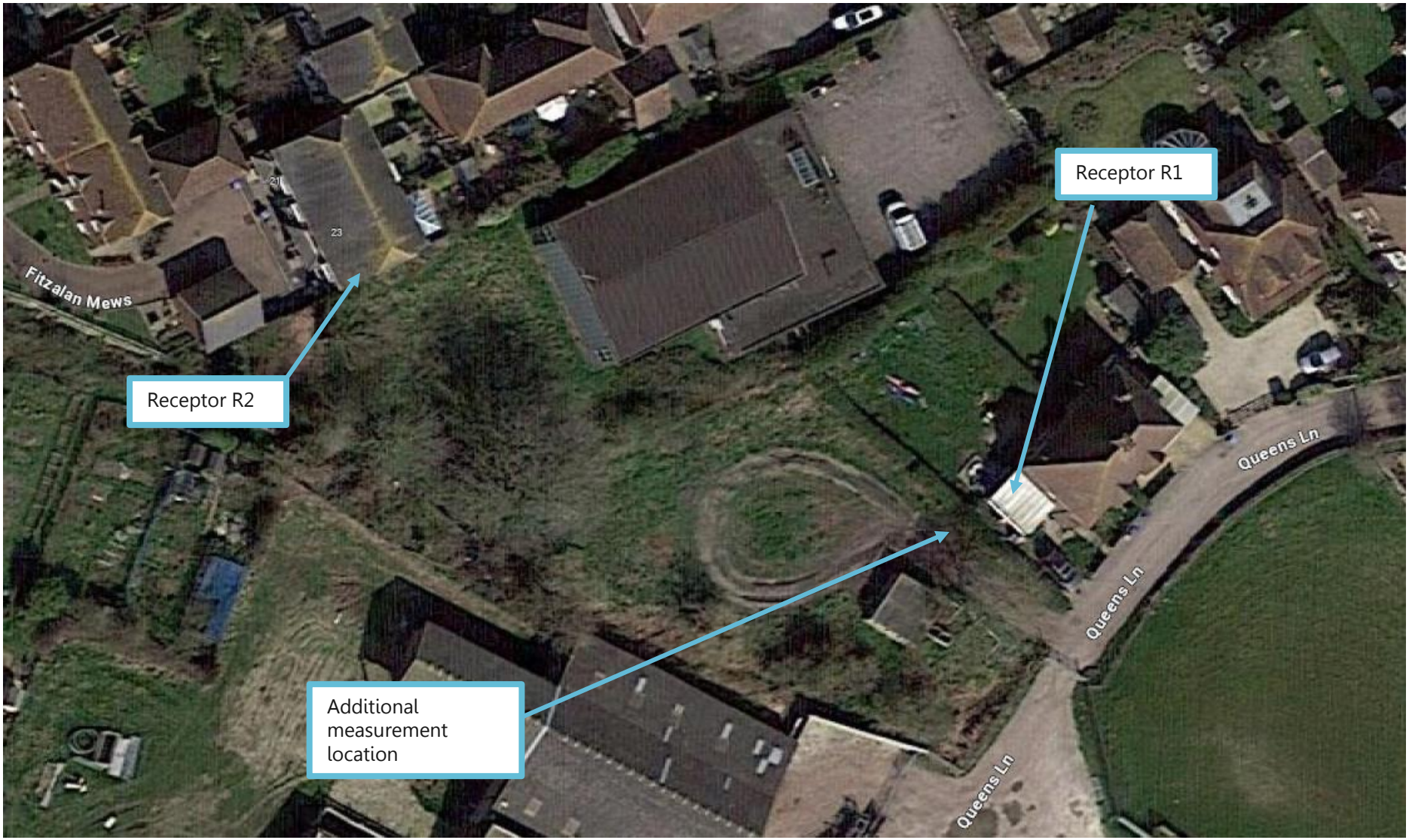
Appendix A Acoustic terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 $\log_{10}$ (s1/s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20µPa. 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 only perceptible under controlled conditions.
dB(A), L_{Ax}	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(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A –weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.
$L_{90,T}$	A noise level index. The noise level that is exceeded for 90% of the measurement time interval, T. It gives an indication of the lower levels of fluctuating noise. It is often used to describe the background noise level and can be considered to be the "average minimum" noise level and is a term used to describe the level to which non-specific noise falls during quiet spells, when there is lull in passing traffic for example.

Appendix B Photographs of site showing areas of interest

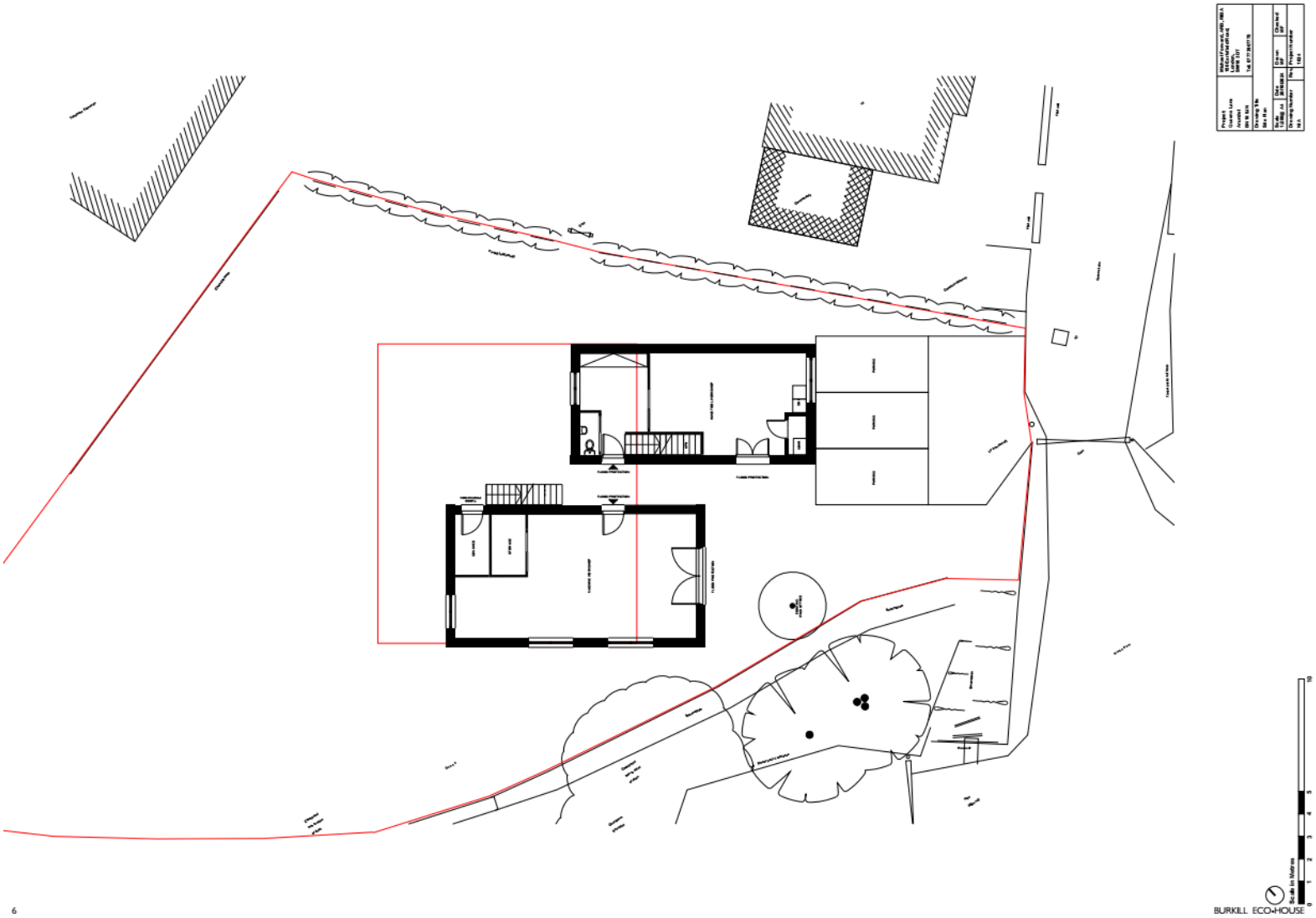


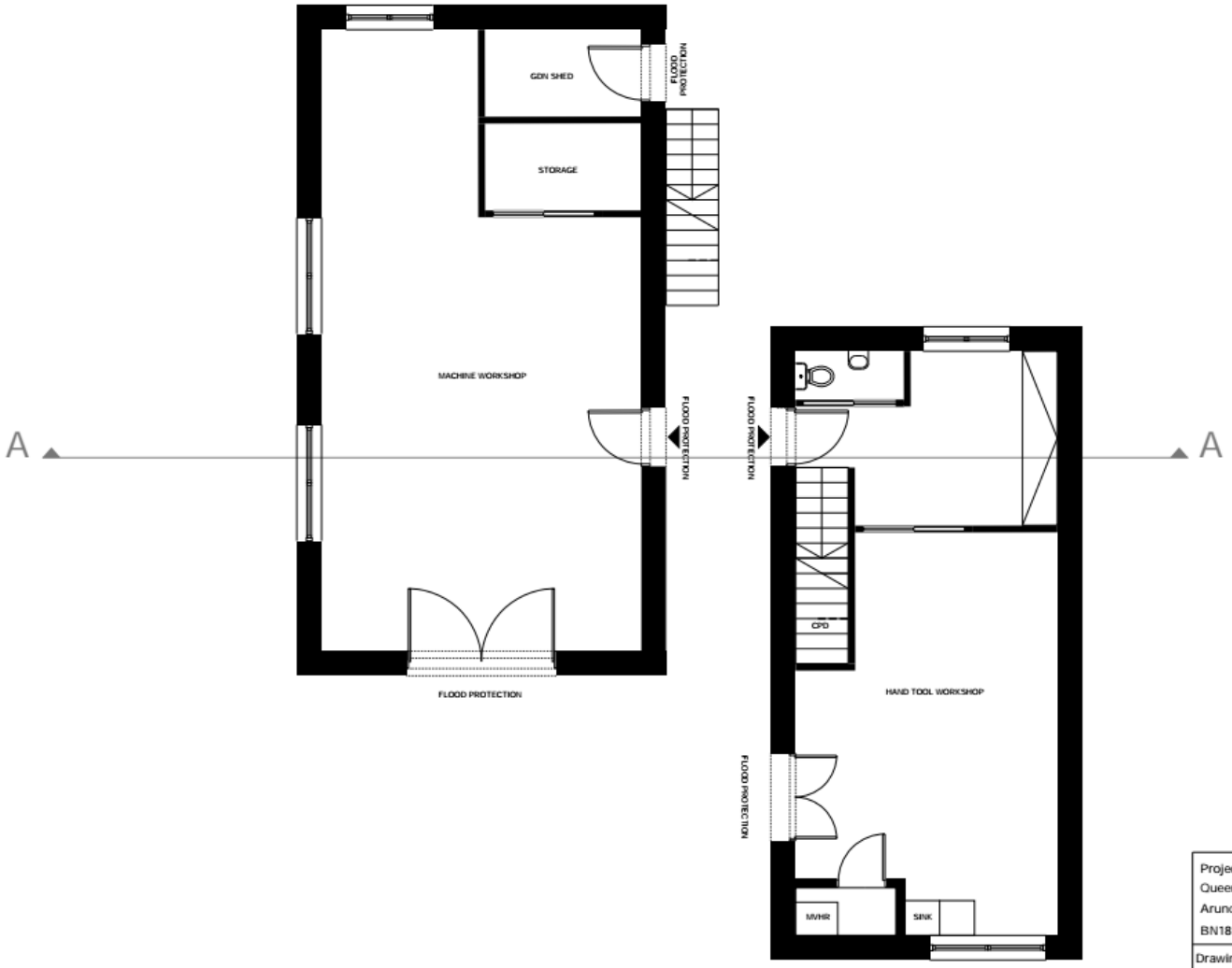
Aerial image © Google 2024

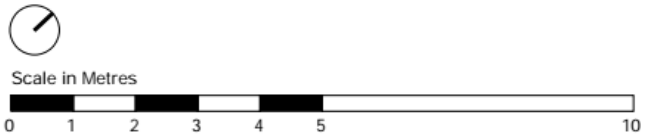


Aerial image © Google 2024

Appendix C Proposed development plans and elevations

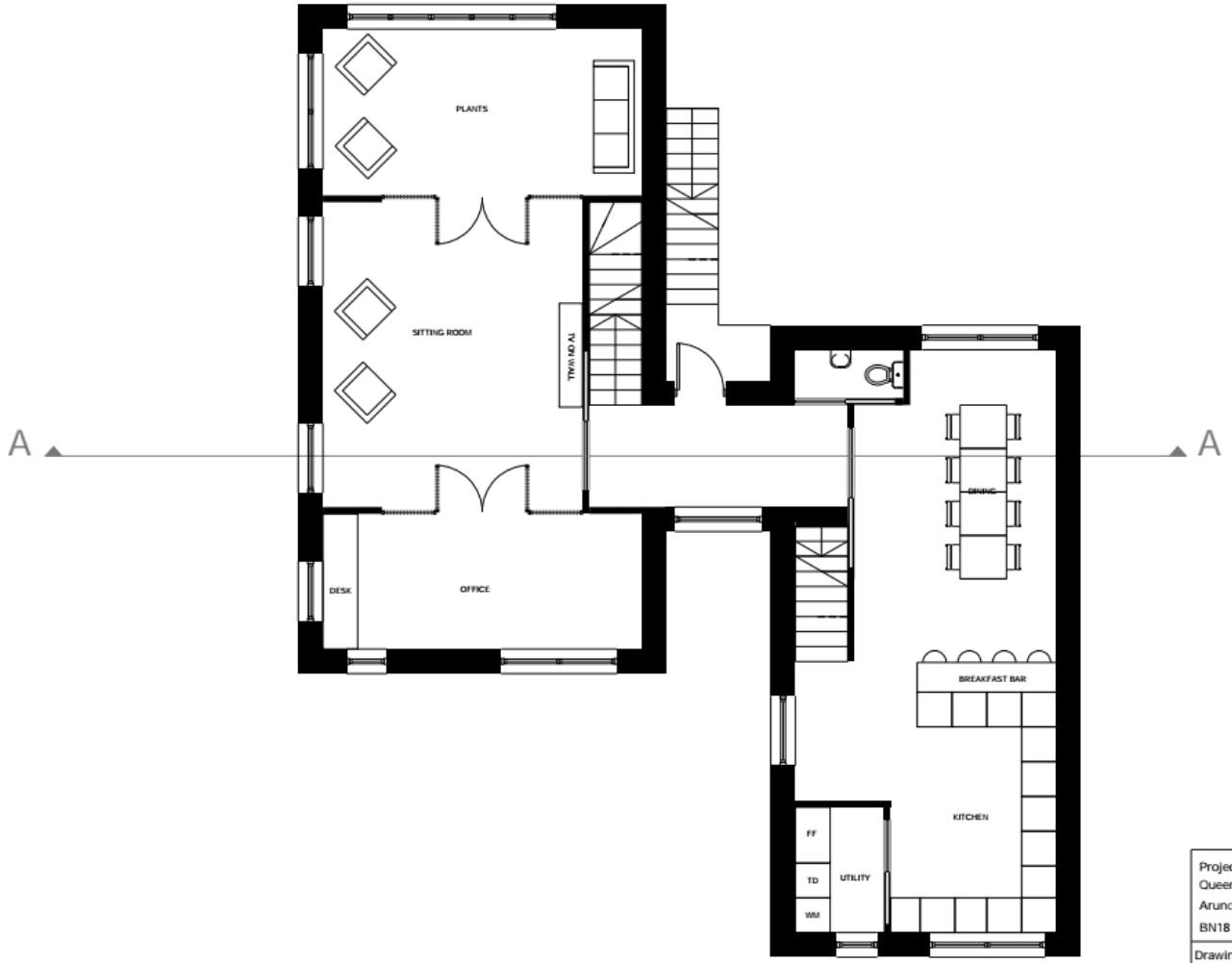






Project: Queens Lane Arundel BN18 9JN		Michael Forward, ARB, RIBA 150 Earlsfield Road, London, SW18 3DT Tel: 07773967775	
Drawing Title: Ground Floor Plan (+1.60m)			
Scale 1:100@ A4	Date 20/10/2024	Drawn MF	Checked MF
Drawing Number N/A	Rev.	Project Number 1024	

BURKILL ECO-HOUSE



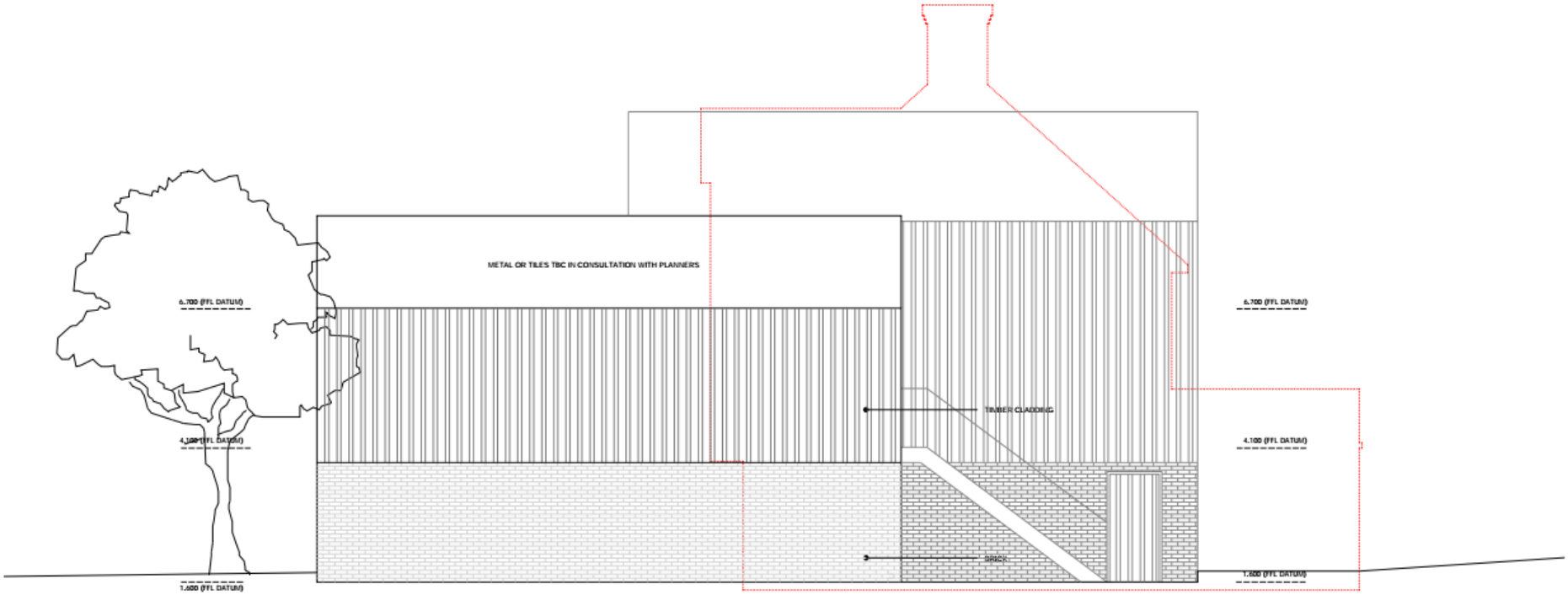
Project: Queens Lane Arundel BN18 9JN		Michael Forward, ARB, RIBA 150 Earlsfield Road, London, SW18 3DT Tel: 07773967775	
Drawing Title: First Floor Plan (+4.10m)			
Scale 1:100@ A4	Date 20/10/2024	Drawn MF	Checked MF
Drawing Number N/A	Rev.	Project Number 1024	

Scale in Metres

0 1 2 3 4 5 10

8

BURKILL ECO-HOUSE



Scale in Metres

0 1 2 3 4 5 10

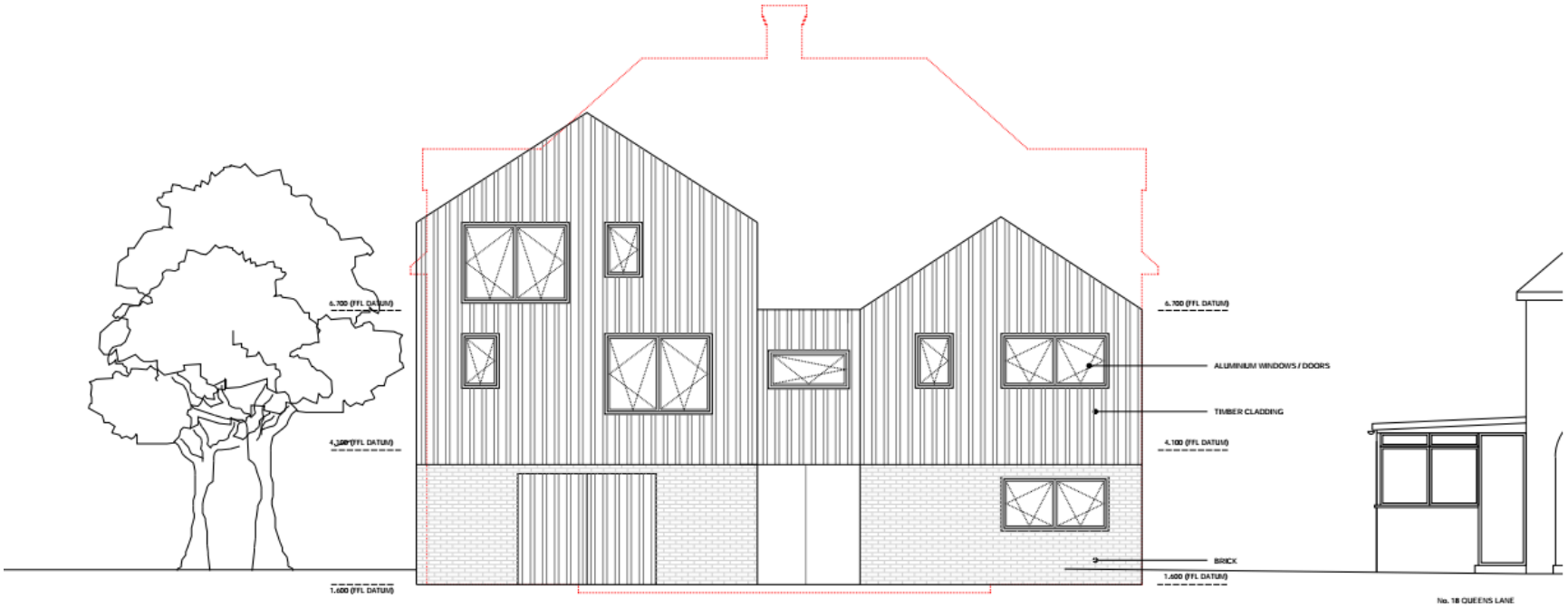
10

Project: Queens Lane Arundel BN18 9JN	Michael Forward, ARB, RIBA 150 Earlsfield Road, London, SW18 3DT Tel: 07773967775
Drawing Title: Proposed North Elevation	

Scale	Date	Drawn	Checked
1:100@ A4	20/10/2024	MF	MF

Drawing Number	Rev.	Project Number
N/A		1024

BURKILL ECO-HOUSE



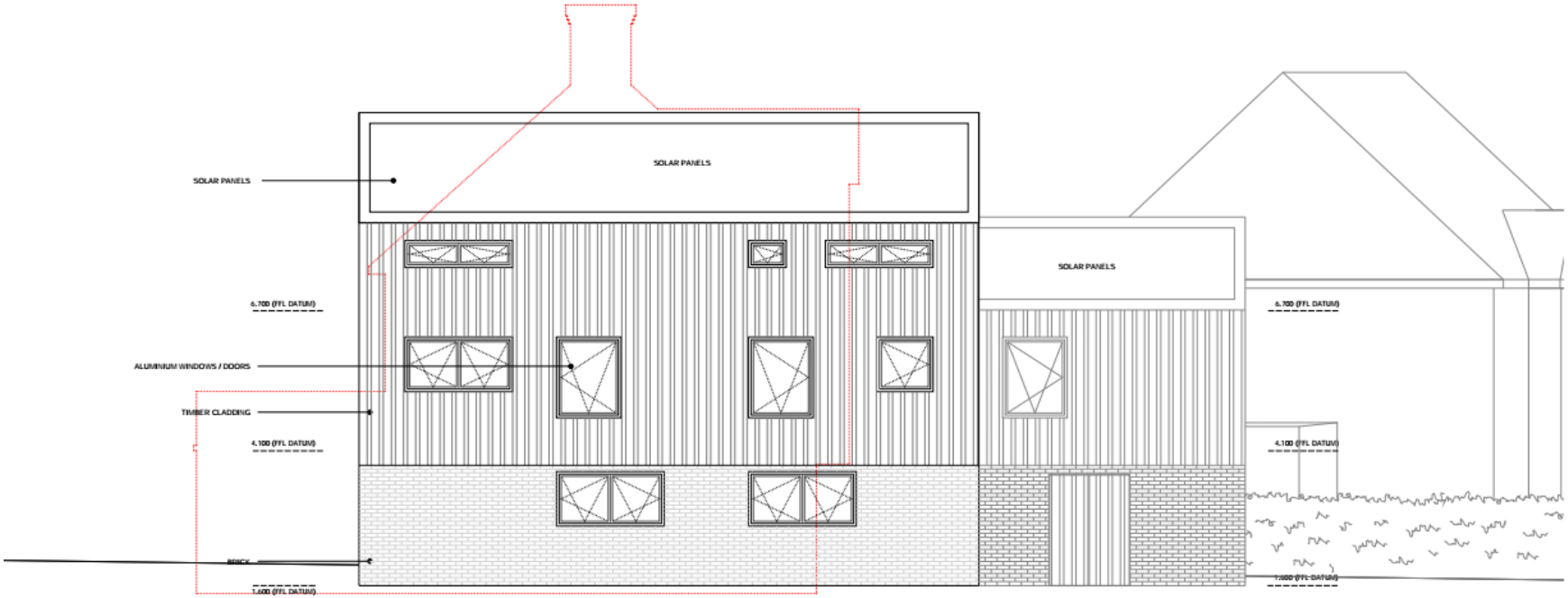
Scale in Metres

0 1 2 3 4 5 10

11

Project: Queens Lane Arundel BN18 9JN		Michael Forward, ARB, RIBA 150 Earlsfield Road, London, SW18 3DT Tel: 07773967775	
Drawing Title: Proposed East Elevation			
Scale 1:100@ A4	Date 20/10/2024	Drawn MF	Checked MF
Drawing Number N/A	Rev.	Project Number 1024	

BURKILL ECO-HOUSE



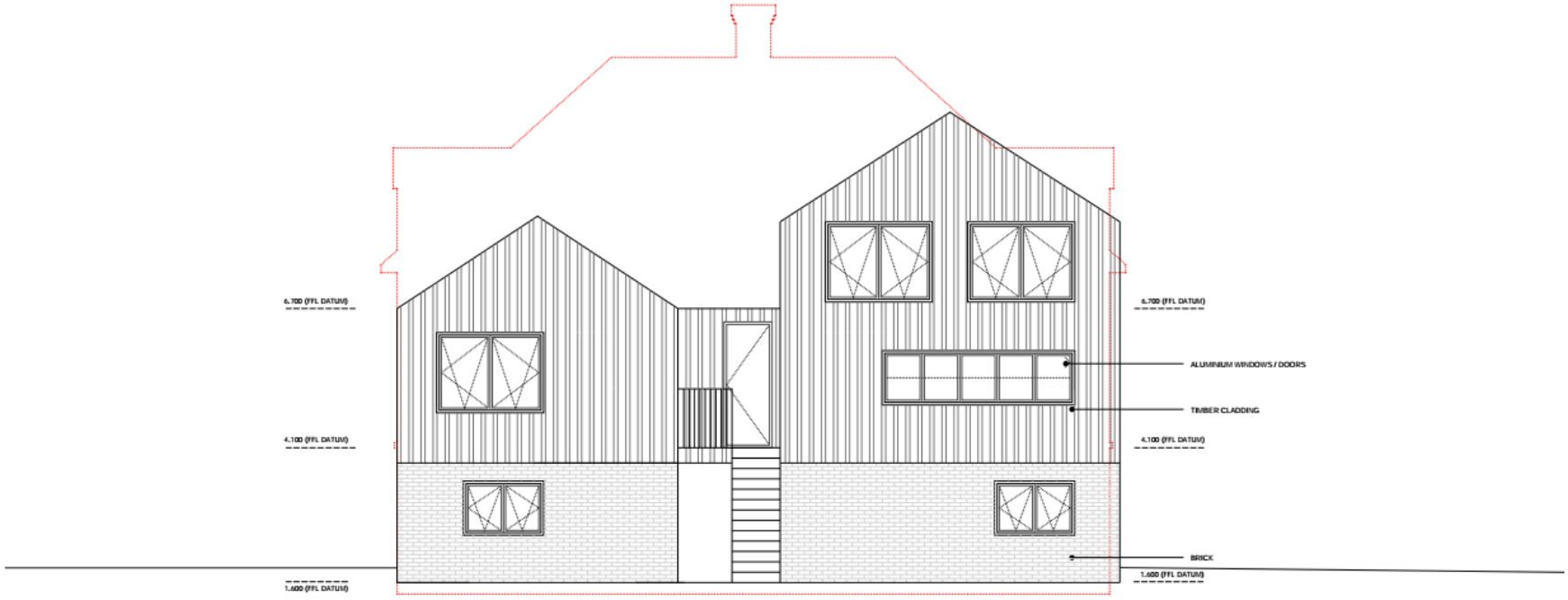
Scale in Metres

0 1 2 3 4 5 10

12

Project: Queens Lane Arundel BN18 9JN		Michael Forward, ARB, RIBA 150 Earlsfield Road, London, SW18 3DT Tel: 07773967775	
Drawing Title: Proposed South Elevation			
Scale 1:100@ A4	Date 20/10/2024	Drawn MF	Checked MF
Drawing Number N/A	Rev.	Project Number 1024	

BURKILL ECO-HOUSE



Scale in Metres

0 1 2 3 4 5 10

Project: Queens Lane Arundel BN18 9JN		Michael Forward, ARB, RIBA 150 Earlsfield Road, London, SW18 3DT Tel: 07773967775	
Drawing Title: Proposed West Elevation			
Scale 1:100@ A4	Date 20/10/2024	Drawn MF	Checked MF
Drawing Number N/A	Rev.	Project Number 1024	

BURKILL ECO-HOUSE

Appendix D Environmental sound survey

Details of environmental sound survey

D.1 Measurements of the existing environmental sound levels were undertaken between 14.30 hours on Friday 22nd November and 14.30 hours on Monday 25th November 2024.

D.2 The sound level meter was programmed to record the A-weighted L_{eq}, L_{90}, L_{10} and L_{max} noise indices for consecutive fifteen-minute sample periods for the duration of the survey.

Measurement position

D.3 The representative measurement position was located on a lamp post on Queen Street. The microphone was positioned approximately 3m above ground level and removed from any reflecting surfaces.

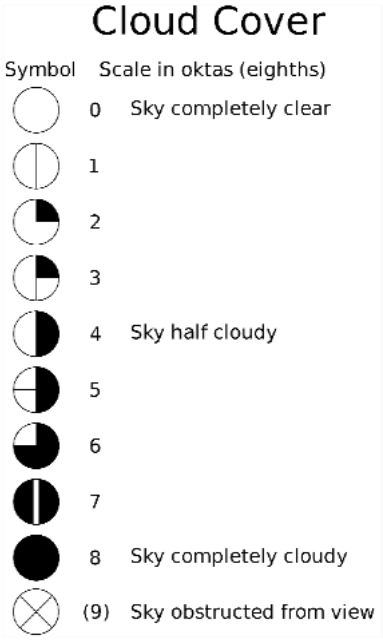
D.4 In accordance with BS 7445-2:21991 *'Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use'*, the measurements were undertaken under free-field conditions.

Equipment

D.5 Details of the equipment used during the survey are provided in the table below. The sound level meter was calibrated before and after the survey; no significant change in the calibration level was noted.

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Rion NL-52 / 00654035	06/07/2023	TCRT23/1489
Condenser microphone	Rion UC-59 / 14826		
Preamplifier	Rion NH-25 / 87474		
Calibrator	Rion NC-74 /34235932	09/10/2024	1509847-1

D.6 Weather conditions were determined both at the start and on completion of the survey. It is considered that the meteorological conditions were appropriate for environmental noise measurements. The table below presents the weather conditions recorded on site at the installation and removal of the meter.

Weather Conditions				
Measurement Location	**Time/Date**	**Description**	**Beginning of Survey**	**End of Survey**
As indicated on Appendix B	14.30 22 Nov - 14.30 25 Nov 2024	Temperature (°C)	6	12
		Precipitation:	No	No
		Cloud cover (oktas – see guide)	3	1
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	No	Damp
		Wind Speed (m/s)	1.4	<1
		Wind Direction	S	W
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No

Results

D.7 The results of the survey are considered to be representative of the environmental sound levels in the area. During installation and removal of the meter, the noise climate at the unattended survey location was affected by local road traffic.

D.8 The results of the unattended survey are presented in a time history graph at the end of this Appendix. Elevated noise levels from Saturday morning to Sunday afternoon are attributed to Storm Bert which generated high winds and heavy rain through that period.

Details of additional attended survey

D.9 Additional attended measurements were made within the site, close to the boundary with the nearest house to the east, between 12.45hrs and 14.00hrs on Monday 25th November 2024.

D.10 The sound level meter was programmed to record the A-weighted L_{eq}, L_{90}, L_{10} and L_{max} noise indices for consecutive fifteen-minute sample periods for the duration of the survey.

D.11 In accordance with BS 7445-2:21991 *'Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use'*, the measurements were undertaken under free-field conditions.

Equipment

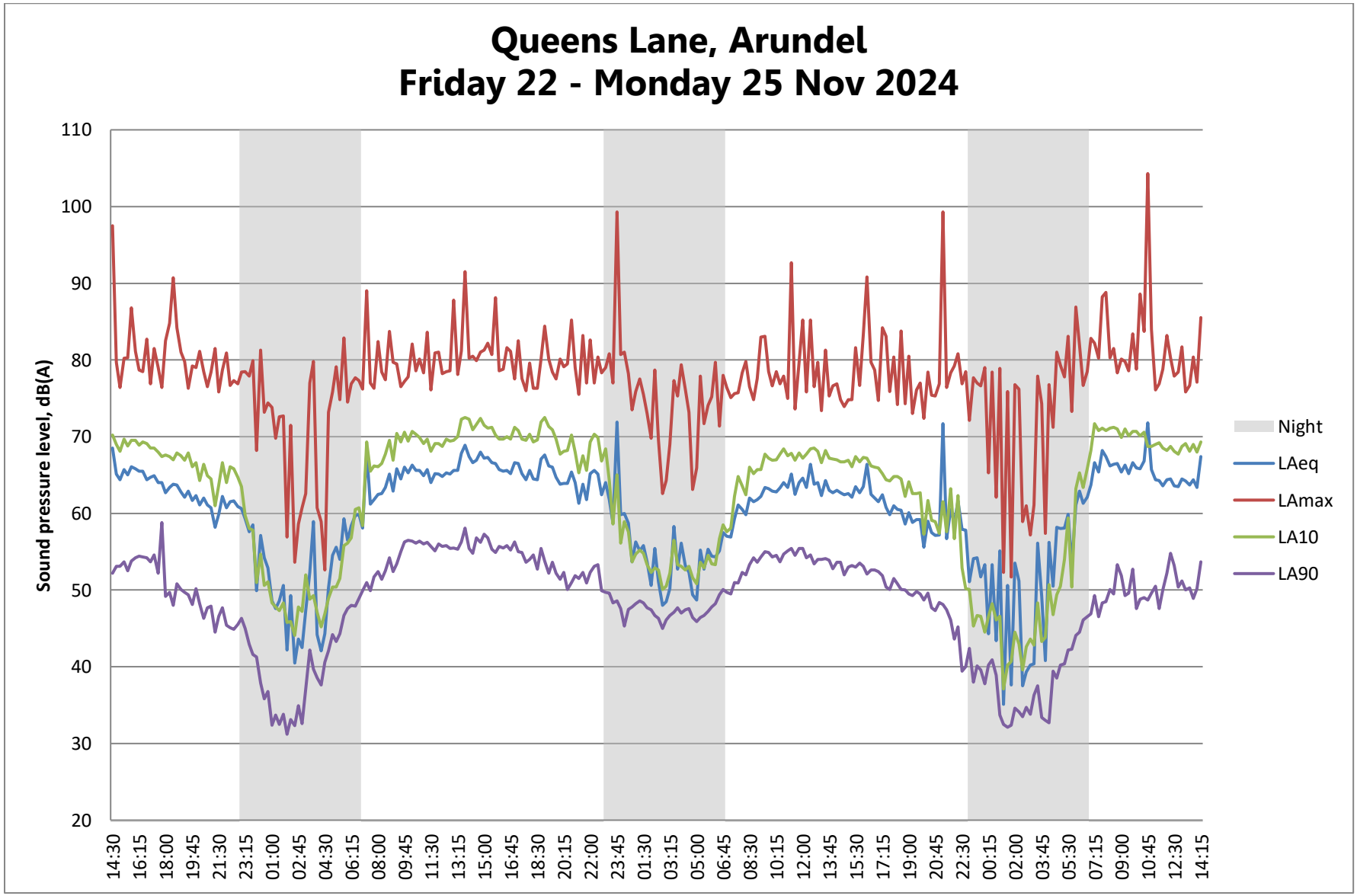
D.12 Details of the equipment used during the survey are provided in the table below. The sound level meter was calibrated before and after the survey; no significant change in the calibration level was noted.

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Svantek 977D / 99470	14/02/2024	Factory conformation certificate
Condenser microphone	Microtech MK255 / 26252		
Preamplifier	Svantek SV12L / 144633		
Calibrator	Svantek SV33B / 125706	03/09/2024	1509191-2

D.13 A summary of the measured sound levels is presented in the table below. The background sound level measured at the unattended survey position during each time period is shown for comparison.

Start time	Measured sound pressure levels at additional measurement location				Measured sound pressure level (unattended survey)
	L_{AfMax}	L_{Aeq}	L_{A10}	L_{A90}	L_{A90}
25/11/2024 12:45	80	57	57	52	47
25/11/2024 13:00	63	54	56	52	45
25/11/2024 13:15	63	54	56	51	44
25/11/2024 13:30	63	54	56	52	45
25/11/2024 13:45	65	55	56	52	45

D.14 It can be seen that the background sound levels at the attended measurement position were higher than at the unattended measurement position and the use of the data gathered at the latter location may therefore be considered a robust representation for the purposes of the assessment.


Queens Lane, Arundel
Friday 22 - Monday 25 Nov 2024
Sound pressure level, dB(A)
110
100
90
80
70
60
50
40
30
20
14:30
16:15
18:00
19:45
21:30
23:15
01:00
02:45
04:30
06:15
08:00
09:45
11:30
13:15
15:00
16:45
18:30
20:15
22:00
23:45
01:30
03:15
05:00
06:45
08:30
10:15
12:00
13:45
15:30
17:15
19:00
20:45
22:30
00:15
02:00
03:45
05:30
07:15
09:00
10:45
12:30
14:15
Night
LAeq
LAmax
LA10
LA90

Appendix E Noise break-out calculations

Hand tools workshop

	Receptor	
	R1	R2
Hand Tools Workshop		
Internal Reverberant SPL, dB $L_{Aeq\ 1hr}$	70	70
North East Elevation		
Wall area, m^2	15.6	15.6
Wall SRI, dB R_w	49	49
Wall sound power level, dBA	27	27
Distance to receptor, m	5	55
Distance correction, dB	-22	-43
Screening, dB	0	-5
SPL at Receptor, wall, dBA	**5**	**-21**
South East Elevation		
Wall area, m^2	8.8	8.8
Wall SRI, dB R_w	49	49
Wall sound power level, dBA	24	24
Distance to receptor, m	5	61
Distance correction, dB	-22	-44
Screening, dB	0	-20
SPL at Receptor, wall, dBA	**2**	**-40**
Window area, m^2	2	2
Window SRI, dB R_w	30	30
Window sound power level, dBA	37	37
Distance to receptor, m	5	61
Distance correction, dB	-22	-44
Screening, dB	0	-20
SPL at Receptor, window, dBA	**15**	**-27**

	Receptor	
	R1	**R2**
South West Elevation		
Wall area, m^2	7.4	7.4
Wall SRI, dB R_w	49	49
Wall sound power level, dBA	24	24
Distance to receptor, m	10	58
Distance correction, dB	-28	-43
Screening, dB	-15	-12
SPL at Receptor, wall, dBA	**-19**	**-31**
Door area, m^2	3.2	3.2
Door SRI, dB R_w	29	29
Door sound power level, dBA	40	40
Distance to receptor, m	10	58
Distance correction, dB	-28	-43
Screening, dB	-15	-12
SPL at Receptor, Door, dBA	**-3**	**-15**
Combined at Receptor, dBA	**16**	**-14**
Feature correction	9	9
Rating level at receptor, dB $L_{Ar,Tr}$	**25**	**-5**

Machine Workshop

	Receptor	
	R1	R2
Machine Workshop		
Internal Reverberant SPL, dB $L_{Aeq\ 1hr}$	85	85
North East Elevation		
Wall area, m^2	14.8	14.8
Wall SRI, dB R_w	49	49
Wall sound power level, dBA	42	42
Distance to receptor, m	13	50
Distance correction, dB	-30	-42
Screening, dB	-10	-5
SPL at Receptor, wall, dBA	**2**	**-5**
Door area, m^2	2.1	2.1
Door SRI, dB R_w	29	29
Door sound power level, dBA	53	53
Distance to receptor, m	13	50
Distance correction, dB	-30	-42
Screening, dB	-10	-5
SPL at Receptor, Door, dBA	**13**	**6**
South East Elevation		
Wall area, m^2	7.5	7.5
Wall SRI, dB R_w	49	49
Wall sound power level, dBA	39	39
Distance to receptor, m	15	57
Distance correction, dB	-32	-43
Screening, dB	-8	-20
SPL at Receptor, wall, dBA	**-1**	**-24**
Door area, m^2	5.5	5.5
Door SRI, dB R_w	29	29
Door sound power level, dBA	57	57
Distance to receptor, m	15	57
Distance correction, dB	-32	-43
Screening, dB	-8	-20
SPL at Receptor, Door, dBA	**17**	**-6**

	Receptor	
	R1	R2
South West Elevation		
Wall area, m^2	20.4	20.4
Wall SRI, dB R_w	49	49
Wall sound power level, dBA	43	43
Distance to receptor, m	18	55
Distance correction, dB	-33	-43
Screening, dB	-20	-5
SPL at Receptor, wall, dBA	**-10**	**-5**
Window area, m^2	4	4
Window SRI, dB R_w	30	30
Window sound power level, dBA	55	55
Distance to receptor, m	18	55
Distance correction, dB	-33	-43
Screening, dB	-20	-5
SPL at Receptor, window, dBA	**2**	**7**
North West Elevation		
Wall area, m^2	5.1	5.1
Wall SRI, dB R_w	49	49
Wall sound power level, dBA	37	37
Distance to receptor, m	17	50
Distance correction, dB	-33	-42
Screening, dB	-5	0
SPL at Receptor, wall, dBA	**-1**	**-5**
Window area, m^2	1.5	1.5
Window SRI, dB R_w	30	30
Window sound power level, dBA	51	51
Distance to receptor, m	17	50
Distance correction, dB	-33	-42
Screening, dB	-5	0
SPL at Receptor, window, dBA	**13**	**9**
Combined at Receptor, dBA	**20**	**13**
Feature correction	7	7
Rating level at receptor, dB $L_{Ar,Tr}$	**27**	**20**