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NOISE ASSESSMENT

PROPOSED DEVELOPMENT OF 4 PROPERTIES ON LAND ADJACENT TO 22 THE AVENUE, WELWYN

MR B GRAY

JANUARY 2018



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Status	Prepared By	Date
1.0 (DRAFT)	L Jephson BEng (Hons) MIOA	4/1/18
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This report has been prepared using all reasonable skill and care within the resources and brief agreed with the client.
LF Acoustics Ltd accept no responsibility for matters outside the terms of the brief or for use of this report, wholly or in part, by third parties.

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1. Introduction

LF Acoustics Ltd have been appointed by Mr B Gray to undertake a noise assessment to support a planning application for a residential development of 4 dwellings on land adjacent to 22 The Avenue, Welwyn.

A previous planning application for up to 12 dwellings on the site (Ref 6/2017/1751/OUTLINE) was refused, with noise considered as one of the reasons, as the submitted noise assessment did not consider the proposed scheme nor consider recent planning guidance. The comments made by the officer consulted on that application have, however, been considered within this report as they relate to development on the site in general.

The present application seeks to demolish the existing barn building and to construct four 2-storey properties on the site. Some boundary bunding has been previously constructed along the boundary with the A1 and as the part of the scheme, this mitigation would be enhanced to provide further protection to the future occupants.

The following section of this report provides a description of the principal standards and guidelines referred to within this report. Section 3 provides a brief description of the site and surrounding noise sources. Section 4 provides a description of the measurement exercise carried out and a summary of the results. Section 5 calculates the noise levels within the proposed development and assesses the measured noise levels against the adopted criteria, with additional noise mitigation measures outlined in Section 6. Finally, Section 7 gives a summary of the main findings of the assessment.

2. Standards and Guidelines

A description of the noise and vibration units referred to in this report is given in Appendix A.

2.1. National Planning Policy Framework

The National Planning Policy Framework (NPPF) was published in 2012 [1]. The aim of the Framework is to move the decision making process to a local level and to promote new development, with the presumption in favour of sustainable development.

Local planning authorities are required to develop local policies, and with regards noise, planning policies and decisions should aim to:

- Avoid noise from giving rise to significant adverse impacts on health and quality of life from new development;
- Mitigate and reduce to a minimum other adverse impacts on heath and quality of life arising from noise from new development, including through the use of conditions; and
- Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established.

2.2. British Standard BS 8233

BS 8233 [2] recommends design aims for noise levels to be achieved in new buildings and is the most appropriate guidance in defining applicable noise levels within the proposed development. The Standard was updated in 2014 to better reflect the requirements of the NPPF in terms of impact classifications and achieving the recommended guidance values, seeks to ensure that the occupants would not be subject to any significant adverse impacts, to ensure compliance with the requirements of the NPPF.

For residential properties, the guidance recommends the following design aims for the daytime (07:00 – 23:00) and night-time (23:00 – 07:00) periods:

- 35 dB $L_{Aeq,T}$ within living rooms and bedrooms during the daytime period;
- 40 dB $L_{Aeq,T}$ within dining areas / rooms during the daytime period;
- 30 dB $L_{Aeq,T}$ within bedrooms at night; and
- 50 – 55 dB $L_{Aeq,T}$ within gardens and patios during the daytime.

With regards internal noise levels, the Standard advises:

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

Where the above limits require windows to be closed to maintain the standard of noise, there needs to be appropriate alternative ventilation provided that does not compromise the façade insulation or resulting noise level.

For outdoor amenity spaces, it is recognised in the Standard that these guideline values may not be achievable in all circumstances. Where development might be desirable, 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, the development should be designed to achieve the lowest practicable levels, but should not be prohibited. Given that there is a need for the development, it is considered in this situation, that this relaxation could be applied, providing the lowest practicable levels have been achieved.

2.3. World Health Organisation Guidelines

The WHO guidance [3] provides guidance of a similar nature to BS8233, although the emphasis is more on health effects associated with noise. The document recommends internal and external noise levels to provide an acoustic environment conducive to un-interrupted speech and sleep. The WHO guidance is summarised below for information purposes.

- It will be important to consider the maximum noise levels and number of noisy events.
- Satisfactory protection should be provided to avoid sleep disturbance, annoyance and speech communication interference.
- Recommended internal noise levels in bedrooms are given as 30 dB $L_{Aeq,T}$ for continuous noise and 45 dB $L_{Amax,F}$ for single events, during the night-time period.

2.4. ProPG: Planning and Noise

Professional planning guidance on planning and noise was published in May 2017 [4]. The guidance seeks to provide a recommended approach to the management of noise within the planning system in England. The guidance has been prepared jointly between the Association of Noise Consultants, The Institute of Acoustics and the Chartered Institute of Environmental Health with the aim of providing a coherent approach to achieving the requirements of the NPPF.

At present, the guidance principally relates to new residential developments where noise is principally influenced by transportation sources.

The guidance advocates a systematic, proportionate, risk based, 2-stage approach, encouraging early consideration of noise within the design process for new residential developments:

- Stage 1 provides an initial noise risk assessment of the development site;
- Stage 2 provides systematic consideration of four key elements: demonstrating a good acoustic design process; observing internal noise level guidelines; undertaking an external amenity area noise assessment; and consideration of other relevant issues.

The initial risk assessment should identify the risk of adverse effects from noise and identifying whether the site poses a negligible, low, medium or high risk. The level of risk does not determine whether a site may be unsuitable for development, but highlights an increasing requirement for noise to be considered within the design of the development and the likelihood of a need for specific noise mitigation measures.

For a Stage 2 assessment, upon which basis this report has been prepared, the guidance refers to BS 8233 with respect of achieving an acceptable internal noise environment and within gardens.

Internally, the guidance recommends that the targets within BS 8233 are adopted as an aim. Expanding upon the guidance within BS 8233, for internal noise environments It is stated:

"Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5 dB, the more that most people are likely to regard them as "unreasonable". Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing "unacceptable" noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form."

Within external amenity areas, the guidance reflects BS 8233, as follows:

"These guideline values (i.e. a level of between 50 – 55 dB L_{Aeq}) may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces."

2.5. Local Authority Guidance

Policies D1 and R19 of the Welwyn Hatfield District Plan apply to noise within new developments.

Policy D1: Quality of Design

The Council will require the standard of design in all new development to be of a high quality. The design of new development should incorporate the design principles and policies in the Plan and the guidance contained in the Supplementary Design Guidance.

Policy R19: Noise and Vibration Pollution

Proposals will be refused if the development is likely:

(i) To generate unacceptable noise or vibration for other land uses; or

(ii) To be affected by unacceptable noise or vibration from other land uses.

Planning permission will be granted where appropriate conditions may be imposed to ensure either:

(iii) An adequate level of protection against noise or vibration; or

(iv) That the level of noise emitted can be controlled.

Proposals should be in accordance with the Supplementary Design Guidance.

The Supplementary Design Guidance, 2005, specifies that the Council will use the guidance contained within the withdrawn PPG 24 to assess the impact of new development and is now outdated.

Based upon the comments made by officers regarding the recent application on the site, the officer advised that consideration should be given to the recent ProPG guidance to assess the suitability for residential development on the site. It is noted in the response, that the officer advised that noise levels within amenity spaces (i.e. gardens) should not exceed 55 dB $L_{Aeq,T}$. However, this stipulation does not accord with either the guidance contained within ProPG nor BS 8233, which advise that where there are other parameters to consider (e.g. the need for housing), then higher limits should be permissible, providing the *development has been designed to achieve the lowest practicable noise levels within external amenity spaces*. Clearly, however, the development would be designed with the aim of achieving the lowest practicable levels to meet the requirements of the relevant Standards and guidance.

2.6. Assessment Criteria

On the basis of the guidance contained within ProPG and BS 8233, the following design aims and criteria have been adopted for this assessment:

- Aim to achieve a good acoustic design for the proposed development;
- Internally the development would be designed to achieve a limit of 35 dB $L_{Aeq,\ 16\ hour}$ or lower within habitable rooms during the daytime period with windows closed and alternative means of ventilation provided;
- Internally the development would be designed to achieve a limit of 30 dB $L_{Aeq,\ 8\ hour}$ or lower, with maximum noise levels not normally exceeding 45 dB $L_{Amax,F}$ within habitable rooms during the night-time period with windows closed and alternative means of ventilation provided; and
- Aim to ensure noise levels within external amenity areas (principally seating / patio areas) do not exceed a level of 55 dB $L_{Aeq,\ 16\ hour}$.

3. Site Description and Potential Noise Sources / Initial Risk Assessment

The proposed development site is located on land to the north of the existing dwelling at 22 The Avenue, Welwyn. At present there is an old barn within the site, which would be demolished.

Noise levels within the site are principally influenced by road traffic from vehicles travelling along the A1, which runs in a shallow cutting directly to the east of the site, with noise levels within the site relatively high throughout the day and night-time periods.

A bund alongside the A1 has been previously constructed in part within the application site, although at present there is a gap adjacent to the building and adjacent to the existing property at no. 22, which is screened by a 1.8m high fence at present. It is proposed to continue the bund the tie into the new bund which has recently been constructed adjacent to no. 20 The Avenue. A close boarded fence (to a minimum specification of 10 kg/m^2) would be provided on top of the bund to provide an overall mitigation height of between 4 – 5 metres. This mitigation would provide a seamless barrier alongside the A1, continuing from no. 20 to the northern boundary of the site and turning back along this boundary, as indicated on Figure 1. The provision of the new noise mitigation would not only seek to reduce noise levels within the proposed development but would also provide additional noise protection for the existing dwellings at no. 20 and 22 The Avenue.

Given that there have been a number of new dwellings constructed on land adjacent to this site recently, an initial risk assessment for the site would indicate that the site would be suitable for residential development, providing an appropriate design and mitigation measures are considered.

It is proposed to construct a small residential development of 4 properties within the site. The layout for the proposed development, upon which this assessment has been based is presented on Figure 2.

To address noise from traffic using the A1, the mitigation measures proposed above would be implemented within the design of the proposed development, which would provide a noticeable reduction in noise levels.

The layout of the dwellings has been proposed to face towards the A1, with the internal access road constructed alongside the A1 to provide some additional separation from traffic. The orientation of the dwellings seeks to provide additional screening for the gardens of the properties, to ensure that the main seating / amenity areas are effectively screened.

Internally, it is proposed to locate less noise sensitive rooms, e.g. kitchens / bathrooms at the front of the properties, to ensure that windows to habitable rooms are mainly within the north western facades of the properties, thus facing away from the road. In addition, appropriate noise mitigation measures would be implemented to ensure a good standard of noise internally. The proposed internal layout is indicated on Figure 3.

The measures outlined above, seek to ensure a satisfactory standard of noise is achieved within the proposed development and the initial risk assessment therefore indicates that the site would be suitable for residential development with appropriate measures implemented to minimise noise.

4. Noise Monitoring

In order to ascertain the existing noise levels on the site, a noise monitoring exercise was carried out to support the previous planning application for a residential development on the site, between Monday 18th and Friday 22nd November 2013.

The measurement exercise comprised an unattended noise survey located along the boundary with the A1.

Weather conditions during the survey were generally good, with generally dry conditions and light winds throughout the survey period. These conditions were considered suitable for undertaking an assessment of the road traffic noise levels.

Whilst the survey was carried out 4 years ago, the noise levels monitored continue to remain valid, as the principal source of noise, traffic on the A1, remains unchanged. Consideration has been given to increases in traffic on the road since the survey was carried out within this assessment. Data available from the DfT, indicates an increase in daily traffic from 87676 vehicles in 2013 to 90534 vehicles in 2016 (2016 is the latest data currently available). This increase would result in noise levels increasing by less than 0.2 dB(A) between the survey and the present time, which whilst insignificant, has been taken into account within this assessment, by adding this figure to the results obtained from the survey.

A Rion NL-52 Class 1 Sound Level Meter was used for the survey, which was calibrated before and after the exercise using a Rion NC-74 Class 1 Acoustic Calibrator. The sound level measured on the instrument with the calibrator applied read 94.0 dB(A) on both occasions.

The instrument was configured to monitor noise levels over contiguous 5 minute periods for the duration of the survey, which enabled maximum noise levels associated with particular events to be identified and to allow a comparison with the attended noise measurements to be made.

The instrument was positioned along the boundary with the A1, which was closer to the road than the proposed dwellings and beyond the existing boundary mitigation, to provide a good indication of the unmitigated road traffic noise levels. The microphone was positioned freefield and at a height of 2 metres above local ground level. The monitoring position is indicated on Figure 1.

Noise levels monitored at this position were principally influenced by the road traffic using the A1.

The results of the survey have been summarised into hourly periods for reporting purposes using the Rion AS-60 Data Management Software and are presented in Appendix B, with a graphical presentation provided on Figure 4.

The noise levels have been analysed to provide the overall day and night-time levels, as indicated in Table 4.1.

Day	Period L_{Aeq} Noise Level [dB]	
	Daytime (07:00 – 23:00)	**Night-time (23:00 – 07:00)**
Monday 18th November 2013	79.1*	73.8
Tuesday 19th November 2013	78.8	73.8
Wednesday 20th November 2013	79.2	74.6
Thursday 21st November 2013	79.3	74.5
Average	**79.1**	**74.1**

Notes * Daytime Period includes levels measured between Monday 10:00 – 23:00 hours and Friday 07:00 – 10:00 hours

Table 4.1 Period Noise Levels Monitored Along Site Boundary (Unmitigated)

Taking account of the increases in traffic flows since 2013, the period noise levels specified in the table above would increase by 0.2 dB(A).

Maximum noise levels monitored at this position indicated typical levels of the order of 85 dB $L_{Amax,F}$, with higher levels generally associated with a motorbike passing or HGVs using the road. Maximum noise levels during the night-time period were observed to reduce compared to the daytime, potentially associated with a different mix of traffic.

5. Calculations and Assessment

5.1. Calculation of External Noise Levels

Modelling of the noise levels has been carried out within the SoundPlan modelling package to determine the noise levels within the proposed development, based upon an open site and the indicative layout provided for the outline planning application. The model implements the calculations procedures from CRTN [5].

It is proposed that 2-storey dwellings would be constructed, to ensure the mitigation provided by the proposed boundary bunding / barrier remains effective.

Ground / road heights for the noise model have been obtained from a combination of data presented on OS mapping and within Google Earth.

The model has been calibrated using the results from the noise survey to enable the day and night-time noise levels to be modelled accurately.

The noise model has taken account of the proposed mitigation to be provided alongside the A1 and consideration of the layout proposed for the dwellings. It has been assumed that the garages to be constructed between the lots would have pitched roofs and be constructed with a ridge height of 4 metres. A 2.4 metre high close boarded fence would be constructed along the northern boundary of the site adjacent to Plot 4 to provide screening to the garden of this property. In addition, the modelling has also assumed that 1.8 metre high close boarded fencing would be constructed along the boundaries to the gardens, with the main patio / seating areas constructed adjacent to the north western facades of the dwellings.

The results of the noise modelling are provided on Figure 5, which indicates the unmitigated scenario with the site cleared and Figure 6, which indicates the noise levels with the proposed boundary mitigation and proposed development. Figure 6 indicates the noise levels at the front facades of the properties, which would be most exposed to noise from the A1 traffic along with the noise levels within the gardens. The noise maps presented on the figures indicate the daytime noise levels at the ground floor level of the properties.

5.2. Assessment

The layout as proposed for the dwellings seeks to provide the most appropriate solution to minimise noise levels within the gardens of the properties.

As indicated previously, the partly constructed bund would be completed and extended to tie into the existing bund at no. 20 The Avenue, with a close boarded fence constructed on top to provide an overall mitigation height of between 4 – 5 metres, equivalent to that provided alongside the new dwellings which have recently been constructed at nos. 16 – 20 The Avenue. It is clear from a comparison of Figures 4 and 5 that the provision of the boundary mitigation would significantly reduce the noise levels on the site.

With the proposed layout, noise levels at the external seating areas to the rear of the properties would be reduced to a level not exceeding 55 dB $L_{Aeq,\ 16\ hour}$ during the daytime period, thus meeting the requirements of both BS 8233 and the ProPG guidance. It is noted that the requirements of the guidance allows for noise levels above 55 dB L_{Aeq}, where there are other overriding planning requirements. The mitigation measures as proposed minimise noise levels within the gardens, whilst not affecting other planning aspects, such as the visual impacts and as such strike a balance to comply with the requirements of the guidance.

Noise levels at the front facades of the properties would be higher, with the calculations indicating façade levels of 66 – 67 dB $L_{Aeq,\ 16\ hour}$ / 69 – 70 dB $L_{Aeq,\ 16\ hour}$ during the daytime at ground and first floor levels and 66 – 67 dB $L_{Aeq,\ 8\ hour}$ at the first floor facades at night. Maximum noise levels overnight at the first floor level of the properties would be likely to be of the order typically of 75 dB $L_{Amax,F}$, taking account of the mitigation afforded by the boundary mitigation and increased distance from the road compared to the unattended noise survey location.

As indicated previously, the proposed internal layout of the dwellings would be such that there were no windows to habitable tooms facing directly onto the A1, although the side windows to the master bedroom, particularly to Plot 4 would still be exposed to noise from the A1.

In order to achieve a satisfactory standard of noise internally and thus accord with the requirements of BS 8233 and ProPG, additional mitigation measures would need to be implemented within the design of the dwellings, in addition to the minimisation of the number of habitable rooms facing onto the road. Measures which would achieve this requirement, which would be finalised at detailed design stage, are discussed within the following section.

6. Additional Noise Mitigation Measures

The mitigation measures for the dwellings would be finalised during the Reserved Matter stage, as the designs were finalised and contractors / suppliers appointed. At this stage, measures have been proposed which would seek to reduce noise levels internally to meet the requirements of BS 8233 and ProPG.

The glazing would be specified prior to construction, however, this would be selected to achieve a minimum sound reduction of 32 dB R_{W+CTR} within the windows to habitable rooms which have a line of sight to the A1 (which would include the side windows to the master bedrooms). This would ensure a good standard of noise was achieved internally with windows closed with regards the requirements of BS 8233 and ProPG. An example of a suitable glazing system is the Saint Gobain SGG 10/16/8.8 double glazed units, which provides a sound reduction of 34 dB R_{W+CTR}.

Elsewhere within the dwellings, a lower specification glazing could be utilised with a minimum sound reduction of 30 dB R_{W+CTR}.

Appropriate acoustically treated assisted ventilation would need to be provided for the dwellings to ensure that the occupants could maintain windows closed should they choose, which maintaining suitable temperatures internally. There are a number of options which could be considered in this regard, although it is proposed that a full ventilation and heat recovery system with cooling function is provided for the dwellings.

Calculations have been made on the basis of the use of this glazing and ventilation, which indicate internal levels within the first floor rooms of the properties facing towards the A1 of 32 dB $L_{Aeq\ 16\ hour}$ daytime and 27 dB $L_{Aeq,\ 8\ hour}$ at night assuming windows closed. The calculation details are provided in Appendix C. These mitigation measures would also seek to ensure maximum noise levels internally were reduced to a satisfactory standard.

As the dwellings would be close to the A1, consideration would need to be given to the proposed construction of the roof during the detailed design, to ensure that a satisfactory acoustic performance is achieved. An example of a suitable construction would comprise slates on Battens on Tyvec Supro breathable underlay on Timber rafters 194 x 50 with 125mm mineral quilt insulation laid between with 50mm Celotex GA3050 rigid sheet insulation fixed to the bottom of the rafter with 2 layers of 12.5mm Soundbloc plasterboard with a min 3mm skim coat screwed through the insulation to the bottom of the rafters. This construction would provide a reduction in noise levels in excess of 40 dB.

The above assessment of additional noise mitigation measures, seeks to demonstrate that the requirements of BS 8233 would be achieved internally, with appropriate glazing and acoustically treated ventilation provided.

Whilst the proposed layout for the properties seeks to demonstrate a good acoustic design, with consideration to the ProPG guidance, the mitigation measures would be refined during the detailed design stage, aiming to reduce noise levels internally further, where possible, within the available budgets. As described above it is proposed to use Mechanical Ventilation and Heat Recovery Systems with cooling functions within the properties, with the intake / extract vents located to the rear on the facades facing away from the A1. This would have the advantage of eliminating the requirement for any acoustic vents within the rooms and additionally providing more thermally efficient properties.

7. Summary

LF Acoustics Ltd have been appointed by Mr B Gray to carry out a noise assessment in support of a planning application for a residential development of 4 dwellings on land adjacent to 22 The Avenue, Welwyn.

The application site is located adjacent to the A1, with noise levels principally influenced by traffic using the road.

A noise monitoring exercise has been carried out within the site to determine the present noise environment, with noise levels modelled across the site based upon the indicative development layout and assessed against the requirements of local planning policies, the NPPF and BS 8233.

Previous planning applications have been made for the site and neighbouring developments, with the principal of residential development accepted by officers at Welwyn Hatfield Council on the basis that appropriate noise mitigation measures are adopted to ensure an acceptable noise environment is achieved.

Some bunding has previously been constructed around the perimeter of the site. It is proposed to extend this bunding along the northern and eastern boundaries, with a close boarded fence constructed on the top, top provide an overall height of between 4 – 5 metres. The mitigation would tie into the recently completed bunding adjacent to no. 20 The Avenue, where new dwellings have recently been constructed. Once completed, the mitigation would not only provide noise reduction for the proposed dwellings, but also for the existing dwelling at no 22.

The mitigation and proposed layout of the dwellings would seek to ensure that there were external seating areas to the rear of the properties where noise levels complied with the requirements of both BS 8233 and the recent ProPG guidance.

Internally, the layout as proposed ensures that there are no habitable rooms with a direct line of sight onto the A1, which has been achieved by locating bathrooms and kitchen to the front of the properties. Additional noise mitigation measures would be required to ensure a satisfactory noise environment. Whilst these measures would be finalised at detailed design stage, the measures proposed demonstrate that the requirements of BS 8233 and ProPG could be achieved and could be secured through the imposition of a suitable planning condition. The measures considered to be required as a minimum include:

- Glazing with a minimum sound reduction of 32 dB R_{W+CTR} to windows of habitable rooms facing towards the A1;
- The provision of acoustically treated assisted ventilation or a mechanical ventilation and heat recovery system with cooling function; and
- Consideration of improving the acoustic performance of the roof construction compared to a standard construction.

With appropriate noise mitigation measures adopted within the final design, noise levels would be reduced to a satisfactory standard with regards to the design aims within BS 8233 and ensuring a good acoustic design with regards to the requirements of the recent ProPG guidance. The proposals thus meet the requirements of the NPPF and local plan policies D1 and R19.

References

1. Department for Communities and Local Government. National Planning Policy Framework. March 2012.

2. British Standards Institute. Guidance on Sound Insulation and Noise Reduction for Buildings. BS 8233. 2014.

3. World Health Organisation. Guidelines for Community Noise. Geneva. 2000.

4. ANC / Institute of Acoustics / Chartered Institute of Environmental Health. ProPG: Planning and Noise. Professional Practice Guidance on Planning & Noise. New Residential Development. May 2017.

5. Department of Transport / Welsh Office. A Calculation of Road Traffic Noise. The Stationary Office. 1988.

Figures

Figure 1:
Site Plan and Noise Monitoring Location

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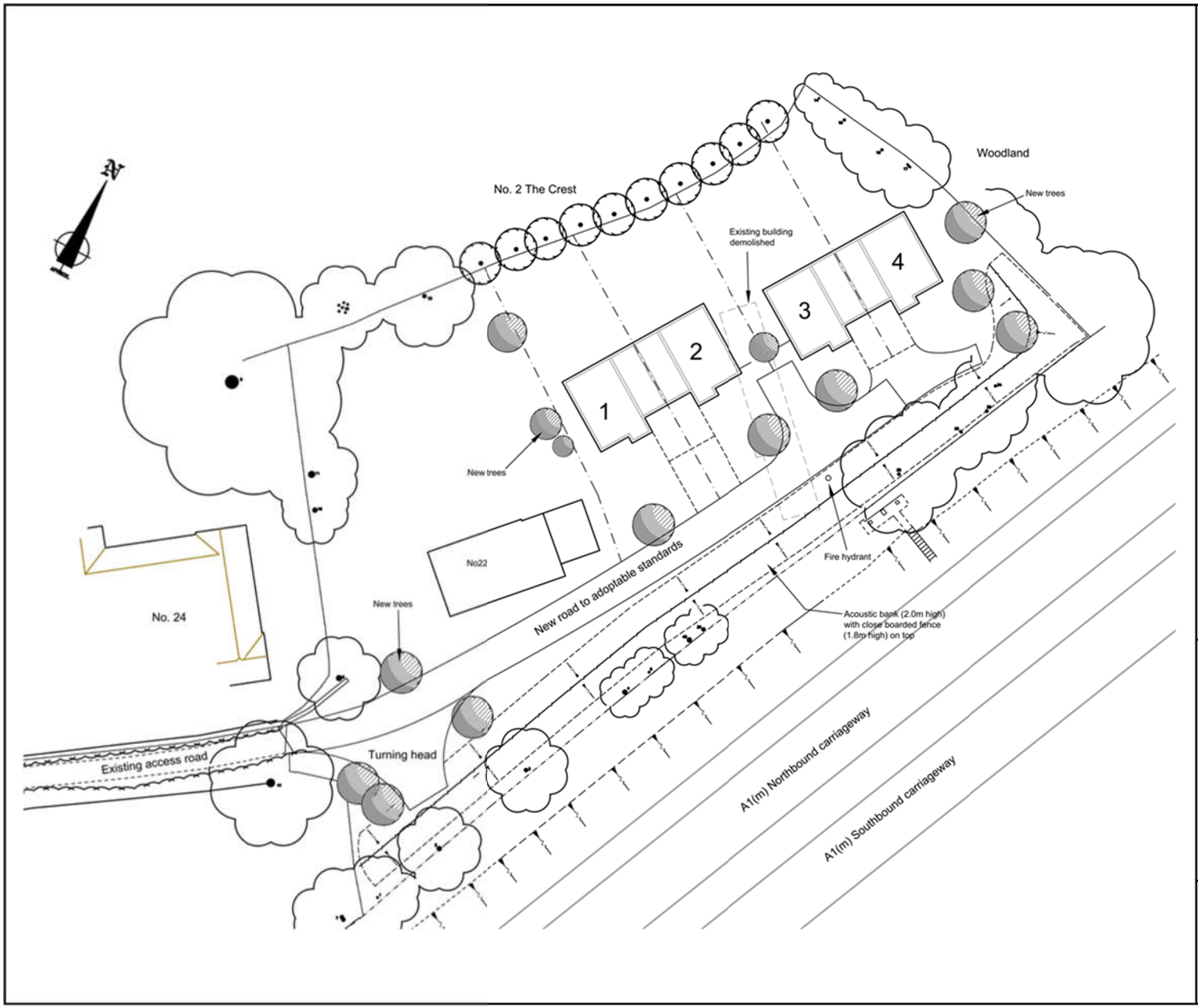

Figure 2:
Proposed Site Layout

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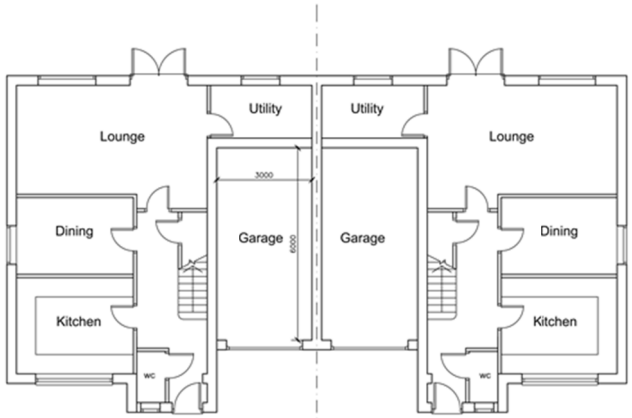
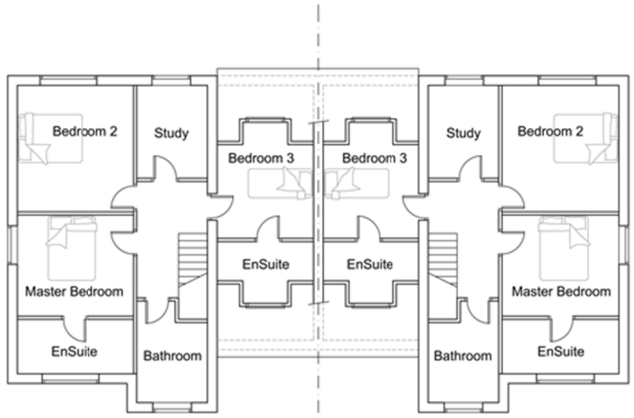


Plot 1 & plot 3 Ground floor plan 61m2 Plot 2 & Plot 4



Plot 1 & Plot 3 First floor plan 70m2 Plot 2 & Plot 4

Figure 3:
Proposed Internal Layout

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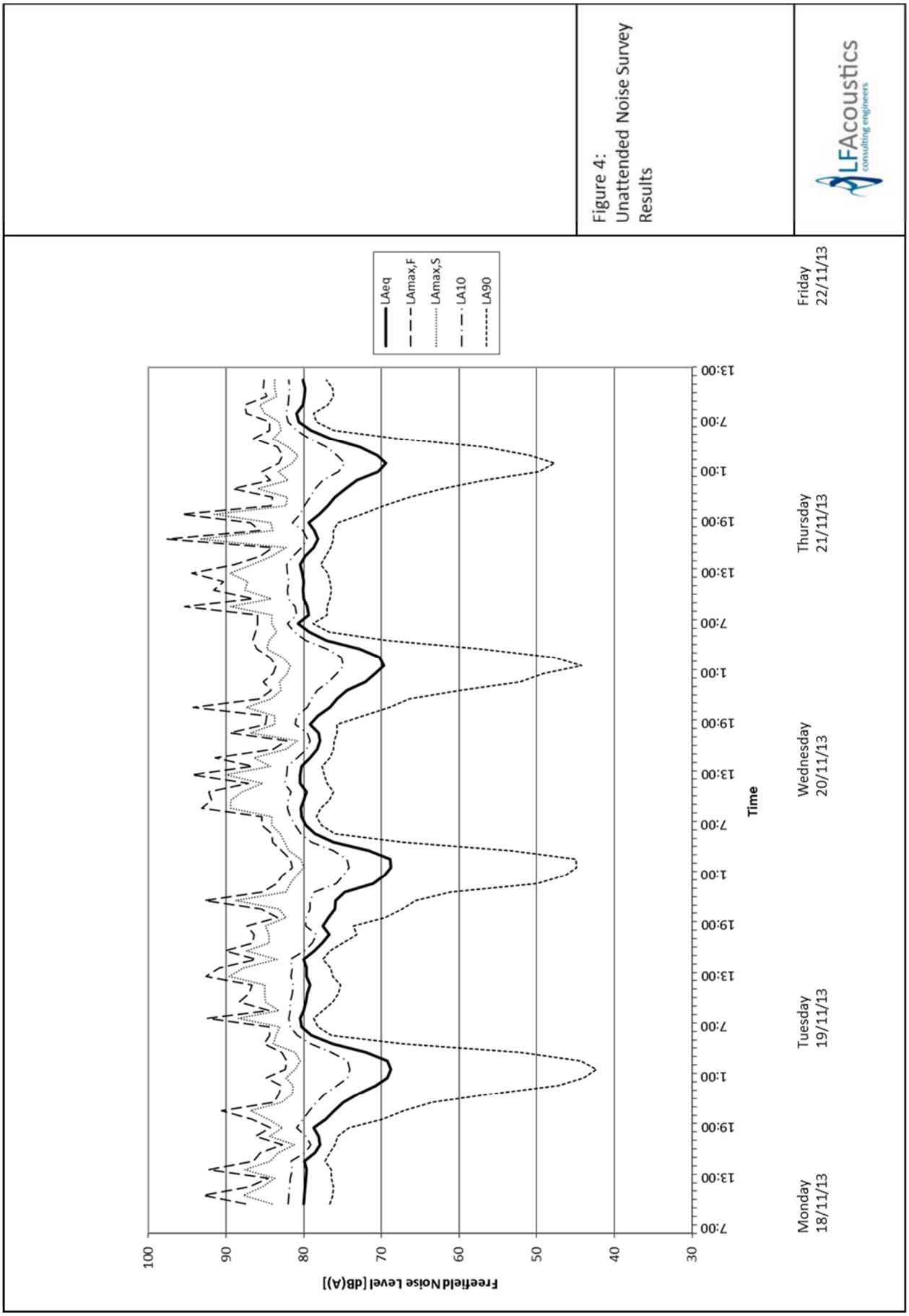

Figure 4:
Unattended Noise Survey
Results

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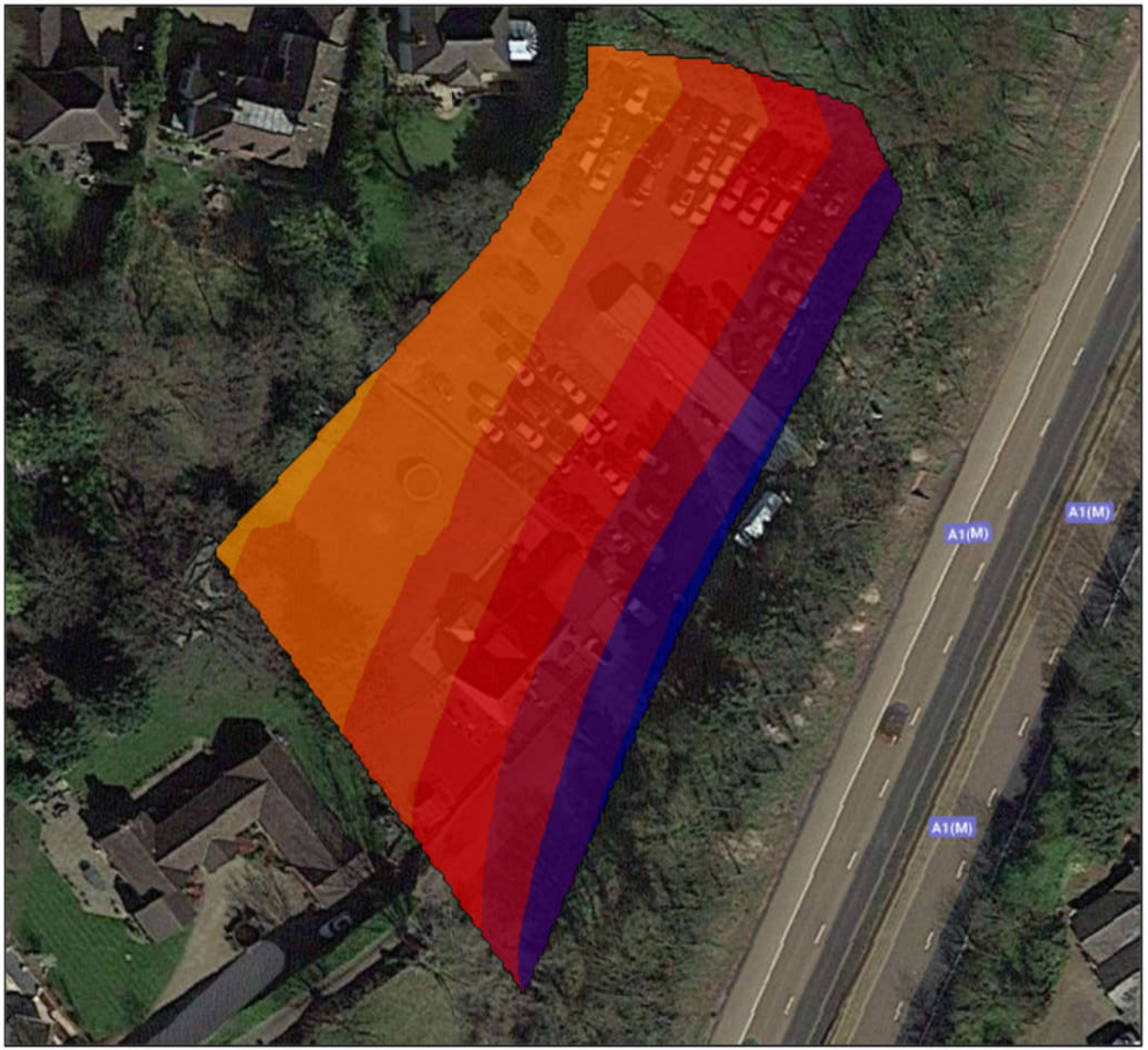

Noise Level LAeq,T
in dB(A)

	< 50
	50 - 52
	52 - 54
	54 - 56
	56 - 58
	58 - 60
	60 - 62
	62 - 64
	64 - 66
	66 - 68
	68 - 70
	70 - 72
	72 - 74
	74 - 76
	>= 76

Figure 5:
Calculated Noise Levels
Daytime
Open Site

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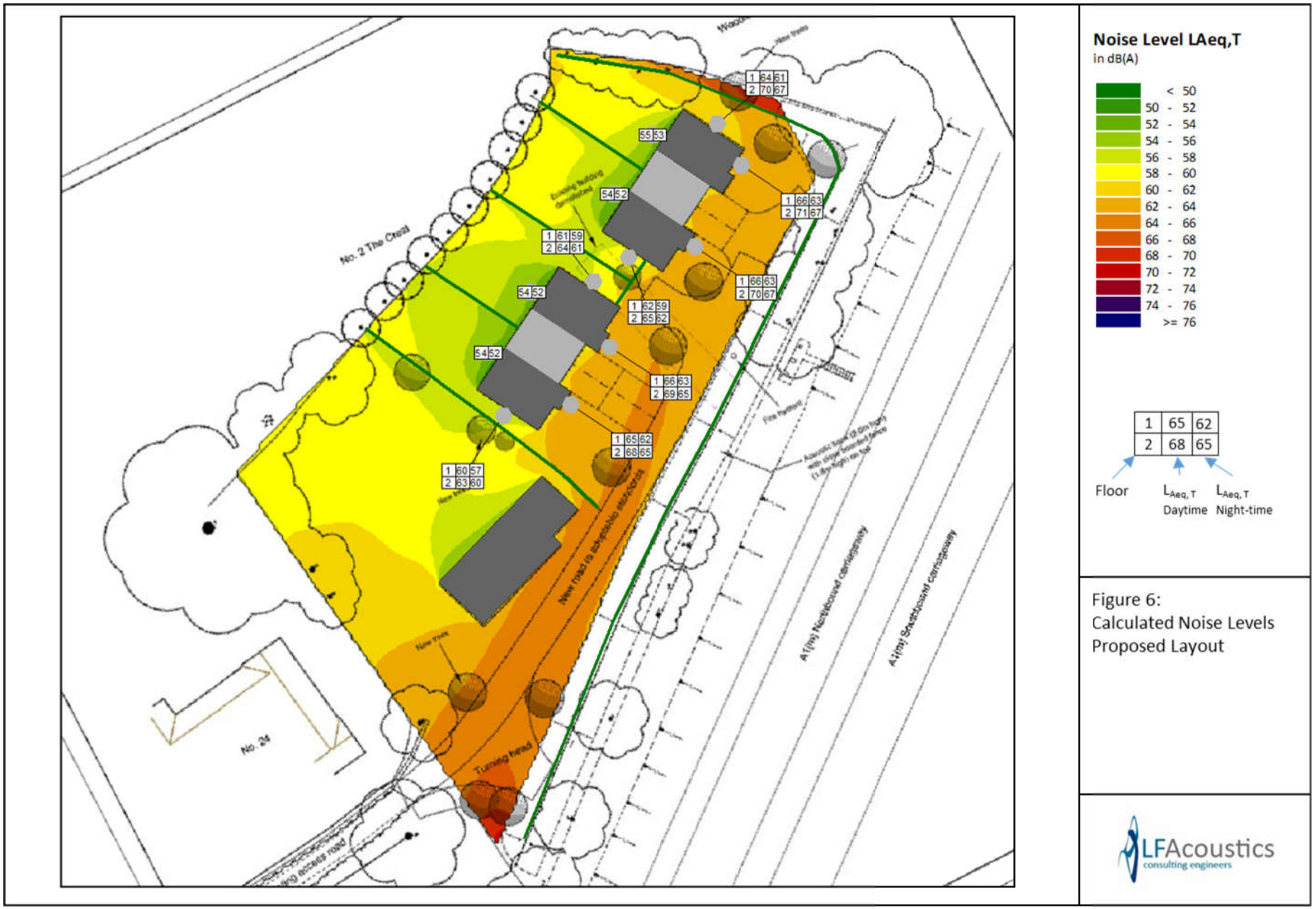

Figure 6:
Calculated Noise Levels
Proposed Layout

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Appendix A
Noise Units

Decibels (dB)

Noise can be defined as unwanted sound. Sound in air can be considered as the propagation of energy through the air in the form of oscillatory changes in pressure. The size of the pressure changes in acoustic waves is quantified on a logarithmic decibel (dB) scale firstly because the range of audible sound pressures is very great, and secondly because the loudness function of the human auditory system is approximately logarithmic.

The dynamic range of the auditory system is generally taken to be 0 dB to 140 dB. Generally, the addition of noise from two sources producing the same sound pressure level will lead to an increase in sound pressure level of 3 dB. A 3 dB noise change is generally considered to be just noticeable, a 5 dB change is generally considered to be clearly discernible and a 10 dB change is generally accepted as leading to the subjective impression of a doubling or halving of loudness.

A-Weighting

The bandwidth of the frequency response of the ear is usually taken to be from about 18 Hz to 18,000 Hz. The auditory system is not equally sensitive throughout this frequency range. This is taken into account when making acoustic measurements by the use of A-weighting, a filter circuit which has a frequency response similar to the human auditory system. All the measurement results referred to in this report are A-weighted.

Units Used to Describe Time-Varying Noise Sources (L_{Aeq}, L_{A10}, L_{A90} and L_{Amax})

Instantaneous A-weighted sound pressure level is not generally considered as an adequate indicator of subjective response to noise because levels of noise usually vary with time.

For many types of noise the Equivalent Continuous A-Weighted Sound Pressure Level ($L_{Aeq,T}$) is used as the basis of determining community response. The $L_{Aeq,T}$ is defined as the A-weighted sound pressure level of the steady sound which contains the same acoustic energy as the noise being assessed over a specific time period, T.

The L_{A10} is the noise level exceeded for 10% of the measurement period. It has been used in the UK for the assessment of road traffic noise.

The L_{A90} is the noise level exceeded for 90% of the measurement period. It is generally used to quantify the background noise level, the underlying level of noise, which is present even during the quieter parts of the measurement period.

The L_{Amax} is the maximum value that the A-weighted sound pressure level reaches during a measurement period. $L_{Amax\,F}$, or Fast, is averaged over 0.125 of a second and $L_{Amax\,S}$, or Slow, is averaged over 1 second.

Appendix B
Unattended Noise Monitoring Results

Proposed Dwelling at 22 The Avenue, Welwyn
Results of Noise Measurements Carried Out Between
18 - 22 November 2013

Equipment Used: Rion NL-52 Class 1 Sound Level Analyser
Location: U - Along Boundary with A1
All Levels; Fast, Freefield, Mic Height 2 metres.

Date	Start Period	Measured Noise Levels [dB]				
		L_{Aeq}	$L_{Amax,F}$	$L_{Amax,S}$	L_{A10}	L_{A90}
Monday	10:00	80.0	87.5	84.1	82.0	76.6
18/11/2013	11:00	79.9	93.0	87.8	81.9	76.3
	12:00	79.8	87.0	85.3	81.8	76.2
	13:00	79.7	84.6	83.7	81.7	76.4
	14:00	79.6	92.2	87.6	81.5	76.4
	15:00	79.9	86.5	84.3	81.6	77.3
	16:00	78.5	85.6	83.3	79.8	76.6
	17:00	77.9	82.7	81.2	79.1	76.0
	18:00	78.1	86.2	84.4	79.7	75.6
	19:00	78.7	84.3	82.7	80.9	74.2
	20:00	77.2	86.7	84.6	80.1	69.9
	21:00	76.1	90.6	86.8	79.3	67.1
	22:00	74.9	83.8	82.8	78.4	63.5
	23:00	73.0	83.2	81.5	77.3	55.8
Tuesday	0:00	70.7	82.9	81.4	75.7	47.2
19/11/2013	1:00	69.2	84.8	82.3	74.3	44.0
	2:00	68.8	82.4	81.1	74.1	42.3
	3:00	69.2	82.2	80.5	74.3	44.3
	4:00	72.0	82.8	81.1	76.4	52.1
	5:00	76.3	85.1	83.9	79.1	67.1
	6:00	79.0	84.4	83.6	80.8	76.4
	7:00	80.3	84.5	83.1	81.7	78.2
	8:00	80.5	92.4	88.4	81.9	78.7
	9:00	80.0	84.5	83.2	81.7	77.5
	10:00	79.7	88.3	84.9	81.7	76.3
	11:00	79.5	87.0	85.0	81.5	75.5
	12:00	79.2	86.7	85.0	81.4	75.3
	13:00	79.6	92.6	89.6	81.6	76.3
	14:00	79.6	90.9	87.8	81.5	76.5
	15:00	80.0	86.1	83.5	81.7	77.5
	16:00	78.6	90.1	87.4	79.9	76.6
	17:00	77.6	86.6	84.5	78.9	75.0
	18:00	76.7	86.4	84.5	78.4	73.2
	19:00	77.5	87.3	84.9	79.7	73.6
	20:00	76.8	83.4	82.3	79.7	69.5
	21:00	76.0	85.5	83.2	79.2	67.3
	22:00	75.9	92.8	88.8	79.2	65.6
	23:00	74.7	85.3	82.3	78.6	61.1
Wednesday	0:00	71.1	83.5	81.7	75.8	50.0
20/11/2013	1:00	69.6	82.7	80.9	74.9	46.3
	2:00	68.8	81.5	80.0	74.2	44.9
	3:00	68.9	81.7	80.4	74.4	45.0
	4:00	71.6	82.8	81.9	76.2	53.4
	5:00	76.2	84.0	82.5	79.0	67.2
	6:00	78.5	84.1	83.0	80.4	76.0
	7:00	79.7	85.4	84.1	81.1	77.7

Proposed Dwelling at 22 The Avenue, Welwyn
Results of Noise Measurements Carried Out Between
18 - 22 November 2013

Equipment Used: Rion NL-52 Class 1 Sound Level Analyser
Location: U - Along Boundary with A1
All Levels; Fast, Freefield, Mic Height 2 metres.

Date	Start Period	Measured Noise Levels [dB]				
		L_{Aeq}	$L_{Amax,F}$	$L_{Amax,S}$	L_{A10}	L_{A90}
Wednesday	8:00	80.3	85.4	84.1	81.7	78.4
20/11/2013	9:00	80.4	93.1	89.4	82.1	77.8
	10:00	80.0	91.9	89.4	82.0	76.7
	11:00	79.6	92.2	87.9	81.6	76.2
	12:00	80.5	87.1	85.3	82.5	77.0
	13:00	80.5	94.4	90.0	82.2	77.4
	14:00	80.3	86.6	84.3	82.1	77.6
	15:00	79.2	91.4	86.4	80.8	76.6
	16:00	78.3	83.9	82.3	79.6	76.2
	17:00	77.9	82.2	80.8	79.2	76.1
	18:00	78.1	89.5	86.8	79.5	75.7
	19:00	79.2	84.9	83.7	81.1	75.7
	20:00	78.2	84.7	83.7	80.9	72.3
	21:00	76.6	94.2	87.4	79.5	69.0
	22:00	75.7	85.7	84.2	79.0	66.4
	23:00	74.4	84.2	82.9	78.3	59.8
Thursday	0:00	72.1	85.2	83.1	76.8	52.2
21/11/2013	1:00	70.8	83.9	82.1	75.7	49.1
	2:00	69.7	83.6	81.7	74.9	44.2
	3:00	70.2	84.4	82.7	75.2	47.9
	4:00	72.8	86.0	84.7	77.0	57.2
	5:00	77.1	86.6	84.5	79.7	69.2
	6:00	79.3	86.2	83.5	81.2	76.7
	7:00	80.7	85.9	84.1	82.1	78.8
	8:00	79.4	85.9	84.1	80.9	77.0
	9:00	79.5	95.3	89.4	81.1	77.0
	10:00	80.0	86.5	84.2	82.0	76.6
	11:00	80.1	91.6	87.6	82.1	76.4
	12:00	80.0	90.3	87.2	81.9	76.6
	13:00	80.2	94.4	89.5	82.1	76.9
	14:00	80.5	88.9	86.7	82.2	77.8
	15:00	79.8	85.6	84.1	81.4	77.2
	16:00	78.7	84.0	82.3	80.3	76.5
	17:00	78.2	97.6	93.3	79.5	76.2
	18:00	78.6	85.7	84.0	80.1	76.2
	19:00	79.4	86.8	84.2	81.5	75.6
	20:00	78.0	95.7	91.5	80.5	72.5
	21:00	76.9	84.2	82.3	79.9	69.7
	22:00	76.0	84.0	82.1	79.2	66.4
	23:00	74.6	89.1	85.9	78.5	62.1
Friday	0:00	73.2	84.3	82.0	77.5	56.7
22/11/2013	1:00	70.4	85.4	83.3	75.5	49.7
	2:00	69.4	83.2	81.5	74.7	47.7
	3:00	70.5	82.7	80.7	75.7	50.9
	4:00	72.8	83.4	82.0	77.1	56.7
	5:00	76.5	86.5	83.9	79.3	67.9

Proposed Dwelling at 22 The Avenue, Welwyn
Results of Noise Measurements Carried Out Between
18 - 22 November 2013

Equipment Used: Rion NL-52 Class 1 Sound Level Analyser
Location: U - Along Boundary with A1
All Levels; Fast, Freefield, Mic Height 2 metres.

Date	Start Period	Measured Noise Levels [dB]				
		L_{Aeq}	$L_{Amax,F}$	$L_{Amax,S}$	L_{A10}	L_{A90}
Friday	6:00	79.1	84.4	82.9	80.9	76.2
22/11/2013	7:00	80.6	84.4	83.2	82.0	78.4
	8:00	80.9	87.4	85	82.3	78.7
	9:00	80.1	87.6	85.7	82.0	76.9
	10:00	79.9	84.7	83.5	81.9	76.2
	11:00	79.8	85.2	83.7	81.8	76.3
	12:00	80.1	85.1	83.7	81.9	77.1

Appendix C
Calculation Details

SGG STADIP® & STADIP SILENCE® RANGE

Configuration of Unit*	Frequency						Rw (C;Ctr)	Rw	Ra	Ra,tr
	125	250	500	1000	2000	4000				
6mm / 15mm / 8.8mm	24	27	39	44	36	46	37 (-3;-6)	37	34	31
8mm / 16mm / 8.8mm	27	26	38	41	35	49	35 (-2;-6)	35	31	29
8mm / 15mm / 10.8mm	27	30	41	41	37	50	39 (-2;-5)	39	37	34
10mm / 16mm / 8.8mm	27	32	42	43	37	51	38 (-1;-4)	38	37	34
10mm / 12mm / 10.8mm	28	35	43	47	44	55	43 (-2;-6)	43	41	37
10mm / 16mm / 12.8mm	23	36	43	37	41	53	40 (-2;-6)	40	38	34
6mm / 16mm / 8.8mm SS	21	27	39	50	45	50	39 (-2;-6)	39	37	33
6mm / 12mm / 9.5mm SS	24	27	37	42	36	45	37 (-3;-6)	37	34	31
8mm / 16mm /10.8mm SS	26	31	42	44	42	55	42 (-3;-7)	42	39	35
8mm / 20mm / 12.8mm SS	24	34	44	49	43	58	44 (-2;-7)	44	42	37
10mm / 15mm /8.8mm SS	23	35	42	48	47	55	44 (-3;-7)	44	41	37
10mm / 16mm / 12.4mm SS	26	39	44	46	45	60	44 (-2;-5)	44	42	39
12mm / 15mm / 8.8mm SS	28	35	43	48	49	56	45 (-2;-6)	45	43	39
12mm /20mm / 12.8mm SS	34	40	48	47	48	63	48 (-1;-4)	48	47	44
10.8mm SS / 24mm / 14.8mm SS	34	43	51	54	57	72	53 (-2;-7)	53	51	46

*SS denotes use of SGG STADIP SILENCE acoustic laminate interlayer.
All acoustic performances are tested and certified in accordance with CE marking. Acoustic test reports can be requested through Saint-Gobain Glass.

Proposed Residential Development on Land at 22 The Avenue, Welwyn
Calculation of Internal Noise Levels

Position : Front Façade Facing A1 - First Floor

Prepared By: LPJ - 4/1/18 **STANDARD GLAZING & ACOUSTIC PASSIVE VENTS**

Sf	Facade Area (inc Window)	10
Swi	Window Area	3
Sew	Sf-Swi	7
Srr	Area of Ceiling	12
S	Sf+Srr	22
A0	Ref Absorption Area	12

			Overall A-Wtd	1/3 Octave Band Leq 125	250	500	1000	2000	
Source Level	$L_{eq\ Freefield}$	A	**68**	57	55	62	66	59	Equivalent Freefield Daytime Level
Window Vent	Dn,e			34	38	43	42	34	Acoustic Passive Vent
		B		0.00022	0.00009	0.00003	0.00003	0.00022	
Glazing	Rwi			27	32	42	43	37	SGG 10/16/8.8 - 34 dB RW+CTR
		C		0.00027	0.00009	0.00001	0.00001	0.00003	
Wall	Rew			41	45	45	54	58	
		D		2.527E-05	1.006E-05	1.006E-05	1.267E-06	5.043E-07	
Ceiling	Rrr			30	42	50	54	54	
		E		0.0005455	3.442E-05	5.455E-06	2.171E-06	2.171E-06	
	10Log (B+C+D+E)			-29.747108	-36.636083	-42.885489	-43.49805	-36.072446	
	A (Furnished)			11	14	16	16	15	
	10*log (S/A)			3.0103	1.9629465	1.383027	1.383027	1.6633142	
	Leq,2			33.3	23.2	23.3	27.0	28.0	
	A-Weighting			-16.0	-9.0	-3.0	0.0	1.0	
	LAeq,2			17.3	14.2	20.3	27.0	29.0	

	Day	Night
LAeq, Internal	**32**	**27**
Reduction	**-36**	