**PHILIP FLETCHER ARCHITECTURAL DESIGN SERVICES**

# ERECTION OF DWELLING
# LAND ADJ. 264 BARNSLEY ROAD, FLOCKTON, WAKEFIELD, WF4 4AJ.

**APPLICATION REF: 2024/60/92066/E**

# NOISE ASSESSMENT

| Report Reference | Date of Issue | Author |
|---|---|---|
| CDIS/1337/25/407 V1.0 | 22nd January 2025 | R. Pennell |

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## SECTION 1 INTRODUCTION

1.1 RP Acoustics Ltd (RPA) has been commissioned by Philip Fletcher Architectural Design Services, on behalf of its client, to undertake a noise assessment to aid in the discharge of Condition 7 of an outline planning permission granted by Kirklees Council (ref: 2024/60/92066/E) for the residential development of a parcel of land adjacent to 264 Barnsley Road, Flockton, Wakefield, WF4 4AJ (the subject site). The noise assessment is based on the reserved matters application layout plan.

1.2 Condition 7 relates to noise, as follows:

> 7. Before construction work commences, a report specifying the measures to be taken to protect the development from noise from all significant noise sources that are likely to affect the proposed development shall be submitted to and approved in writing by the Local Planning Authority. The report shall:
>
> a) Determine the existing noise climate
> b) Predict the noise climate in living rooms and gardens (daytime), bedrooms (night-time) and other habitable rooms of the development
> c) Detail the proposed attenuation/design necessary to protect the amenity of the occupants of the new residences (including ventilation if required).
>
> The development shall not be occupied until all works specified in the approved report have been carried out in full and such works shall be thereafter retained.

1.3 The objectives of the assessment were to:

*i.* Determine the ambient noise climate at the subject site during representative periods of the daytime and night time.

*ii.* Provide recommendations for a scheme of sound attenuation works, as necessary, to comply with the requirements of Condition 7.

1.4 This report details the methodology and results of the assessment and provides recommendations for the building envelope design (fenestration and ventilation). It has been prepared to aid in the discharge of Condition 7.

1.5 This report has been prepared for Philip Fletcher Architectural Design Services and its client for the sole purpose described above, with no extended duty of care to any third party implied or offered.

1.6 A glossary of acoustics terms used in the main body of the text is contained in Appendix 1.

## SECTION 2 SITE SETTING AND DEVELOPMENT PROPOSALS

### 2.1 SITE SETTING

2.1.1 The site is located in a residential area in Flockton, to the south west of Wakefield. An annotated aerial image of the site and its environs is contained in Appendix 2.1. The subject site is bound by the following:

*i.* The A637 (Barnsley Road) to the north, with existing dwellings on the far side of the road.

*ii.* Agricultural land to the east and south.

*iii.* An existing dwelling to the west.

2.1.2 During the course of the survey, Barnsley Road traffic as noted to be the only significant noise source. Barnsley Road was noted to be moderately heavily trafficked, with a manual traffic count indicating of the order of 550 vehicles per hour. The road surface was noted to be coarse and although a 20 mph speed limit is in force, this did not appear to be adhered to by the majority of traffic.

### 2.2 DEVELOPMENT PROPOSALS

2.2.1 The development proposals consist of the construction of a single dwelling with associated parking and landscaping. A proposed internal layout plan is contained in Appendix 2.2. With reference to the plan, it can be seen that the dwelling is oriented at 90 degrees to the road, with no glazing to habitable rooms on the road frontage elevation.

## SECTION 3 ENVIRONMENTAL NOISE SURVEY

3.1 In order to assess the ambient noise climate at the subject site and obtain design data for a sound attenuation scheme, a baseline noise survey was undertaken on Tuesday 14th January 2025. For the purpose of the assessment, the following monitoring position (MP) was used:

*i.* MP1 was located at circa 3 metres from the nearside kerb of Barnsley Road (representative of the road frontage façade), at 1.5 metres above ground level (mAGL), in a free field environment.

3.2 The approximate location of the monitoring position is identified on the annotated aerial image contained in Appendix 2.1.

3.3 Noise measurements were undertaken using a NTi Audio XL2 Type 1 integrating sound level meter. A 90 mm windshield was fitted for all measurements. The measurement system calibration was verified immediately before the commencement of the measurement sessions and again at the end. No drift in calibration level was noted. Weather conditions throughout the survey were appropriate for monitoring.

3.4 Measurements consisted of A–weighted broadband parameters, together with linear third octave band Leq levels, with a logging interval of 1 second. Measurement data was post-processed using NTi Audio Data Explorer software.

3.5 The following table contains a summary of the noise measurement data, rounded to the nearest decibel.

**Table 3.1: Summary of Noise Measurement Data**

| MP | Date | Time | $L_{Aeq,T}$ (dB) | $L_{AFmax}$ (dB) | $L_{A1,T}$ (dB) | $L_{A10,T}$ (dB) | $L_{A90,T}$ (dB) | Comments |
|---|---|---|---|---|---|---|---|---|
| MP1 | 14/01/25 | 12:10-15:00 | 71 | 82 | 78 | 75 | 51 | Main noise source is local traffic. |
| **Daytime Ambient Noise Level at MP1 ≈ 71 dB $L_{Aeq\ (0700–2300)}$ based on TRL methodology**<br>**Night Time Ambient Noise Level at MP1 ≈ 63 dB $L_{Aeq\ (2300–0700)}$ based on TRL methodology**<br>**Night time maximum noise level at MP1 ≤ 78 dB $L_{AFMax}$ (based on daytime $L_{A1,T}$ measurement)** | | | | | | | | |

3.6 During the course of the survey, Barnsley Road was noted to be moderately heavily trafficked, with a manual traffic count during the monitoring period recording circa. 550 vehicles/hour. As stated, the noise climate consisted of local traffic, with no other significant noise sources noted.

3.7 For the prediction of daytime road traffic noise, the Department of Transport's Memorandum on the Calculation of Road Traffic Noise (CRTN) explains that the following shortened measurement procedure may be used. Measurements of $L_{A10}$ are made over any three consecutive hours between 10:00 and 17:00 hours. Using $L_{A10\ (3\ hour)}$ as the arithmetic mean of the three consecutive values of hourly $L_{A10}$, the $L_{A10\ (18\ hour)}$ can be calculated from the equation:

(i) $L_{A10\ (18\ hour)} = L_{A10\ (3\ hour)} - 1$ dB

3.8 A study prepared by TRL Limited on behalf of the Department for Environment, Food and Rural Affairs (DEFRA) entitled 'Converting the UK Traffic Noise Index $L_{A10\ (18\ hour)}$ to EU Noise Indices for Noise Mapping' presents a methodology for calculating day, evening and night time road traffic noise levels where detailed hourly traffic data is not available, using the following relationships:

(ii) $L_{day\ (07:00–19:00)} \approx 0.95 * L_{A10,\ 18\ hour} + 1.44$ dB (for non-motorway roads)

(iii) $L_{evening\ (19:00–23:00)} \approx 0.97 * L_{A10,\ 18\ hour} - 2.87$ dB (for non-motorway roads)

(iv) $L_{night\ (23:00–07:00)} \approx 0.90 * L_{A10,\ 18\ hour} - 3.77$ dB (for non-motorway roads)

3.9 Based on the above formulae (combining ii & iii), the average daytime ambient noise level is calculated to be 71 dB $L_{Aeq\ (0700–2300)}$ at MP1.

3.10 Based on the above formula (iii), the average night time ambient noise level is calculated to be 63 dB $L_{Aeq\ (2300–0700)}$ at MP1. From experience, for road traffic, the typical night time discrete event maxima associated with vehicle passes ($L_{AFmax}$) closely approximates to the daytime $L_{A1,\ 3\ hour}$.

## SECTION 4 ASSESSMENT CRITERIA

### 4.1 NATIONAL PLANNING POLICY FRAMEWORK

4.1.1 The National Planning Policy Framework (NPPF) is a material consideration in planning decisions. At the heart of the NPPF is a presumption in favour of sustainable development and the policies, taken as a whole, constitute the Government's view on what sustainable development in England means in practice for the planning system.

4.1.2 The NPPF states that there are three overarching objectives to sustainable development, which include an economic objective (contributing to building a strong, responsive and competitive economy), a social objective (providing the supply of housing required to meet the needs of present and future generations) and an environmental objective (which includes minimising waste and pollution).

4.1.3 The main policy statements in relation to noise are Paragraphs 191 and 193 of the NPPF, which state:

> 191. 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[69];
>
> 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; and
>
> c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.

> 193. Planning policies and decisions should 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.

4.1.4 In relation to 'adverse impacts' (footnote [69]), the NPPF refers to the Explanatory Note to the Noise Policy Statement for England (NPSE) for guidance.

4.1.5 The Noise Policy Statement for England (NPSE) and associated Explanatory Note were published by DEFRA in 2010 and set out the Government's noise management strategy to enable noise management decisions to be made within the wider context (i.e. guiding principles of sustainable development), in a cost-effective manner and in a timely fashion.

4.1.6 Fundamental to this approach is 'there is a need to integrate consideration of the economic and social benefit of the activity or policy under examination with proper consideration of the adverse environmental effects, including the impact of noise on health and quality of life. This should avoid noise being treated in isolation in any particular situation, i.e. not focussing solely on the noise impact without taking into account other related factors'.

4.1.7 The noise policy aims of NPSE are to (i) avoid significant adverse impact on health and quality of life, (ii) mitigate and minimise adverse impacts on health and quality of life, and (iii) where possible, contribute to the improvement of health and quality of life. The policy aims are always to be considered within the context of the Government's policy on sustainable development.

4.1.8 In relation to the mitigation and minimisation of adverse impacts, NPSE considers that *'in reality, although not always stated, the aim has tended to be to minimise noise 'as far as is reasonably practical'*. This is reinforced in Paragraph 2.24 of the Explanatory Note, which requires that '*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. This does not mean that such adverse effects cannot occur'*.

4.1.9 In relation to explaining the 'significant adverse' and 'adverse' effects quoted in the NPPF, NPSE uses the two established concepts from toxicology that are currently being applied to noise impacts, for example by the World Health Organisation (WHO), these are:

- NOEL – No Observed Effect Level. This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to noise.
- LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.

4.1.10 The NPSE then extends these concepts to lead to a SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.

4.1.11 No specific criteria are presented in the NPSE, to provide the necessary policy flexibility until further evidence and suitable guidance is available. In lieu of specific criteria, for this assessment, RPA makes reference to existing guideline documents, which are summarised in the following paragraph(s).

## 4.2 NATIONAL PLANNING PRACTICE GUIDANCE: NOISE

4.2.1 Guidance provided in the National Planning Practice Guidance (NPPG) for noise, presents a table of noise exposure hierarchy, which relates the NOEL, LOAEL and SOAEL levels to the subjective perception of noise and examples of outcomes (reproduced in Table 4.1 below).

4.2.2 When considering the factors that influence whether noise could be a concern, the NPPG considers that 'the subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected'. This includes factors such as the source and absolute level of the noise, the time of day it occurs, the number of noise events and the frequency and pattern of occurrence.

**Table 4.1: Summary of Noise Exposure Hierarchy (from NPPG, Noise)**

| Perception | Examples of Outcomes | Increasing Effect Level | Action |
|---|---|---|---|
| Not Noticeable | No Effect | No Observed Effect | No specific measures required |
| Noticeable and not intrusive | Noise can be heard, but does not cause any change in behaviour or attitude. 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 | |
| Noticeable and intrusive | Noise can be heard and causes small changes in behaviour and/or attitude, 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 perceived change in the quality of life. | Observed Adverse Effect | Mitigate and reduce to a minimum |
| | | Significant Observed Adverse Effect Level | |
| Noticeable and disruptive | The noise causes a material change in behaviour and/or attitude, 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 |
| Noticeable and very disruptive | Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory | Unacceptable Adverse Effect | Prevent |

## 4.3 BS 8233:2014

4.3.1 BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings' (BS 8233) sets guideline indoor ambient noise levels for dwellings, for steady external noise sources, which it is desirable are not exceeded. These levels are reproduced in Table 4.2 and are based on guidelines issued by the World Health Organisation (WHO). The Standard also states that 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.

4.3.2 The Standard considers that for regular individual noise events, a guideline value may be set in terms of SEL or $L_{AFmax}$ depending on the character and number of events per night. The WHO Guidelines on Community Noise, 1999 (WHO Guidelines) considers that if negative effects on sleep are to be avoided, noise events exceeding 45 dB $L_{Amax}$ should be limited. Professional Practice Guidance on Planning and Noise, 2017 (ProPG) (Note 4 to Figure 2) considers '*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. In most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45 dB $L_{Amax,F}$ more than 10 times a night*.'

4.3.3 Note 5 to Figure 2 of ProPG states '….*Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however, any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal $L_{Aeq}$ target levels should not normally be exceeded,….*'

Table 4.2: Indoor Ambient Noise Levels in Dwellings (as recommended in BS 8233:2014)

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

4.3.4 For traditional external areas that are used for amenity space, such as gardens and patios, BS 8233 considers that it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. BS 8233 also states '*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'*.

4.3.5 With reference to the above guidelines, by definition, 'reasonable internal conditions' cannot represent a significant adverse impact (the prevention of which is the 1st aim of NPSE). With cognisance to the 2nd aim of NPSE (to minimise noise impact), the internal ambient noise levels detailed in Table 4.2 are considered appropriate.

4.3.6 Likewise, for external amenity space, a design range of 50 to 55 dB $L_{Aeq,T}$ is considered appropriate to comply with the requirements of the NPPF. Furthermore, the BS 8233 guidance that in certain circumstance '*development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited'*, is considered to be in keeping with the NPSE Explanatory Note, which requires that '*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. This does not mean that such adverse effects cannot occur'*.

4.3.7 On the basis of the above, the following design criteria are considered to be in keeping with the aims of the NPPF:

*i.* Living rooms and bedrooms ≤ 35 dB $L_{Aeq\ (07:00–23:00)}$

*ii.* Dining rooms ≤ 40 dB $L_{Aeq\ (07:00–23:00)}$

*iii.* Bedrooms ≤ 30 dB $L_{Aeq\ (23:00–07:00)}$

*iv.* 45 dB $L_{AFmax}$ not normally exceeded in bedrooms at night.

*v.* Guideline range of 50 - 55 dB $L_{Aeq\ (07:00-23:00)}$ in external amenity areas during the daytime and where this is not achievable, design to achieve the lowest practicable levels.

## SECTION 5 SOUND ATTENUATION SCHEME PROPOSALS

### 5.1 INTRODUCTION

5.1.1 The sound attenuation scheme proposals are based on the design criteria detailed in Para. 4.3.7, the incident noise levels detailed in Table 3.1 and the proposed layout plans contained in Appendix 2.2. Should layout changes be considered, RPA should be consulted as to the potential impact on the sound attenuation scheme.

5.1.2 In order to calculate the sound insulation requirements of the building envelope for habitable rooms throughout the development, the Building Research Establishment (BRE) building envelope insulation calculation spreadsheet was used. This spreadsheet is based on the calculation methodology advocated in BS 8233. The spreadsheet allows input of external noise levels, room dimensions and reverberation time together with parameters for the various elements of the building envelope and calculates the internal noise level in terms of the external noise level metric ($L_{Aeq}$ and $L_{AFmax}$ in this case). Calculations were based on dimensions taken off plan.

5.1.3 The ventilation recommendations relate to the sound insulation scheme only and the developer should ensure compliance with the ventilation requirements of the Building Regulations.

5.1.4 The sound attenuation scheme proposals detailed below are summarized on the annotated site layout plan contained in Appendix 2.2.

## 5.2 HABITABLE ROOMS ON THE EASTERN AND WESTERN (SIDE) FAÇADES

5.2.1 Based on the BRE spreadsheet, habitable rooms on the eastern and western (side) façades should be fitted with acoustic glazing rated at ≥ 36 dB $R_w + C_{tr}$, such as a Saint Gobain Glass 6 mm float (16 mm) 8.4 Stadip Silence acoustic laminate double glazing configuration. Acoustic trickle vents should be provided that have a vent open $D_{n,e,w} + C_{tr}$ of ≥ 38 dB per 5000 $mm^2$ EA (e.g. Greenwood 5000EAW.AC2, or equivalent).

## 5.3 HABITABLE ROOMS ON THE SOUTHERN (REAR) FAÇADE

5.3.1 Based on the BRE spreadsheet, standard thermal double glazing and standard trickle vents are considered appropriate for habitable rooms on the southern (rear) façade.

## 5.4 VENTILATION REQUIREMENTS

5.4.1 In addition to the acoustic double glazing system, in order to provide whole house ventilation, the use of some form of assisted (mechanical) ventilation is required.

5.4.2 Mechanical ventilation requires either an individual room system or a 'whole house' system. The choice of system is, however, primarily dependant on the ventilation requirements of the development.

5.4.3 The recommended solution is the provision of a 'whole house' System 3 mechanical extract ventilation (MEV) system with boost facility such as the Vent-Axia MVDC-MS MEV unit (or equivalent). The MVDC-MS is Building Regulations ADF compliant and provides constant extraction from wet areas, with normal, boost and purge settings. The unit produces low levels of self noise and can be mounted in a cupboard to ensure compliance with BS 8233 internal levels.

5.4.4 As stated, the ventilation recommendations relate to the sound insulation scheme only and the developer should ensure compliance with the ventilation requirements of the Building Regulations.

## 5.5 EXTERNAL AMENITY

5.5.1 The daytime external ambient noise level exceeds the upper design range of 55 dB $L_{Aeq,16hr}$. This should, however, be considered in the context of the NPPF and the BS 8233 guidance that in certain circumstance '*development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited'*. It is noteworthy that a significant number of dwellings in Flockton have external amenity areas on the Barnsley Road frontage.

## SECTION 6 CONCLUSIONS

6.1 A noise assessment has been undertaken to aid in the discharge of Condition 7 of a planning permission granted by Kirklees Council (ref: 2024/60/92066/E) for the residential development of a parcel of land adjacent to 264 Barnsley Road, Flockton, Wakefield, WF4 4AJ.

6.2 Condition 7 requires a noise assessment to consider the potential impact of all significant noise sources on the proposed development.

6.3 Based on the noise survey undertaken, the noise climate consists of local traffic, with no other significant noise sources noted. A glazing and ventilation strategy has been developed to control noise associated with road traffic impacting on the development.

**APPENDIX 1** ▪ Glossary of acoustic terms

## Appendix 1
## Glossary of Acoustic Terms

### Sound Pressure Level ($L_p$)

The basic unit of sound measurement is the sound pressure level. As the pressures to which the human ear responds can range from 20 µPa to 200 Pa, a linear measurement of sound levels would involve many orders of magnitude. Consequently, the pressures are converted to a logarithmic scale and expressed in decibels (dB) as follows:

$L_p = 20 \log_{10}(p/p_0)$

Where $L_p$ = sound pressure level in dB; p = rms sound pressure in Pa; and $p_0$ = reference sound pressure (20 µPa).

### A-weighting Network

A frequency filtering system in a sound level meter, which approximates under defined conditions the frequency response of the human ear. The A-weighted sound pressure level, expressed in dB(A), has been shown to correlate well with subjective response to noise.

### Equivalent continuous A-weighted sound pressure level, $L_{Aeq, T}$

The value of the A-weighted sound pressure level in decibels of continuous steady sound that within a specified time interval, T, has the same mean-square sound pressure as a sound that varies with time. $L_{Aeq, 16h}$ (07:00 to 23:00 hours) and $L_{Aeq, 8h}$ (23:00 to 07:00 hours) are used to qualify daytime and night time noise levels.

### $L_{A10, T}$

The A-weighted sound pressure level in decibels exceeded for 10% of the measurement period, T. $L_{A10, 18h}$ is the arithmetic mean of the 18 hourly values from 06:00 to 24:00 hours.

### $L_{A90, T}$

The A-weighted sound pressure level of the residual noise in decibels exceeded 90% of a given time interval, T. $L_{A90}$ is typically taken as representative of background noise.

### $L_{AF\ max}$

The maximum A-weighted noise level recorded during the measurement period. The subscript 'F' denotes fast time weighting, slow time weighting 'S' is also used.

### Sound Exposure Level (SEL or $L_{AE}$)

The energy produced by a discrete noise event averaged over one second, no matter how long the event actually took. This allows for comparison between different noise events which occur over different lengths of time.

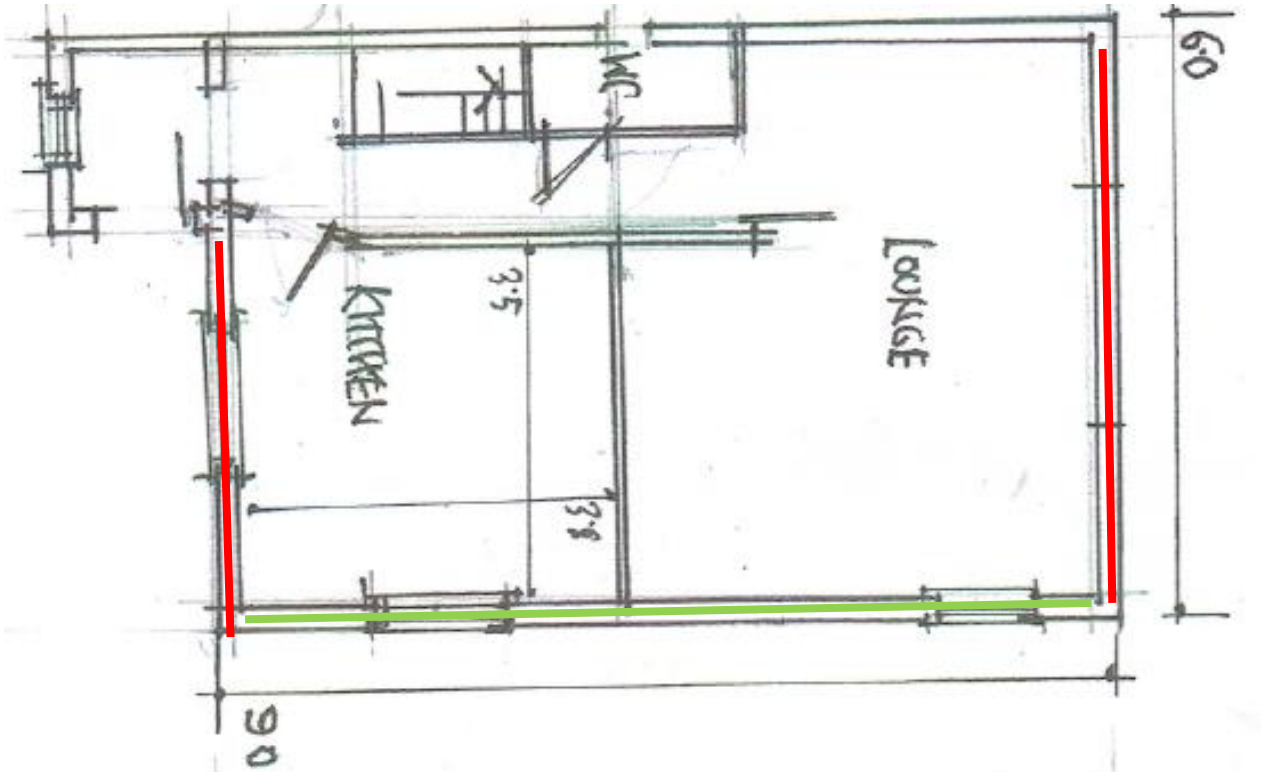
**APPENDIX 2**

- Annotated aerial site image
- Proposed layout plans

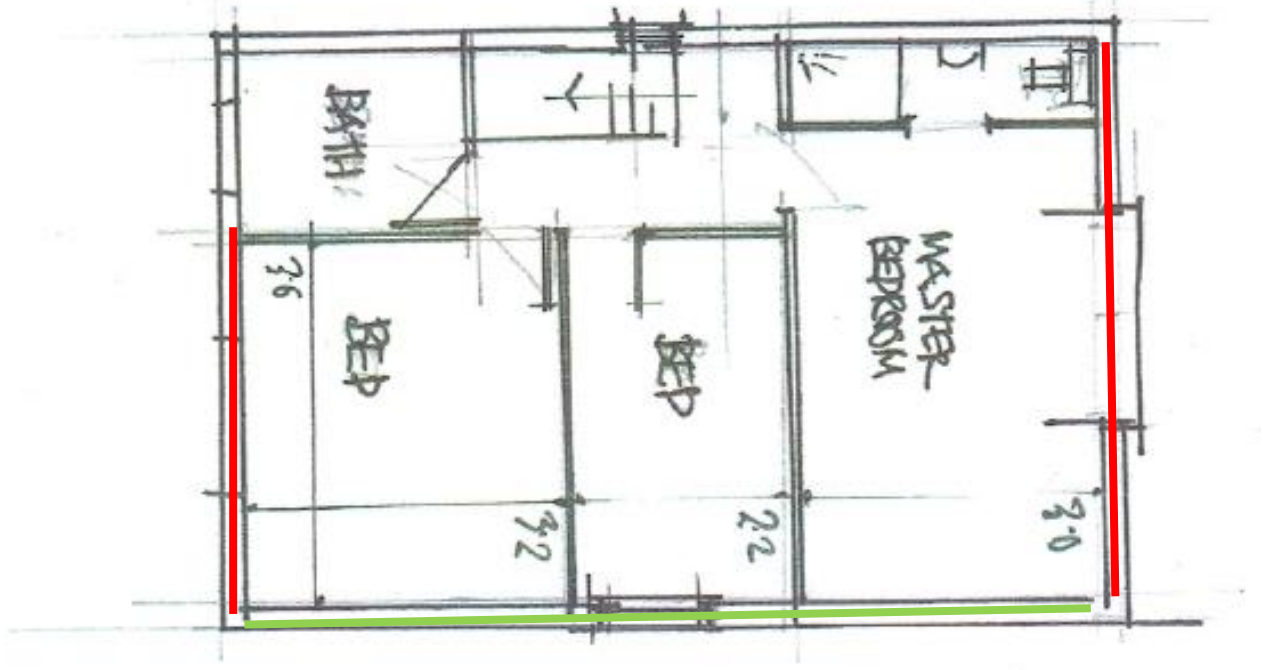
Appendix 2.1: Annotated Aerial Site Image

Appendix 2.2: Proposed Plans

**Ground Floor Layout**




**First Floor Layout**




Notes:

- Acoustic glazing and acoustic trickle vents (see Section 5.2)
- Standard glazing and trickle vents (see Section 5.3.
- MEV system (see Section 5.4)