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Environmental Noise Impact Assessment Report for Planning

The Plough, 81 Chapel Street, Thatcham, Berkshire, RG18 4JS

Report Reference 20711.ENIA.RPT.01

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Revision Reference	**Issue Date**	**Purpose and/or Description of Revision**
First Issue	30th July 2024	Environmental noise impact assessment report prepared in support of a full planning application the conversion of the existing public house into 3 no. flats and the construction of a two-storey building to the rear of the site for 2 no. flats

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EXECUTIVE SUMMARY

ES Acoustics Ltd have been commissioned to prepare a noise impact assessment for the Proposed Development at The Plough, 81 Chapel Street, Thatcham, Berkshire, RG18 4JS.

An appraisal of the site determined road traffic noise from Chapel Street to the north and Stoney Lane to the east to be the dominate source of environmental noise. No other significant sources of environmental noise were observed. Noise levels measured on site are shown below:

Measurement Position	Period	Residual Sound Level $L_{Aeq,\ T}$ (dB)	Representative Background Noise Level L_{A90} (dB)	10th Highest Maximum Noise Level Per Night L_{AFmax} (dB)
1	Daytime 07:00-23:00	73	55 – 62	n/a
	Night-time 23:00-07:00	68	39	87, 87
2	Daytime 07:00-23:00	56 – 58	44 – 49	n/a
	Night-time 23:00-07:00	50 – 51	28 – 30	69, 70

Noise impacts on the proposed development have been assessed against the guidance presented in 'Professional Practice Guidance on Planning and Noise' (ProPG), BS 8233:2014, as well as Local and National Planning Policy Guidelines.

With regards to the noise risk category of the site in accordance with ProPG guidance, a single noise risk category would not be adequately representative, as the development site falls within the 'low' to 'high' risk categories depending on the specific location on site, and the time of day or night. The existing building on site overlooking Chapel Street falls within the 'medium' to 'high' noise risk categories, while the rear of the site falls within the 'low' to 'medium' noise risk categories. Note that the risk categories determined are considered in the absence of mitigation proposals.

Noise mitigation measures have been suggested to avoid significant adverse effects and minimise adverse effects. Full external building fabric performance specifications and ventilation specifications are presented in Section 6.

The assessment of external noise ingress has concluded that significant adverse effects are unlikely to occur at the proposed residential development if appropriate mitigation measures are implemented.

It is therefore considered that the site is appropriate for residential development.

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LIST OF ATTACHMENTS

1 INTRODUCTION

ES Acoustics Ltd have been commissioned by Sandstone Estates Ltd to prepare a noise impact assessment for the Proposed Development at The Plough, 81 Chapel Street, Thatcham, Berkshire, RG18 4JS.

This report presents the findings of the noise impact assessment prepared in support of a full planning application and includes the following:

- A description of the proposed development, including the identification of key noise sources including transportation infrastructure and commercial premises to ensure that any potential impacts of noise on the intended occupiers of the development are properly considered;
- A review appropriate National and Local Planning Policy and Good Practice Guidance relevant to the Proposed Development to establish suitable criteria for the Proposed Development;
- Details of the environmental noise surveys undertaken on site, as well as subjective observations with regards to the types of noise incident on the site;
- An initial site noise risk assessment in accordance with ProPG: Professional Practice Guidance on Planning and Noise; and
- The noise impact assessment including:
    - an acoustic assessment of the proposed external building fabric constructions to confirm whether sufficient sound insulation is provided with regards to external noise ingress;
    - an acoustic assessment of the external amenity areas; and
    - a scheme of mitigation measures as required.

2 PROPOSED DEVELOPMENT

2.1 Site Description

The application site is situated within the jurisdiction of the West Berkshire Council, located within a mixed-use area comprised primarily of residential use with some nearby commercial properties.

Figure 1 below shows the application site boundary in red, which is demarcated by Chapel Street to the north, Stoney Lane to the east and neighbouring residential properties to the south and west.

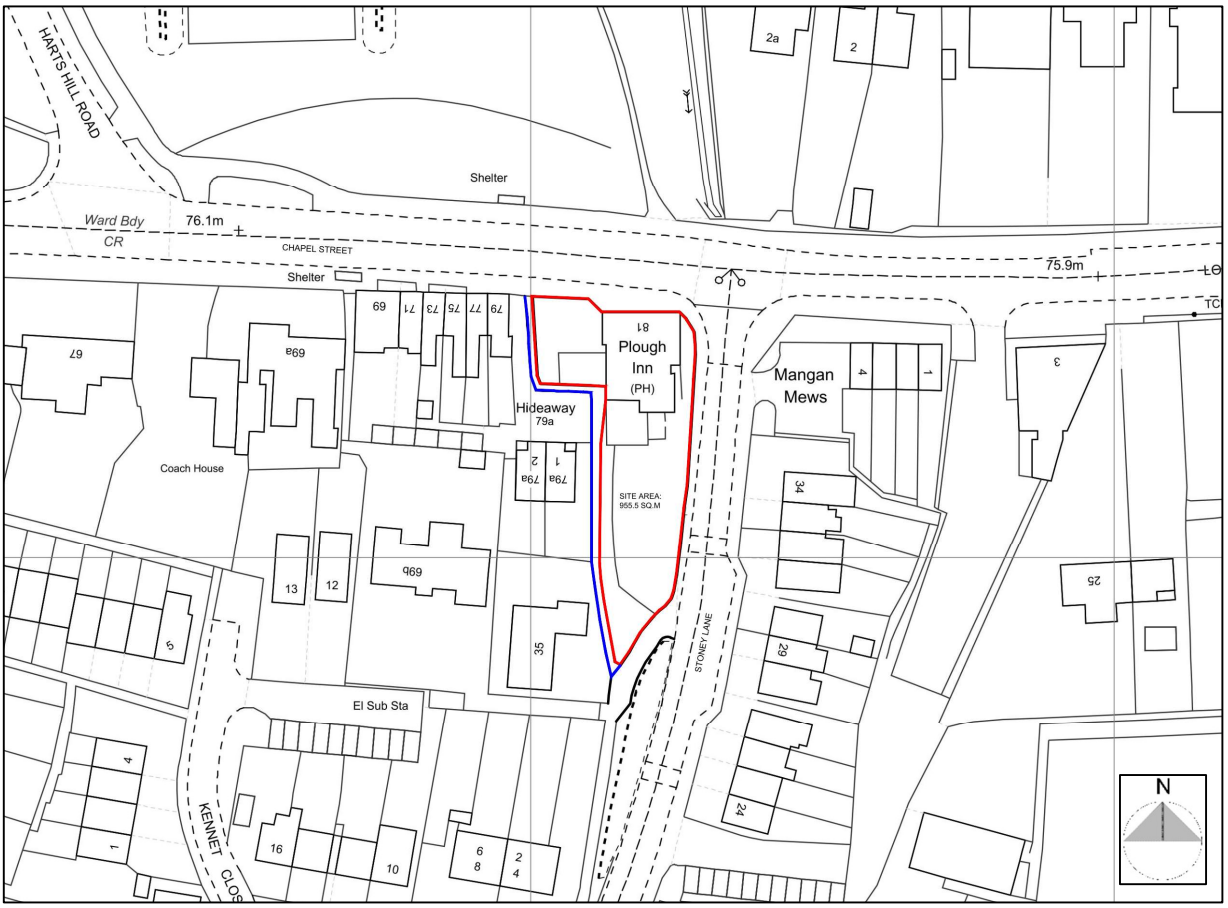


Figure 1 Proposed development site (Image Reference: Surveying and Design Services Ltd)

Based on an inspection of the site and the surrounding area, the key noise source that comprises the ambient environmental noise within the area is road traffic noise from Chapel Street to the north and Stoney Lane to the east. Note that Chapel Street is the primary noise source with traffic flows being significantly higher than on Stoney Lane. No other significant sources of environmental noise were observed.

2.2 Proposal

The proposal involves the change of use of the existing public house to residential use and a new-build two-storey building to the rear of the site. The change of use aspect would provide 3 no. flats in total, comprised of 1 no. 3 bedroom flat and 1 no. 2 bedroom flat on the ground floor, and 1 no. 3 bedroom flat on the first floor. The new-build aspect of the scheme would would provide 2 no. flats in total, comprised of 1 no. 2 bedroom flat on the ground floor and 1 no. 2 bedroom flat on the first floor.

A proposed site plan is shown in Figure 2 below:

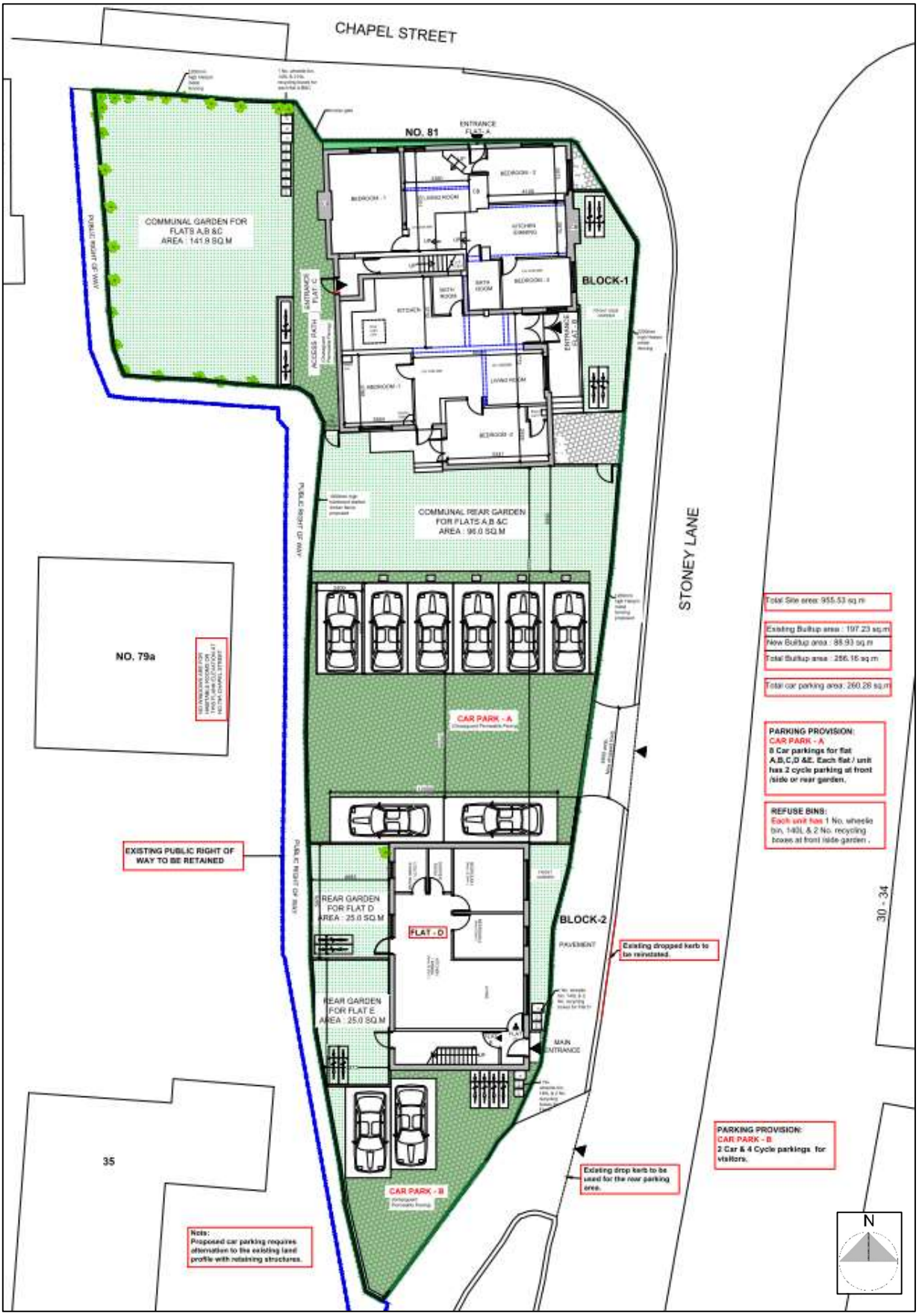


Figure 2 Proposed development site – ground floor plan (Image Reference: Surveying and Design Services Ltd)

3 PLANNING POLICY AND GUIDANCE

This section of the report presents the key planning policy and guidance relevant for the assessment of noise for a residential development such as this.

3.1 National Policy

3.1.1 National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) superseded and replaced Planning Policy Guidance Note 24 (PPG24), which previously covered issues relating to noise and planning in England.

The paragraphs relating to noise state:

180. Planning policies and decisions should contribute to and enhance the natural and local environment by; […]

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans

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;

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; […]

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.

3.1.2 Noise Policy Statement for England (NPSE)

The Noise Policy Statement for England (NPSE) was developed by DEFRA and published in March 2010. The long-term vision of the Government noise policy is to '*Promote good health and good quality of life*

through the effective management of noise within the context of Government policy on sustainable development.'

The NPSE vision noted above is supported by the following aims:

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

- *Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life*

The NPSE outlines observed effect levels relating to the above, as follows:

- *No observed effect level (NOEL): this is the level of noise exposure below which no effect at all on health or quality of life can be detected;*
- *Lowest observed adverse effect level (LOAEL): this is the level of noise exposure above which adverse effects on health and quality of life can be detected;*
- *Significant observed adverse effect level (SOAEL): This is the level of noise exposure above which significant adverse effects on health and quality of life occur;*

Noise effect levels are not set at absolute noise level targets, but instead vary depending on the context and character of the noise and site-specific factors which may impact on the severity of the effect. The NPSE states:

'It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.'

3.1.3 National Planning Practice Guidance (NPPG)

The NPPG provides practical guidance on how the NPPF should be applied as well as and guidance on the factors influencing whether noise may be a concern at the planning stage and how adverse effects can be mitigated. The table below summarises the effect levels presented within the NPSE, as follows:

Response	Examples of Outcomes	Increasing Effect Level	Action
Not present	No Effect	No Observed Effect	No specific measures required
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 change in the quality of life.	No Observed Adverse Effect	No specific Measures required

Response	Examples of Outcomes	Increasing Effect Level	Action
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 & reduce to a minimum
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

Table 1 Noise exposure hierachy

3.2 Local Policy

3.2.1 West Berkshire Council Planning Policy

The West Berkshire Council's Planning Policy website notes the following:

The National Planning Policy Framework (NPPF) sets out the Government's planning policies and must be taken into consideration in the preparation of Development Plans.

Applications for planning permission must be determined in accordance with the Development Plan unless material considerations indicate otherwise.

The Development Plan for West Berkshire is currently made up of a number of different documents:

- *Local Plan, which comprises of the following three documents:*
  - *Core Strategy Development Plan Document (2006 - 2026) adopted July 2012*
  - *Housing Site Allocations Development Plan Document adopted May 2017*
  - *West Berkshire District Local Plan 1991 - 2006 (Saved Policies 2007) as amended in July 2012 and May 2017*
- *Stratfield Mortimer Neighbourhood Development Plan adopted June 2017*
- *Compton Neighbourhood Development Plan adopted February 2022*
- *South East Plan Natural Resource Management Policy 6 [114KB] relating to the Thames Basin Heaths Special Protection Area*
- *Minerals and Waste Local Plan (2022-2037) adopted December 2022*

Key planning policies relating to noise and residential development are summarised below:

Policy OVS.5 'Environmental Nuisance and Pollution Control'

The Council will only permit development proposals where they do not give rise to an unacceptable pollution of the environment. In order to minimise the adverse impact on the environment or loss of amenity proposals should have regard to:

a) the need to ensure the adequate storage and disposal of waste materials; and

b) the installation of equipment to minimise the harmful effects of emissions; and

c) the hours, days or seasons of operations; and

d) locating potential nuisance or pollution activities onto the least sensitive parts of the site or where the impacts can be best contained by physical or other appropriate measures.

Policy OVS.6 'Noise Pollution'

The Council will require appropriate measures to be taken in the location, impact as a result of noise generated. Special consideration is required where noisy development is proposed in or near Sites of Special Scientific Interest or which would harm the quiet enjoyment of Areas of Outstanding Natural Beauty. Proposals for noise sensitive developments should have regard to the following:

a) existing sources of noise e.g. from roads, railways and other forms of transport, industrial and commercial developments, sporting, recreation and leisure facilities; and

b) the need for appropriate sound insulation measures; and

c) the noise exposure levels outlined in Annex 1 of PPG24. In the context of this policy noise sensitive uses are housing, schools and hospitals.

3.3 Best Practice and Guidance

3.3.1 World Health Organization (WHO) Guidelines

WHO Guidelines for Community Noise (1999) provides guideline values for community noise in specific environments. This has since been supplemented by WHO Environmental Noise Guidelines for European Region (WHO, Regional office for Europe, 2018).

The WHO guideline values most relevant to new residential development are outlined in the table below:

Specific Environment	Critical Health Effects	L_{Aeq} [dB]	Time [hrs]	L_{Afmax} [dB]
Dwelling, indoors	Speech intelligibility and moderate annoyance, day & evening	35	16	n/a
	Sleep disturbance night-time	30	8	45
Outside bedrooms (from noise sources other than road traffic, railways, aircraft or wind turbines)	Sleep disturbance, window open (outdoor values)	45	8	60

Table 2 Guideline Values from WHO Guidelines for Community Noise (1999)

The effects of noise in dwellings are typically sleep disturbance, annoyance and speech interference. For bedrooms the critical effect is sleep disturbance. The 1999 WHO guidance notes that indoor guideline values for bedrooms at night are 30dB L_{Aeq} for continuous noise and 45dB L_{Amax} for single sound events, but the guidance also notes that lower noise levels may be disturbing depending on the nature of the noise source.

3.3.2 BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings'

Table 4 of BS 8233:2014 (reproduced below) provides guidance on recommended internal ambient noise levels in residential spaces based on World Health Organisation (WHO) research.

Room	Daytime (07:00-23:00)	Night-time (23:00-07:00)
Living Room	≤ 35 dB $L_{Aeq,16hr}$	N/A
Dining Room	≤ 40 dB $L_{Aeq,16hr}$	N/A
Bedroom	≤ 35 dB $L_{Aeq,16hr}$	≤ 30 dB $L_{Aeq,8hr}$

Table 3 BS 8233:2014 indoor ambient noise levels for dwellings

The following notes should be considered alongside the levels presented above:

- *The levels presented above are for steady external noise sources without a specific character. Noise is considered to have a specific character if it contains features such as a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content, in which case lower noise limits might be appropriate*
- *The levels are based on annual average data and do not have to be achieved in all circumstances e.g. it is normal to exclude occasional events, such as fireworks night or New Year's Eve*
- *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*
- *If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level*
- *The levels outlined above are not applicable under "purge ventilation" conditions as defined by Approved Document F of the Building Regulations, as this should only occur occasionally e.g. to remove odour from painting or burnt food). However, the levels above should be achieved whilst providing sufficient background ventilation, either via passive or mechanical methods*

It should be noted that the 2014 version of BS 8233:2014 does not include any specific requirement for maximum instantaneous noise levels (L_{max}) within dwellings. However, methodology for the assessment of maximum noise levels is included in ProPG (Section 3.3.3) and referenced in WHO guidelines above.

Section 7.7.3.2 of BS 8233:2014 *'Guidance on sound insulation and noise reduction for buildings'* presents desirable guideline levels for amenity areas. The section is presented in its entirety below:

"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$

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

Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space."

3.3.3 ProPG: Professional Practice Guidance on Planning and Noise

ProPG was published to provide practitioners with guidance and a recommended approach for the assessment of noise impact on residential developments during the planning stage.

The guidance can be seen as the missing link between the current NPPF and its predecessor, PPG24 (Planning Policy Guidance 24: Planning and Noise), which provided a prescriptive method for assessing sites for residential development but without the nuance of the key elements described in ProPG.

The guidance seeks to assist in the delivery of sustainable development by promoting good health and wellbeing through the effective management of noise and encourage a good acoustic design in and around proposed new residential development whilst considering national policy on planning and noise.

The recommend approach for assessment is summarised below:

- *Stage 1 – an initial noise risk assessment of the proposed development site*
- *Stage 2 – a systematic consideration of four key elements:*
    - *Element 1 – Demonstrating a "Good Acoustic Design Process" (including feasibility of reducing or relocating existing noise sources, site orientation and building layout and appropriate constructions methods to meet performance requirements);*
    - *Element 2 – Observing internal "Noise Level Guidelines" (as presented in Section 3.3.1 of this report, with additional consideration of individual noise events which should normally not exceed L_{AFmax} 45 dB more than 10 times in bedrooms at night);*
    - *Element 3 – Undertaking an "External Amenity Area Noise Assessment" (ProPG aligns with BS 8233:2014 and suggests that noise levels in external amenity areas should*

ideally not be above $L_{Aeq,16hr}$ 50-55dB. However, there is an acceptance that these guideline values may not be achievable in all circumstances where development might be desirable, and in such situations, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces but should not be prohibited.); and

- *Element 4 – Consideration of "other relevant issues" (including compliance with national and local policy, acoustic design vs unintended adverse consequences, acoustic design vs wider planning objectives)*

To help consider noise at a site at an early stage an initial noise risk assessment should assess the Noise Risk Category of the site to help provide an indication of the likely suitability of the site for new residential development from a noise perspective. The table below sets out the indicative noise levels for the Noise Risk Categories and a description of the potential effect of noise were no further noise mitigation to take place as well as additional guidance.

Noise Risk Category	Potential Effect if Unmitigated	Pre-Planning Application Guidance
0- Negligible $L_{Aeq,16hr}$ < 50dB $L_{Aeq,8hr}$ < 40dB	No adverse effect	These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds.
1- Low $L_{Aeq,16hr}$ 50-60dB $L_{Aeq,8hr}$ 40-50dB	Increasing risk of adverse effect ↓	At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.
2- Medium $L_{Aeq,16hr}$ 60-70dB $L_{Aeq,8hr}$ 50-60dB		As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development.
3- High $L_{Aeq,16hr}$ >70dB $L_{Aeq,8hr}$ >60dB		High noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice.

Table 4 ProPG Stage 1 Site Noise Risk Assessment

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

Whilst the assessment outlined in this report does not necessarily constitute a full assessment in accordance with the ProPG, the assessment methodology and criteria used have been based on the principals and guidance outlined in the ProPG document.

A Stage 1 Risk Assessment is presented in Section 5, with the key elements outlined in the Stage 2 Assessment being covered in Sections 6 and 7.

3.3.4 Approved Document O: Overheating

Approved Document O took effect on 15 June 2022 with the aim to protect the health and welfare of occupants of a building by reducing the occurrence of high indoor temperatures with residential buildings.

Requirement O1 requires reasonable provision for limiting unwanted solar gain as well as providing an adequate means of removing excess heat from the indoor environment. Compliance with Requirement O1 can be demonstrated via a simplified method or via dynamic thermal modelling.

The simplified method presents minimum free areas for bedrooms as a percentage of the floor area for high and medium risk locations, which are 13% and 4% respectively. Note that this would correspond to an outside to inside sound reduction via a partially open window of 4dB for 13% open area, and 9dB for 4% open area (based on calculations presented within the Association of Noise Consultants and Institute of Acoustics Guide to Demonstrating Compliance with the Noise Requirements of Approved Document O).

The thermal modelling method requires a CIBSE TM59 assessment and consideration of acceptable strategies for reducing overheating risk via limiting solar gains and removing excess heat from the building.

Paragraphs 2.7 and 2.10 are presented below:

2.7 Solar gains in summer should be limited by any of the following means.

a. Fixed shading devices, comprising any of the following.

- *i. Shutters, ii. External blinds, iii. Overhangs, iv. Awnings.*

b. Glazing design, involving any of the following solutions.

- *i. Size, ii. Orientation, iii. g-value, iv. Depth of the window reveal.*

c. Building design – for example, the placement of balconies.

d. Shading provided by adjacent permanent buildings, structures, or landscaping.

2.10 Excess heat should be removed from the residential building by any of the following means.

a. Opening windows (the effectiveness of this method is improved by cross-ventilation).

b. Ventilation louvres in external walls.

c. A mechanical ventilation system.

d. A mechanical cooling system

In meeting the obligations noted above, consideration must be given to noise during night, pollution, security, protection from falling and protection from entrapment.

Paragraph 3.3 cover the noise consideration and is presented below:

3.3 Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.

a. 40dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am).

b. 55dB L_{AFmax}, more than 10 times a night (between 11pm and 7am).

Based on the noise targets presented above and the % open areas noted as part of the simplified method, external noise levels above which the simplified method cannot be used are presented in the table below:

Parameter	High Risk Location	Moderate Risk Location
$L_{Aeq,8h}$ averaged over 8 hours (between 11pm and 7am)	44 dB	49 dB
L_{AFmax} more than 10 times a night (between 11pm and 7am)	59 dB	64 dB

Table 5 External noise levels above which the simplified method cannot be used

In the case of dynamic thermal modelling, we would propose the use of the equation below (presented within the Association of Noise Consultants and Institute of Acoustics Guide to Demonstrating Compliance with the Noise Requirements of Approved Document O) to ascertain the maximum free areas for bedrooms as a percentage of the floor area to ensure compliance with the noise requirement:

$$L_2 = L_{1ff} - \mathrm{R} + 10\log_{10}(\frac{S \times T}{V}) + 11$$

Where:

L_2 is the internal level

$L_{1,ff}$ is the free-field external level (i.e. assumed to be 3 dB lower than a level 1m away from the façade according to BS 8233:2014)

R is the sound reduction index, assumed to be zero for the open area, S (m^2)

T is the reverberation time, 0.5 seconds for the standardised internal level

V is the room volume (m^3). Consider as the floor area x room height.

S, open area as a fraction of floor area, e.g. 0.05 x floor area.

The equation can be rearranged to make S the subject of the equation to ascertain the open area required.

Notes:

Floor areas cancel out in S and V. R=0, T=0.5, V=2.4

L_2 = 40 (the internal noise level requirement of ADO), and therefore 40-11=29

$$\frac{L_2 - L_{1ff} + R - 11}{10} = \log_{10}(\frac{S \times 0.5}{2.4}) \equiv \frac{10^{\frac{29-L_{1ff}}{10}}}{0.5} \times 2.4 = S$$

Once the open area has been established to achieve the noise requirement, we would recommend that the dynamic thermal modelling calculations are undertaken to verify whether the TM59 assessment passes. If it does not pass, additional methods of limiting solar gains as presented in paragraph 2.7 should be explored, or a different method of removing excess heat used (i.e. ventilation louvres, a mechanical ventilation system, or a mechanical cooling system).

4 ENVIRONMENTAL NOISE SURVEY

4.1 Measurement Location and Procedure

Noise surveys were undertaken on site as shown in the figure below, with the locations chosen in order to collect data representative of the worst-case levels expected on the site due to all nearby sources.

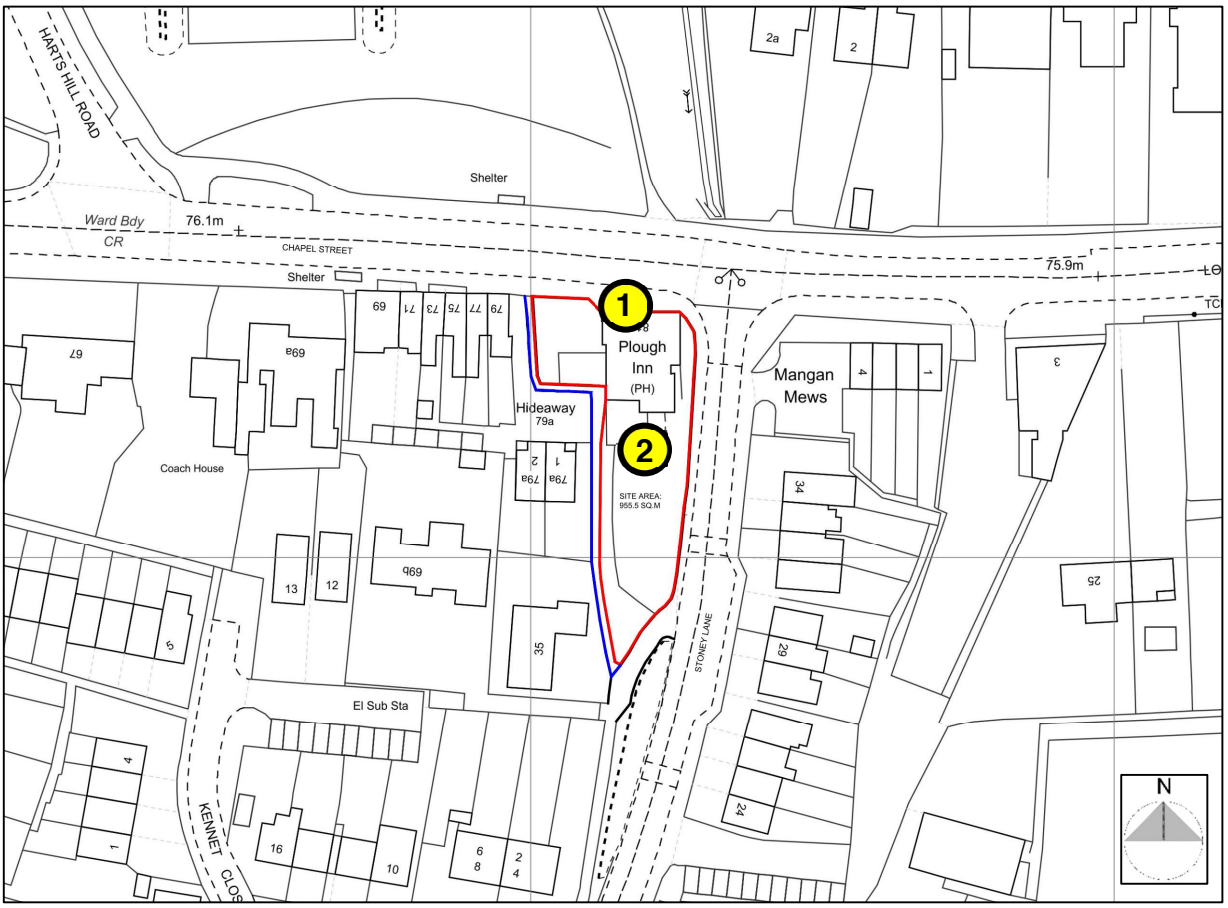


Figure 3 Noise survey measurement locations (Image Reference: Surveying and Design Services Ltd)

The measurement procedure in all cases complied with ISO 1996-2:2017 Acoustics '*Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels'*, with automated monitoring undertaken between 11:35 on 09/04/2024 and 10:15 on 11/04/2024.

The key acoustic descriptors measured for this assessment are as follows:

- $L_{Aeq,T}$ *(the continuous equivalent A-weighted noise level over a given time period, T);*
- $L_{AFMax,T}$ *, the maximum sound level over each measurement period; and*
- $L_{A90,T}$ *(the noise level exceeded for 90% of the measurement period T, referred to as the 'background' noise level).*

4.2 Measurement Equipment

Table 6 presents the equipment used for the baseline noise surveys. The equipment calibration was verified before and after use and no abnormalities were observed.

Equipment	Make and Model	Serial Number
Sound Level Meter	Svantek 977 Class 1 Sound Level Meter	34191
Microphone Capsule	Svantek MK 255	77747
Microphone Preamplifier	Svantek SV 12L	32446
Sound Level Meter	Svantek 958 Class 1 Sound Level Meter	69074
Microphone Capsule	ACO Pacific 7052E	19233
Microphone Preamplifier	Svantek SV 12L	25991
Calibrator	Svantek SV36 Class 1 Sound Calibrator	122255

Table 6 Noise survey equipment

4.3 Weather Conditions

Weather conditions during the automated monitoring were generally dry with light winds and therefore suitable for the measurement of environmental noise.

Temperature and precipitation data has been sourced from the CW5554 Thatcham UK weather station[1], which reported limited periods of precipitation throughout the survey period as noted in the table below. It should be noted that the levels of precipitation reported would not have negatively impacted the survey results. Measurements of wind speed were undertaken with a handheld anemometer on site during the installation and collection visits, with wind speeds reported below 5 m/s on both occasions.

A summary of the weather data is reported in the table below:

Date	Temperature min to max ° C	Precipitation mm
09/04/2024	6.6 – 11.8	1.1mm
10/04/2024	4.0 – 12.5	1.9mm
11/04/2024	12.2 – 17.9	0.4mm

Table 7 Weather data

4.4 Survey Results

Noise time histories of the measurement data are presented in Appendix B.

A summary of the measurement results is presented in Table 8 below.

Measurement Position	Period	Residual Sound Level $L_{Aeq,\,T}$ (dB)	Representative Background Noise Level L_{A90} (dB)	10th Highest Maximum Noise Level Per Night L_{AFmax} (dB)
1	Daytime 07:00-23:00	73	55 – 62	n/a
	Night-time 23:00-07:00	68	39	87, 87
2	Daytime 07:00-23:00	56 – 58	44 – 49	n/a
	Night-time 23:00-07:00	50 – 51	28 – 30	69, 70

Table 8 Measured noise levels

A further daily and nightly breakdown of the data is presented in Table 9.

[1] Weather Station ID: C5554, located 4km from the site at Latitude 51.408, Longitude -1.277

Date	Period	Residual Sound Level $L_{Aeq,\ T}$ (dB)	Representative Background Noise Level L_{A90} (dB)	10th Highest Maximum Noise Level Per Night L_{AFmax} (dB)
Noise Monitoring Position 1				
09/04/2024	Daytime 11:35-23:00	73	58	n/a
09-10/04/2024	Night-time 23:00-07:00	68	39	87
10/04/2024	Daytime 07:00-23:00	73	62	n/a
10-11/04/2024	Night-time 23:00-07:00	68	39	87
11/04/2024	Daytime 07:00-10:15	75	55	n/a
Noise Monitoring Position 2				
09/04/2024	Daytime 11:35-23:00	56	49	n/a
09-10/04/2024	Night-time 23:00-07:00	51	30	69
10/04/2024	Daytime 07:00-23:00	57	47	n/a
10-11/04/2024	Night-time 23:00-07:00	50	28	70
11/04/2024	Daytime 07:00-10:15	58	44	n/a

Table 9 Measured noise levels per day and night period

Note that the noise levels in the tables above are reported ‘as measured’, meaning that noise levels at Noise Monitoring Position 1 would be 3 dB higher than an equivalent free-field level due to the reflection from the building façade. The noise levels measured at Noise Monitoring Position 2 would be considered as free field levels, with no further correction necessary.

5 INITIAL SITE RISK ASSESSMENT

5.1 Report Author Observations

In terms of a general noise assessment based on the results of the environmental noise surveys undertaken on site and the qualified subjective observations of the author, external noise levels at the front elevation of the development site broadly follow a normal diurnal pattern synonymous with road traffic noise. In a planning context, the levels of road traffic noise would be considered moderate to high for the façade overlooking Chapel Street, and moderate to low for the rear section of the site. The site is not affected by exceptional (very high) noise levels of magnitude that should preclude the site from residential development.

It is the author's experience that residential development sites exposed to noise levels comparable with those at the site in question would be granted planning consent, subject to noise related conditions requiring a scheme of noise mitigation to protect against road traffic noise.

Existing properties along Chapel Street near to the development site are predominantly residential use, and the presence of these existing properties establishes the residential nature of the general area. The proposed development does not therefore introduce a noise sensitive use into an area where there are no other existing dwellings in equivalent positions locally and/or in the general vicinity.

As approval for the scheme is being via a full planning application, a scheme of noise mitigation measures would be required as part of the planning approval process to show how noise from road traffic would be mitigated. This information is provided within Section 6 of the report.

5.2 Stage 1 Risk Assessment

A ProPG Stage 1 Risk Assessment is provided in the table below, which considers the front and rear of the site independently due to the different environmental noise level at each location:

Period	**Free-field Noise Level dB $L_{Aeq,T}$**	**Noise Risk Category dB $L_{Aeq,T}$**
Front of the site overlooking Chapel Street		
Daytime 07:00-23:00	70	Medium to High Risk
Night-time 23:00-23:00	65	High Risk
Rear of the site		
Daytime 07:00-23:00	57	Low Risk
Night-time 23:00-23:00	50	Low to Medium Risk

Table 10 Stage 1 risk assessment

The Noise Risk Assessment guidance within ProPG is on a visually represented sliding scale defined categories of noise risk from 'Negligible' to 'High Risk' as indicated within the Figure 1 diagram of the guidance, reproduced as Table 4 within this report.

The 'Noise Risk' relates to the potential adverse effect to future occupiers of the development without any noise mitigation measures being considered within the development scheme design, i.e. for a

development with no acoustic design considerations and therefore any type of glazing and ventilation system etc.

A scheme of noise mitigation measures is presented in Section 6 to ensure that significant adverse impacts on health and quality of life are mitigated, minimised, and avoided.

6 PROPOSED DEVELOPMENT BUILDING ENVELOPE MITIGATION

A scheme of suitable noise mitigation measures to protect the proposed dwellings against external noise relates principally to the sound insulation performance of elements of the overall external building envelope. The composite acoustic performance required of any portion of the building envelope will depend on its location relative to the principal noise sources around the site and the nature of the spaces behind it (noise criteria, size, room finishes, etc.).

By following the rigorous calculation procedure outlined in Section G.2 of Annex G of BS 8233:2014 the sound insulation performance for the whole building envelope is assessed, considering each façade element. Note that this calculation method is based on that given in BS EN 12354-3.

6.1 Non-Glazed External Building Fabric Construction

6.1.1 Change of Use Aspect of the Scheme

It is understood that the existing non-glazed external building fabric construction is a masonry cavity wall, which would provide a sound reduction index value of at least R_w 50 dB.

No additional upgrades would be required for acoustic reasons.

6.1.2 New Build Aspect of the Scheme

Due to the early project stage the exact construction of the non-glazed external building fabric of the new build aspect of the scheme is unknown.

However, regardless of it being a masonry or Metsec type system, the overall sound insulation performance should be no less than R_w 50 dB.

6.2 Glazing Specifications

Calculations have been undertaken to determine a suitable façade sound insulation strategy for the scheme. Due to the variation in noise levels across the site, 2 no. glazing types are proposed which would cover the following:

- Glazing Type 1
    - Rear facing window of Flat B, Bedroom 1
    - Roof lights for Flat C, Bedroom 3
    - All windows for Flats D and E
- Glazing Type 2
    - All other windows on Flats A, B and C

For the avoidance of doubt, a markup is provided below identifying the zones where each Glazing Type is required.

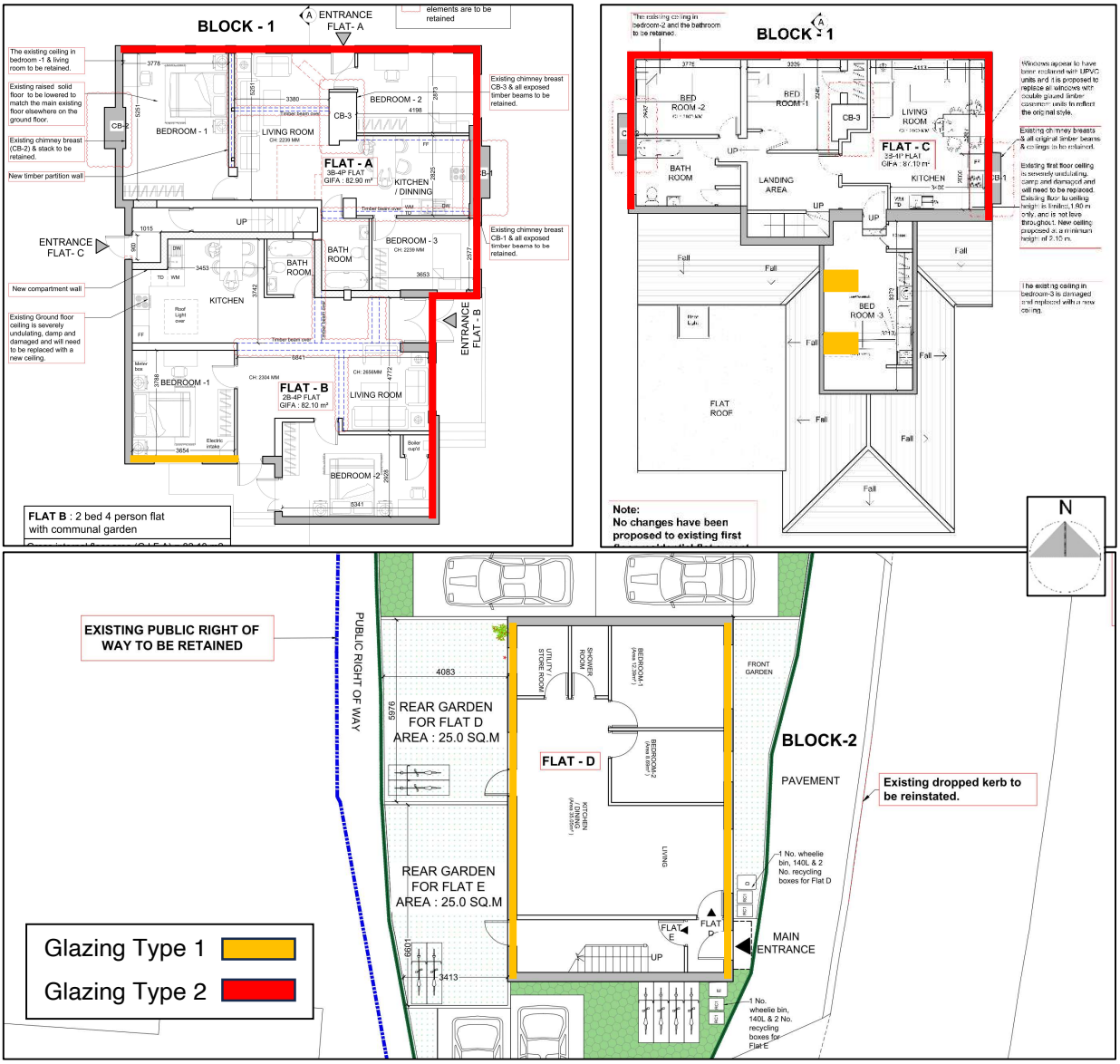


Figure 4 Glazing markup plan (Image Reference: Surveying and Design Services Ltd)

Minimum octave band sound reduction index (SRI) values required for all glazed elements to be installed are shown in the table below:

Glazing Type	Octave band centre frequency SRI, dB						R_w (C;C_{tr})
	125Hz	250HZ	500Hz	1kHz	2kHz	4kHz	
Type 1	-17	-21	-26	-30	-33	-30	29 (-0;-3)
Type 2	-27	-27	-27	-38	-46	-50	41 (-2;-6)

Table 11 Glazing type and required glazing performance for change of use aspect

The performance is specified for the whole window unit including the frame. Sole glass performance data would not demonstrate compliance with this specification. The nominated glazing supplier should verify that their proposed window system meets the attenuation figures shown at each centre frequency band.

Example glazing configurations capable of providing the maximum level of sound insulation required are shown below:

Calculated Sound Insulation Requirement for Glazing	Example Window Construction Capable of Achieving the Sound Insulation Requirement
29 (-0;-3)	**New Window System:** 4mm single glazed window system **Upgrade to existing windows:** Existing window system sufficient
41 (-2;-6)	**New Window System:** 6mm laminated glass / 12mm air gap / 8mm laminated glass **Upgrade to existing windows:** Secondary glazing system comprised of a proprietary frame system to achieve a 100mm air gap and a 4mm secondary pane of glass

Table 12 Example glazing types

The performance is specified for the whole window unit including the frame. Sole glass performance data would not demonstrate compliance with this specification. The nominated glazing supplier should verify that their proposed window system meets the attenuation figures shown at each centre frequency band.

6.2.1 Ventilation Specifications

6.2.2 Whole Dwelling Ventilation

Requirement F1(1) of Approved Document F of the Building Regulations requires that 'there shall be adequate means of ventilation provided for people in the building'.

With regards to 'whole dwelling ventilation', supply air for the dwelling should be delivered via either continuous supply fans (e.g an MVHR system) or background ventilators (e.g. trickle vents or wall vents).

Appropriate means of providing sufficient background ventilation for each glazing type are provided within the following table:

Glazing Type	Background Ventilation Provision
Type 1	1- **Trickle Ventilators** – A minimum performance of 32 dB $D_{n,e,w}$ (e.g. Titon XS13, or similar) is required. 2- **Mechanical ventilation system** – See noise limits in Table 14
Type 2	1- **Trickle Ventilators** – Unsuitable due to high L_{Amax} events during night-time 2- **Mechanical ventilation system** – See noise limits in Table 14

Table 13 Whole dwelling ventilation specifications for each glazing type

In the case of mechanical ventilation, systems should be designed to meet the internal noise levels as defined in the table below:

Room Type	dB L_{Aeq}	NR
Bedrooms / Living Rooms	30	25
Kitchen / Bathrooms	45	40

Table 14 ADF guidance levels for mechanical building services

6.2.3 Purge Ventilation

The only time windows will be required to be open for the purpose of ventilation will be for occasional 'purge' ventilation. With respect to noise levels during purge ventilation conditions, ProPG states the following:

'…the internal noise level guidelines are generally not applicable under 'purge ventilation' conditions as defined by Building Control Approved Document F, as this should only occur occasionally (e.g. to remove odour from painting and decorating or from burnt food).'

It is therefore not considered necessary to further consider noise levels during purge ventilation conditions. Using windows for this purpose is unlikely to result in any significant adverse effects due to the limited time the window would be open, with the occupant having full control over the open condition.

6.2.4 Increased Ventilation to Mitigate Against Internal Heat Gains

Approved Document O only applies to bedrooms during night-time hours within new buildings. Therefore, the change of use aspect of the scheme would not be required to meet the requirements of this legislation, and this would only apply to the new-build aspect of the scheme.

Provisional calculations have been undertaken based on the formula outlined in Section 3.3.4 to establish what degree windows can be open as a percentage of the floor area of the room. A summary of the calculations is shown in the table below:

Building	External Noise Level at 1m From Façade During Night-time	Sound Reduction Required to Achieve ADO Target	Maximum Open Area of the Window*
Block 2, Flats D and E	51 dB(A)	11 dB	3 %

Table 15 Maximum open area of windows for ADO compliance
***as a percentage of the floor area to achieve noise target internally of 40 dB(A)**

Please note that if windows are required to be open to a greater extent than the percentages noted above to mitigate against internal heat gains, the noise requirement of ADO would be exceeded.

It is recommended that an overheating model and assessment is undertaken considering the maximum open area openings as noted above. Should the model comply with the open areas reported, then openable windows would be a suitable method of mitigating against excess heat inside the building. In the event that the overheating model does not comply with the open areas reported above, then acceptable strategies for reducing overheating risk via limiting solar gains and removing excess heat from the building should be investigated, as outlined in Section 3.3.4.

If the developer prefers to install a mechanical ventilation system for the scheme to address the passive ventilation requirements, it would be recommended that a system is selected which can provide a dual function of both passive ventilation and enhanced ventilation rates/cooling for the purposes of overheating mitigation. Such an example system would be the Nuaire MRXBOX Hybrid Cooling System[2].

[2] https://www.nuaire.co.uk/product-list-page/mrxbox-hybrid-cooling-system

7 EXTERNAL AMENITY AREA ASSESSMENT

Proposed external amenity areas are highlighted in purple on the plan below. Based on the noise levels measured on site, the expected noise levels within each amenity space are as marked up on the plan.

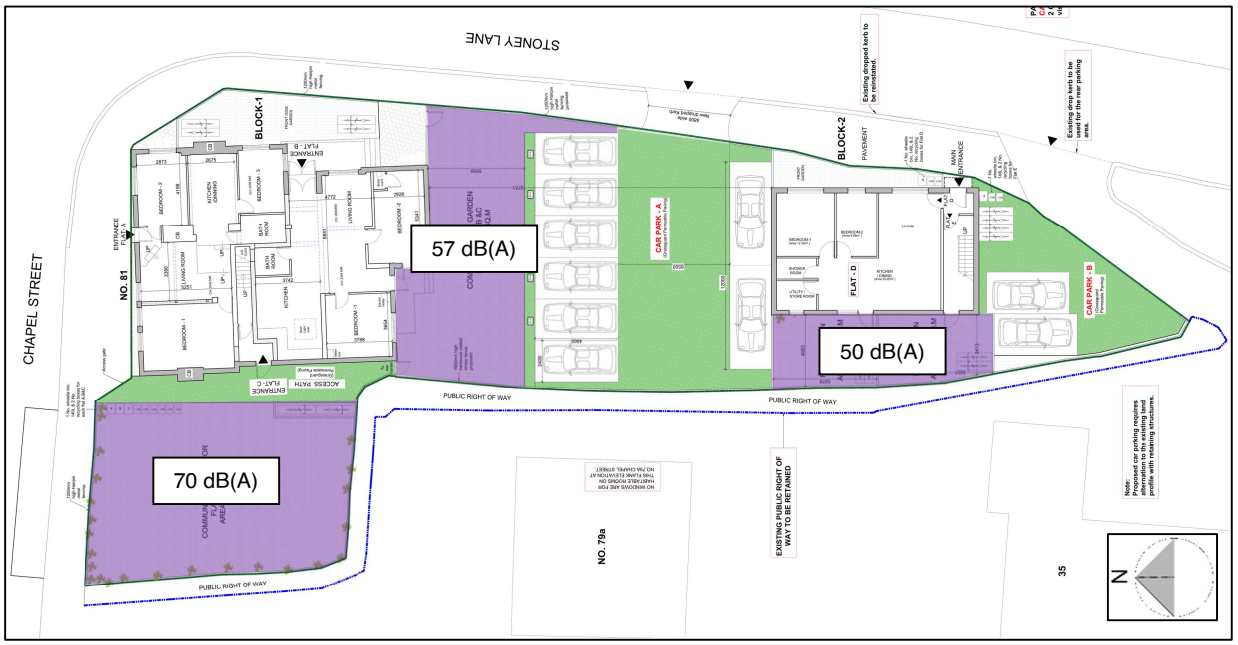


Figure 5 Proposed external amenity areas (Image Reference: Surveying and Design Services Ltd)

It is understood that 1200mm high Hairpin metal fencing is currently proposed along the boundaries of the amenity spaces to the side and rear of Block 1, while a 1800mm high hardwood slatted timber fence is proposed to the boundary of the amenity spaces for Block 2.

Flats A, B and C would have access to the amenity space to the side and rear of Block 1. While noise levels in the amenity space adjacent to Chapel Street are high, residents would have access to a quieter amenity space at the rear, whereby noise levels only marginally exceed the recommended guidance levels presented in BS 8233:2014. Note that the recommended noise levels presented within BS 8233:2014 are guideline values only. The standard notes that it is recognised that these guideline values are not achievable in all circumstances where development might be desirable, and in situations where noise levels exceed the guideline values, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited. Noise levels could be reduced within these amenity spaces if the 1800mm high hardwood slatted timber fence is proposed throughout in lieu of the 1200mm high Hairpin metal fencing.

Flat D and E would have private amenity spaces to the rear of Block 2, whereby noise levels would meet the recommended guidance levels presented in BS 8233:2014.

8 CONCLUSION

Environmental noise surveys have been undertaken at the site of the Proposed Development at The Plough, 81 Chapel Street, Thatcham, Berkshire, RG18 4JS.

Based on the results of the noise survey a noise impact assessment considering relevant planning policy and guidance has been undertaken.

The assessment of external noise ingress has concluded that significant adverse effects are unlikely to occur at the proposed residential development if appropriate mitigation measures are implemented, which are detailed within this report.

It is therefore considered that the site is appropriate for residential development.

APPENDIX A

ACOUSTIC TERMINOLOGY

Decibel scale - dB

The decibel (dB) is a relative unit of measurement used in acoustics. The dB is a logarithmic ratio between a measured level and a reference level of 0 dB (i.e the threshold of human hearing). Simply put, the decibel compresses the wide range of sounds we hear into more manageable numbers.

Addition of noise from several sources

Sound produced by multiple sound sources are added logarithmically e.g. power ratio of 2 = 3dB, power ratio of 10 = 10dB. Therefore, two equally intense sound sources operating simultaneously produce a sound level which is 3dB higher than a single source e.g. 60dB + 60dB = 63dB.

Subjective impression of noise

Human response to sound is highly individualized and often based on psychological factors such as emotion and expectation. Sensitivity to sound typically depends on the loudness, pitch, duration of the occurrence, and time of occurrence (e.g. a sound source could cause annoyance during the night where it would not during the day). The following table is a guide to explain increases or decreases in sound levels for many scenarios.

Change in sound level	Change in perceived loudness
1 dB	Imperceptible
3 dB	Just barely perceptible
6 dB	Clearly noticeable
10 dB	About twice as loud

'A' Weighted Frequency Filter - dB(A)

The human ear is not equally sensitive in all frequencies. The A-weighting filter was devised to take this into account when undertaking noise measurements and allows a sound level meter to replicate the human ears response to sound.

$L_{Aeq, T}$

Sound can fluctuate widely over a given period. L_{Aeq} is the A-weighted equivalent continuous sound level, with T denoting the time period over which the fluctuating sound levels were averaged e.g. $L_{Aeq,16h}$ is the equivalent continuous noise level over an 16 hour period.

L_{A90}

A-weighted sound level exceeded for 90% of the measurement period, calculated via statistical analysis. The L_{A90} descriptor is typically used to establish background sound levels for noise impact assessments

L_{A10}

A-weighted sound level exceeded for 10% of the measurement period, calculated via statistical analysis.

L_{AFmax}

A-weighted sound level maximum sound pressure level that has been measured over a given time period

APPENDIX A

ACOUSTIC TERMINOLOGY

Octave Bands

The audio or frequency spectrum of the human ear is in the range of 20Hz to 20 kHz. The spectrum tells how the energy of the sound signal is distributed in frequency. Octave bands divides the audio spectrum into 10 equal parts. The International Standards Organisation defines the centre frequency of these bands as 31.5Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1kHz, 2kHz, 4kHz, 8kHz and 16kHz.

Noise Rating (NR) Curves

A method of rating noise using a set of curves relating octave band sound pressure levels. Typically used for building services systems within offices

Airborne sound

Sound radiated from a source into the surrounding air e.g. musical instruments, tv/radio, machinery/equipment. Airborne sound insulation refers to the reduction or attenuation of airborne sound, usually via a solid partition between a source and receiver.

Impact sound

Sound resulting from the impact between colliding objects, e.g. footfall impact upon a floor. Impact sound insulation refers to the resistance of a floor to the transmission of impact sound, typically via the installation of a ‘resilient layer’

Flanking sound

The transmission of airborne sound between two adjacent rooms by paths other than via the separating partition between the rooms, e.g. the abutment point of a wall and floor.

Structure-borne noise

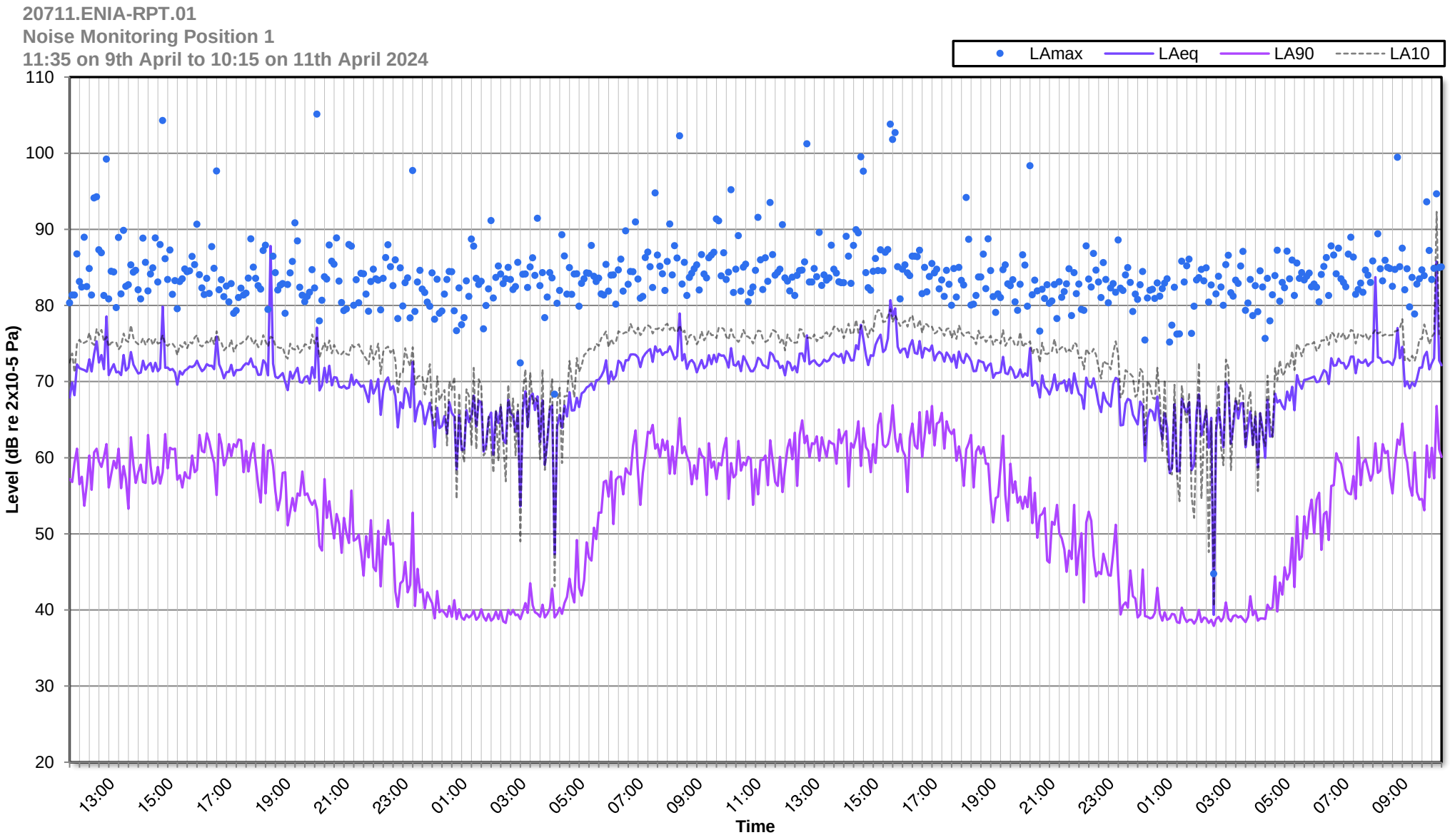
Noise caused by the vibration of elements of a structure. This can result in reradiated noise, whereby the vibrating element transmits airborne sound into a space e.g. vibration caused by mechanical plant installed within a plant room which is not adequately isolated from the structure, or construction/demolition work in an adjacent building.

Reverberant sound

Sound in an enclosed space (usually a room), which results from repeated reflections at the boundaries. Reverberation time is the time taken for a steady sound level in an enclosed space to decay by 60dB, measured from the moment the sound source is switched off. A example of a typically reverberant space would be a classic church. Absorptive materials can be used to reduce reflections and reverberation times.

APPENDIX B

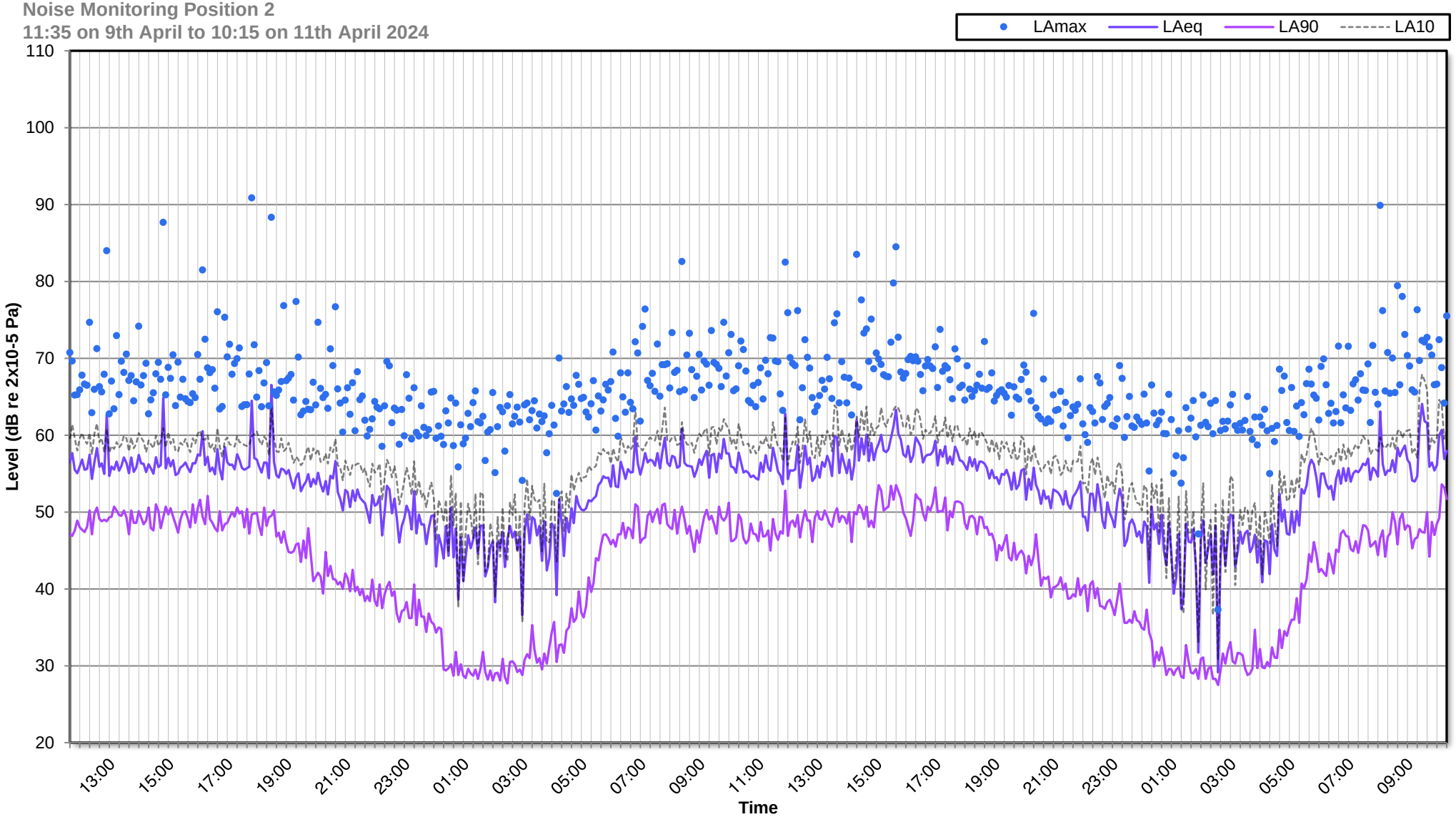
ENVIRONMENTAL NOISE TIME HISTORIES



APPENDIX B

ENVIRONMENTAL NOISE TIME HISTORIES

20711.ENIA-RPT.01
Noise Monitoring Position 2
11:35 on 9th April to 10:15 on 11th April 2024



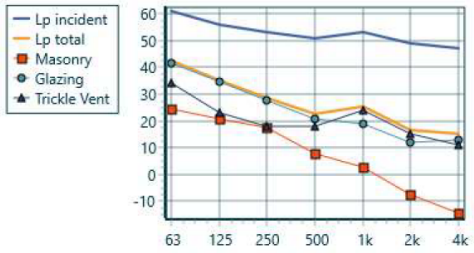
APPENDIX C

EXTERNAL BUILDING FABRIC NOISE INGRESS CALCULATIONS

Outdoor To Indoor Sound Transmission (v9.0.24)

Program copyright Marshall Day Acoustics 2017
Margin of error is generally within ±3 dB
- Key No. 6570
Job Name:The Plough, 81 Chapel Street, Thatcham, RG18 4JS
Job No.: 20711 Initials:Daniel Green MIOA
Date:17/07/2024
File Name:Type 1 - Bedroom Daytime LAeq.inz

Comment:



	Octave Band Centre Frequency (Hz)							
Source	63	125	250	500	1k	2k	4k	Overall dBA
Incident sound level (freefield)	61.0	56.0	53.0	51.0	53.0	49.0	47.0	57
Path								
Element 1 , STL	-39	-38	-38	-46	-53	-59	-64	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	
Area(+10LogA) [8.7 m^2]	9	9	9	9	9	9	9	
Element sound level contribution	25	21	18	8	3	-7	-14	12
Element 2 , STL	-15	-17	-21	-26	-30	-33	-30	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	
Area(+10LogA) [1.8 m^2]	3	3	3	3	3	3	3	
Element sound level contribution	42	35	28	21	19	12	13	26
Element 3 , STL	-30	-36	-38	-36	-32	-37	-39	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	
Area(+10LogA) [10 m^2]	10	10	10	10	10	10	10	
Element sound level contribution	34	23	18	18	24	15	11	26
Receiver								
Room volume(-10LogV) [30 m3]	-15	-15	-15	-15	-15	-15	-15	
Reverberation time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
RT (+10LogT)	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	
Equation Constant	11	11	11	11	11	11	11	
Room sound level	42	35	29	23	25	17	15	29
Level difference								LpAinc - LpARev,T0
D2m,nT	22	24	28	31	31	35	35	28

** Element descriptions:
#1: Masonry
#2: Glazing
#3: Trickle Vent

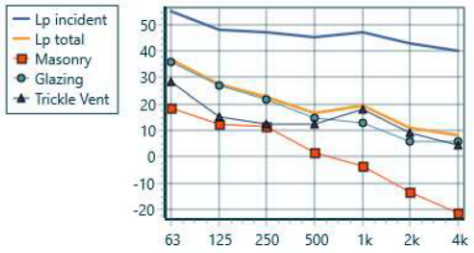
APPENDIX C

EXTERNAL BUILDING FABRIC NOISE INGRESS CALCULATIONS

Outdoor To Indoor Sound Transmission (v9.0.24)

Program copyright Marshall Day Acoustics 2017
Margin of error is generally within ±3 dB
- Key No. 6570
Job Name:The Plough, 81 Chapel Street, Thatcham, RG18 4JS
Job No.: 20711 Initials:Daniel Green MIOA
Date:17/07/2024
File Name:Type 1 - Bedroom Night LAeq.inz

Comment:



Source	Octave Band Centre Frequency (Hz) 63	125	250	500	1k	2k	4k	Overall dBA
Incident sound level (freefield)	55.0	48.0	47.0	45.0	47.0	43.0	40.0	51
Path								
Element 1 , STL	-39	-38	-38	-46	-53	-59	-64	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	
Area(+10LogA) [8.7 m^2]	9	9	9	9	9	9	9	
Element sound level contribution	19	13	12	2	-3	-13	-21	6
Element 2 , STL	-15	-17	-21	-26	-30	-33	-30	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	
Area(+10LogA) [1.8 m^2]	3	3	3	3	3	3	3	
Element sound level contribution	36	27	22	15	13	6	6	19
Element 3 , STL	-30	-36	-38	-36	-32	-37	-39	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	
Area(+10LogA) [10 m^2]	10	10	10	10	10	10	10	
Element sound level contribution	28	15	12	12	18	9	4	20
Receiver								
Room volume(-10LogV) [30 m3]	-15	-15	-15	-15	-15	-15	-15	
Reverberation time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
RT (+10LogT)	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	
Equation Constant	11	11	11	11	11	11	11	
Room sound level	36	27	23	17	19	11	8	23
Level difference								LpAinc - LpARev,T0
D2m,nT	22	24	28	31	31	35	35	28

** Element descriptions:
#1: Masonry
#2: Glazing
#3: Trickle Vent

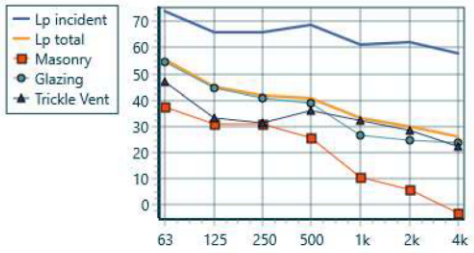
APPENDIX C

EXTERNAL BUILDING FABRIC NOISE INGRESS CALCULATIONS

Outdoor To Indoor Sound Transmission (v9.0.24)

Program copyright Marshall Day Acoustics 2017
Margin of error is generally within ±3 dB
- Key No. 6570
Job Name:The Plough, 81 Chapel Street, Thatcham, RG18 4JS
Job No.: 20711 Initials:Daniel Green MIOA
Date:17/07/2024
File Name:Type 1 - Bedroom Night LAmax.inz

Comment:



Source	Octave Band Centre Frequency (Hz) 63	125	250	500	1k	2k	4k	Overall dBA
Incident sound level (freefield)	74.0	66.0	66.0	69.0	61.0	62.0	58.0	69
Path								
Element 1 , STL	-39	-38	-38	-46	-53	-59	-64	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	
Area(+10LogA) [8.7 m^2]	9	9	9	9	9	9	9	
Element sound level contribution	38	31	31	26	11	6	-3	26
Element 2 , STL	-15	-17	-21	-26	-30	-33	-30	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	
Area(+10LogA) [1.8 m^2]	3	3	3	3	3	3	3	
Element sound level contribution	55	45	41	39	27	25	24	39
Element 3 , STL	-30	-36	-38	-36	-32	-37	-39	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	
Area(+10LogA) [10 m^2]	10	10	10	10	10	10	10	
Element sound level contribution	47	33	31	36	32	28	22	37
Receiver								
Room volume(-10LogV) [30 m3]	-15	-15	-15	-15	-15	-15	-15	
Reverberation time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
RT (+10LogT)	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	
Equation Constant	11	11	11	11	11	11	11	
Room sound level	55	45	42	41	33	30	26	41
Level difference								LpAinc - LpARev,T0
D2m,nT	22	24	28	31	31	35	35	28

** Element descriptions:
#1: Masonry
#2: Glazing
#3: Trickle Vent

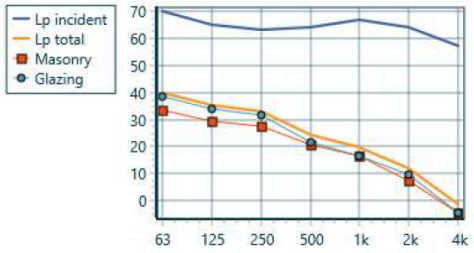
APPENDIX C

EXTERNAL BUILDING FABRIC NOISE INGRESS CALCULATIONS

Outdoor To Indoor Sound Transmission (v9.0.24)

Program copyright Marshall Day Acoustics 2017
Margin of error is generally within ±3 dB
- Key No. 6570
Job Name:The Plough, 81 Chapel Street, Thatcham, RG18 4JS
Job No.: 20711 Initials:Daniel Green MIOA
Date:17/07/2024
File Name:Type 2 - Bedroom Daytime LAeq.inz

Comment:



	Octave Band Centre Frequency (Hz)							
Source	63	125	250	500	1k	2k	4k	Overall dBA
Incident sound level (freefield)	70.0	65.0	63.0	64.0	67.0	64.0	57.0	70
Path								
Element 1 , STL	-39	-38	-38	-46	-53	-59	-64	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	
Area(+10LogA) [8.7 m^2]	9	9	9	9	9	9	9	
Element sound level contribution	34	30	28	21	17	8	-4	23
Element 2 , STL	-27	-27	-27	-38	-46	-50	-57	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	
Area(+10LogA) [1.8 m^2]	3	3	3	3	3	3	3	
Element sound level contribution	39	34	32	22	17	10	-4	26
Receiver								
Room volume(-10LogV) [30 m3]	-15	-15	-15	-15	-15	-15	-15	
Reverberation time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
RT (+10LogT)	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	
Equation Constant	11	11	11	11	11	11	11	
Room sound level	40	35	33	24	20	12	-1	28
Level difference								LpAinc - LpARev,T0
D2m,nT	33	33	33	43	51	55	62	42

** Element descriptions:
#1: Masonry
#2: Glazing

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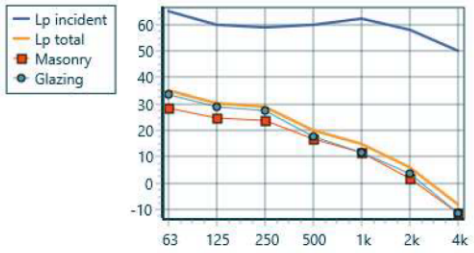
File Name:Type 2 - Bedroom Night LAeq.inz

Comment:



	Octave Band Centre Frequency (Hz)							
Source	63	125	250	500	1k	2k	4k	Overall dBA
Incident sound level (freefield)	65.0	60.0	59.0	60.0	62.0	58.0	50.0	65
Path								
Element 1 , STL	-39	-38	-38	-46	-53	-59	-64	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	
Area(+10LogA) [8.7 m^2]	9	9	9	9	9	9	9	
Element sound level contribution	29	25	24	17	12	2	-11	19
Element 2 , STL	-27	-27	-27	-38	-46	-50	-57	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	
Area(+10LogA) [1.8 m^2]	3	3	3	3	3	3	3	
Element sound level contribution	34	29	28	18	12	4	-11	22
Receiver								
Room volume(-10LogV) [30 m3]	-15	-15	-15	-15	-15	-15	-15	
Reverberation time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
RT (+10LogT)	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	
Equation Constant	11	11	11	11	11	11	11	
Room sound level	35	30	29	20	15	6	-8	24
Level difference								LpAinc - LpARev,T0
D2m,nT	33	33	33	43	51	55	62	41

** Element descriptions:
#1: Masonry
#2: Glazing

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EXTERNAL BUILDING FABRIC NOISE INGRESS CALCULATIONS

Outdoor To Indoor Sound Transmission (v9.0.24)

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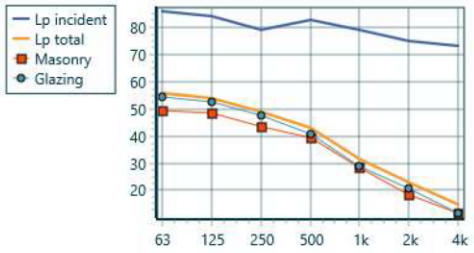
Margin of error is generally within ±3 dB
- Key No. 6570
Job Name:The Plough, 81 Chapel Street, Thatcham, RG18 4JS
Job No.: 20711 Initials:Daniel Green MIOA
Date:17/07/2024
File Name:Type 2 - Bedroom Night-time LAmax.inz

Comment:



Source	Octave Band Centre Frequency (Hz) 63	125	250	500	1k	2k	4k	Overall dBA
Incident sound level (freefield)	86.0	84.0	79.0	83.0	79.0	75.0	73.0	84
Path								
Element 1 , STL	-39	-38	-38	-46	-53	-59	-64	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	
Area(+10LogA) [8.7 m^2]	9	9	9	9	9	9	9	
Element sound level contribution	50	49	44	40	29	19	12	40
Element 2 , STL	-27	-27	-27	-38	-46	-50	-57	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	
Area(+10LogA) [1.8 m^2]	3	3	3	3	3	3	3	
Element sound level contribution	55	53	48	41	29	21	12	43
Receiver								
Room volume(-10LogV) [30 m3]	-15	-15	-15	-15	-15	-15	-15	
Reverberation time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
RT (+10LogT)	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	
Equation Constant	11	11	11	11	11	11	11	
Room sound level	56	54	49	43	32	23	15	45
Level difference								LpAinc - LpARev,T0
D2m,nT	33	33	33	43	51	55	62	39

** Element descriptions:
#1: Masonry
#2: Glazing