AŁN
acoustic design

Belmont Close

Noise Impact Assessment

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1 EXECUTIVE SUMMARY

ALN Acoustic Design Ltd has been appointed to assess the suitability of a site at Belmont Close, Barnet, Enfield, for residential development in accordance with the provisions of the National Planning Policy Framework and the Noise Policy Statement for England.

The main source of environmental noise at the site is plant equipment located at the rear of various commercial premises on Cockfosters Parade. A noise survey has been carried out to establish environmental noise levels at the site. Noise levels of up to 54dB $L_{Aeq,day}$ and 42dB $L_{Aeq,night}$ are expected at the development. The Professional Practice Guidance on Planning and Noise for new residential development indicates a low risk of an adverse effect at the proposed development without mitigation. In the proposed internal arrangement, bedrooms and living rooms are to face away from the commercial units which will help to minimise their exposure to noise.

Calculations have been carried out to derive a suitable sound insulation performance specification for the façade elements in order to achieve internal noise levels in accordance with BS8233:2014 guidelines. The noise implications of the proposed ventilation strategy have been considered. It is concluded that the use of standard thermal double-glazing and a natural ventilation strategy would be consistent with achieving suitable internal noise levels for resting and sleeping.

Noise levels within the external amenity areas are expected to be within BS8233:2014 guidelines.

It is proposed that the residential units will be heated using air-source heat pumps. An assessment has been carried out of the noise emitted by the proposed external units and it is found that the BS4142 noise rating level will be below the background noise level, and therefore unlikely to have a significant impact at neighbouring properties.

It is concluded that the proposed development will provide suitable acoustic conditions for its occupants and will not have a significant noise impact on existing residential receptors.

2 INTRODUCTION

ALN Acoustic Design Ltd has been appointed by Foxglade Properties Ltd to carry out a noise assessment in relation to a proposed residential development on Belmont Close in the London Borough of Enfield.

The site is currently occupied by a block of garages with planted areas to the west and south. It is located at the east of a private development on Belmont Close. There is a row of ground-floor commercial premises to the east of the site on Cockfosters Parade which have flats above. There is an existing house immediately to the south ('The Cottage'). A site location plan is provided in Figure 1.

The proposed development comprises 6no. 2-storey residential units which are to be located above the ground-floor garages. Each of the residential units will have an external terrace on which an air-source heat pump will be located. The proposed roof plan is provided in Figure 2.

This report has been prepared by Arthur Lewis-Nunes MSc who is a corporate member of the Institute of Acoustics.

A glossary of acoustic terminology used in this report is provided in Appendix A.

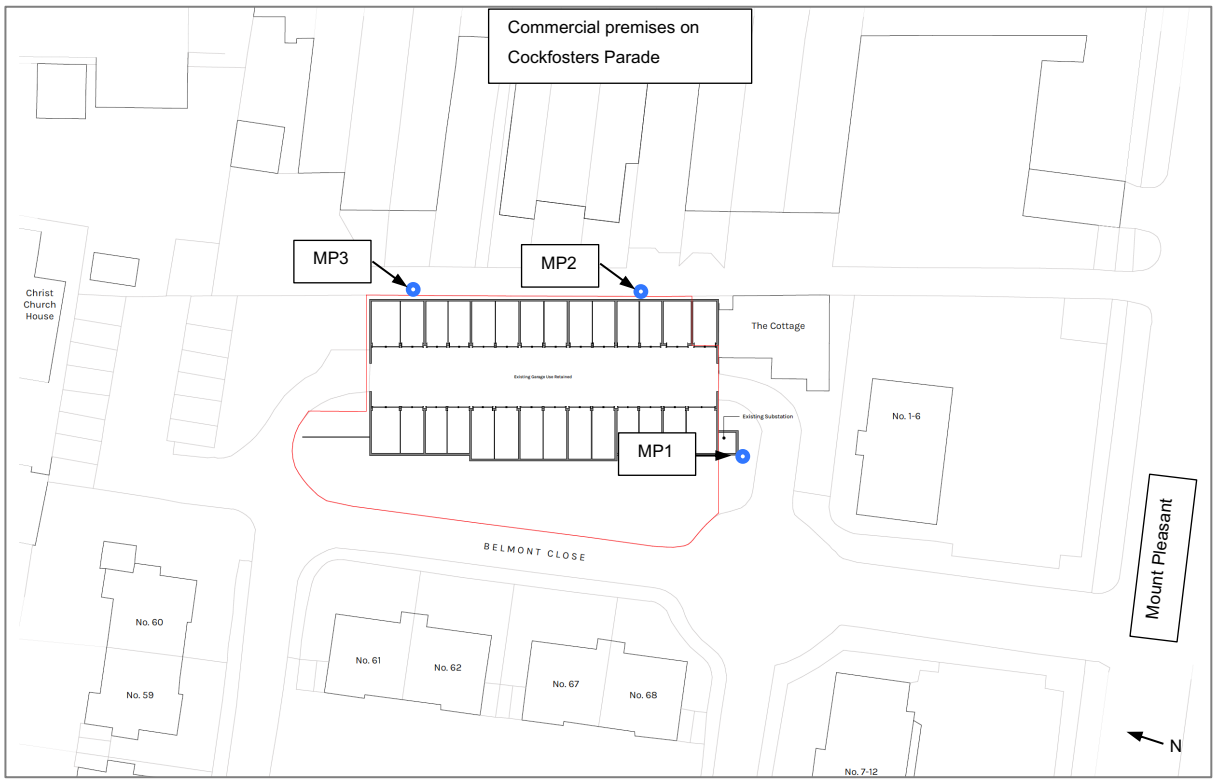

Figure 1: Site location plan

Figure 2: Proposed roof plan

3 PLANNING POLICY & ASSESSMENT CRITERIA

3.1 National Planning Policy Framework

At a national level, government policy in relation to noise sensitive development is set out in the National Planning Policy Framework (NPPF). This document provides a number of broad guiding principles for noise policies which are reproduced below:

174. 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; and

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

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
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;

…

187. 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.

NPPF does not itself prescribe any particular assessment methodology or criteria to assess noise impact, but refers to the Noise Policy Statement for England.

3.2 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) sets out the overarching policy on noise management in England. NPSE sets out three main aims in the context of environmental, neighbour and neighbourhood noise:

- *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.*

Reference is made in the NPSE to the concepts from the field of toxicology of the "*No Observed Effect Level*" (NOEL) and "*Lowest Observed Adverse Effect Level*" (LOAEL) which can be applied to the assessment of noise impact.

NPSE also introduces the "*Significant Observed Adverse Effect Level"* (SOAEL), which is described as being "*the level above which significant adverse effects on health and quality of life occur*". NPSE does not provide a quantitative definition of SOAEL and recognises that the SOAEL is likely to vary depending on the noise source, the receptor and the time in question.

3.3 Planning Practice Guidance

The Planning Practice Guidance for noise, issued by the Department for Levelling Up, Housing and Communities (formerly the Ministry for Housing, Communities and Local Government), expands on the NPPF and NPSE. It states:

Local planning authorities' plan-making and decision taking should take account of the acoustic environment and in doing so consider:

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

It provides examples of behavioural outcomes associated with particular effect levels, including the onset of the SOAEL.

3.4 London Plan

The 'Agent of Change' Policy A13 of the London Plan (2021) describes how the responsibility for mitigating the impact of noise and other nuisances lies with the new, incoming development and is reproduced below.

A The Agent of Change principle places the responsibility for mitigating impacts from existing noise and other nuisance-generating activities or uses on the proposed new noise-sensitive development. Boroughs should ensure that Development Plans and planning decisions reflect the

Agent of Change principle and take account of existing noise and other nuisance-generating uses in a sensitive manner when new development is proposed nearby.

B Development should be designed to ensure that established noise and other nuisance-generating uses remain viable and can continue or grow without unreasonable restrictions being placed on them.

C New noise and other nuisance-generating development proposed close to residential and other noise-sensitive uses should put in place measures to mitigate and manage any noise impacts for neighbouring residents and businesses.

D Development proposals should manage noise and other potential nuisances by:

- *a. ensuring good design mitigates and minimises existing and potential nuisances generated by existing uses and activities located in the area*
- *b. exploring mitigation measures early in the design stage, with necessary and appropriate provisions including ongoing and future management of mitigation measures secured through planning obligations*
- *c. separating new noise-sensitive development where possible from existing noise-generating businesses and uses through distance, screening, internal layout, sound-proofing, insulation and other acoustic design measures.*

E Boroughs should not normally permit development proposals that have not clearly demonstrated how noise and other nuisances will be mitigated and managed.

Policy D14 Noise advises how planning decisions should be used to manage noise and is reproduced below.

A. In order to reduce, manage and mitigate noise to improve health and quality of life, residential and other non-aviation development proposals should manage noise by:

1) avoiding significant adverse noise impacts on health and quality of life

2) reflecting the Agent of Change principle as set out in Policy D13 Agent of Change

3) mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses

4) improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity)

5) separating new noise-sensitive development from major noise sources (such as road, rail, air transport and some types of industrial use) through the use of distance, screening, layout, orientation, uses and materials – in preference to sole reliance on sound insulation

6) where it is not possible to achieve separation of noise-sensitive development and noise sources without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through applying good acoustic design principles

7) promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver.

B. Boroughs, and others with relevant responsibilities, should identify and nominate new Quiet Areas and protect existing Quiet Areas in line with the procedure in Defra's Noise Action Plan for Agglomerations.

3.5 Enfield Development Management Document

Policy DMD 68 of the Enfield Development Management Document (2014) sets out the following requirements and restrictions on developments that may experience significant noise impacts:

1. Developments that generate or would be exposed to an unacceptable level of noise will not be permitted.

2. Developments must be sensitively designed, managed and operated to reduce exposure to noise and noise generation. Particular regard should be had to the following:

1. *Building design (positioning of façades and selection of materials);*
2. *Layout of uses and rooms;*
3. *Positioning of building services;*
4. *Landscaping;*
5. *Sound insulation; and*
6. *Hours of operation and deliveries.*

3. Development involving noise sensitive uses close to sources of significant noise will only be permitted if mitigation measures reduce noise to an acceptable level to safeguard the amenity of future occupiers. Applications must be accompanied by a noise assessment to demonstrate that occupiers/users will not be exposed to unacceptable levels of noise, having regard to relevant noise exposure categories noise standards and corresponding advice.

3.6 BS8233:2014 & World Health Organisation Guidelines

British Standard BS8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings sets out desirable limits for internal ambient noise levels within dwellings from steady external noise sources (see Table 1 below).

Location	Day (07:00-23:00)	Night (23:00-07:00)
Living room	35 dB $L_{Aeq,16hr}$	-
Dining room / area	40 dB $L_{Aeq,16hr}$	-
Bedrooms	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$

Table 1: BS8233 Indoor ambient noise levels

WHO *Guidelines for Community Noise* (1999) provides guidance on suitable internal noise levels within dwellings which are in accordance with the BS8233 recommendations. The WHO Guidelines also recommend that internal noise levels for individual events should not normally exceed 45dB L_{AFmax} more than 10-15 times per night in order to avoid sleep disturbance.

3.7 ProPG: Planning and Noise

The Professional Practice Guidance on Planning and Noise (ProPG) was developed in 2017, jointly by representatives from the Association of Noise Consultants, the Institute of Acoustics and the Chartered Institute of Environmental Health. It is intended to provide guidance to encourage better acoustic design in new residential developments and to protect people from the harmful effects of noise.

ProPG sets out a methodology for an initial assessment of the suitability of sites for residential development and relating levels of risk of adverse effects to the sites' noise exposure level using a scale which is reproduced in Figure 3 below.

The document then describes a 'good acoustic design process', which considers the external noise environment, desirable limits for internal noise levels within the dwellings, the feasibility of reducing noise levels through the building layout, orientation and screening, and reducing noise transmission through the building envelope.

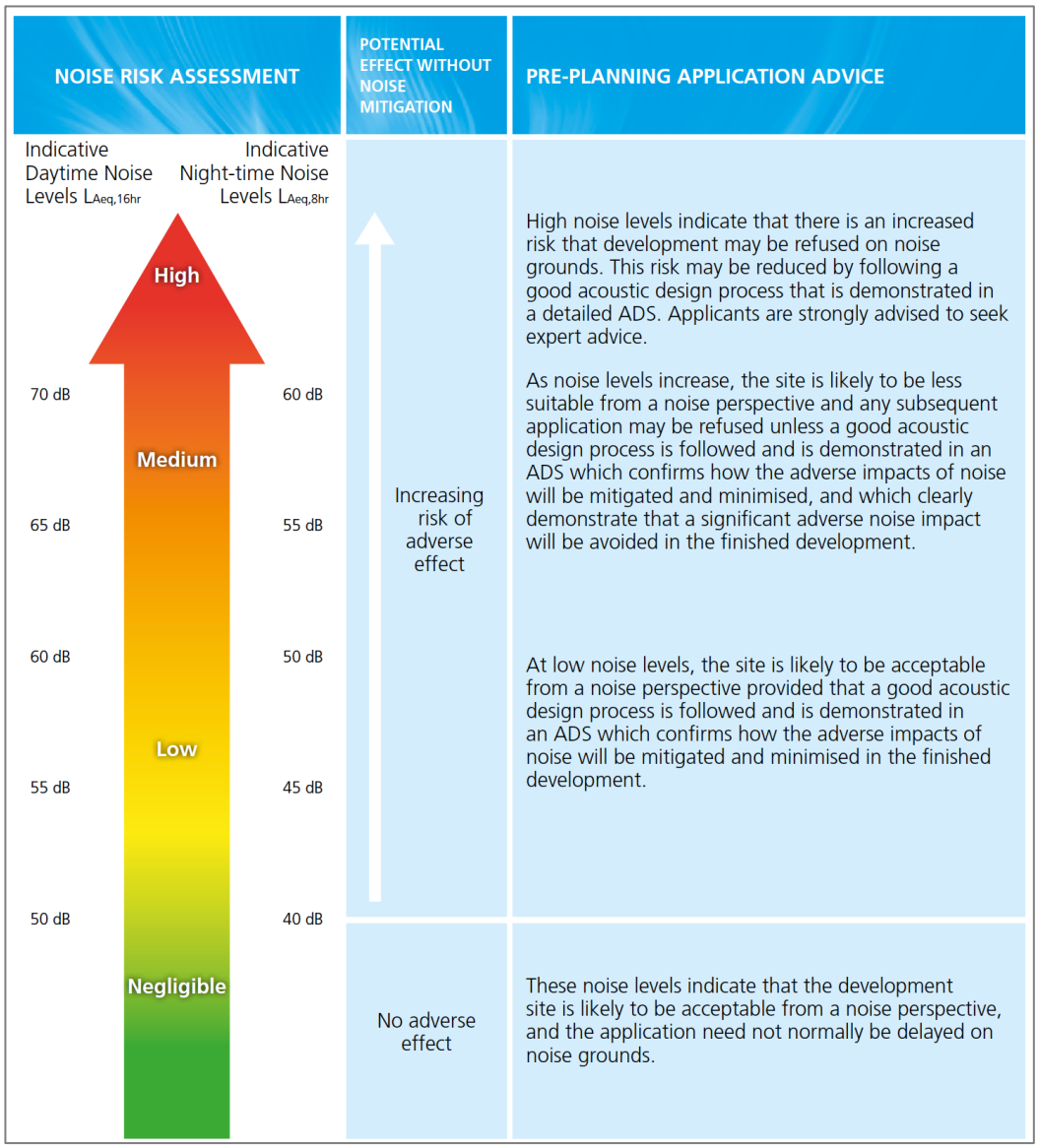

Figure 3: ProPG Initial site noise risk assessment

3.8 Approved Document Part O

Building Regulations Approved Document Part O (2021) sets out the requirements for new residential buildings to mitigate overheating and provides guidance on compliance. The Approved Document states that windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits:

- 40dB $L_{Aeq,T}$ averaged over 8 hours (between 11pm and 7am)
- 55dB L_{AFmax}, more than 10 times a night (between 11pm and 7am).

3.9 British Standard BS4142:2014

BS4142:2014 '*Methods for rating and assessing industrial and commercial sound*' is the current British Standard which provides a well-established methodology for the assessment of the impact of noise from fixed mechanical and electrical plant and equipment.

The degree of adverse impact for a particular noise source is dependent upon factors including the extent by which it exceeds the background noise level, the character of the noise and its time of occurrence.

A 'Rating Level' for the specific source is established, which has been corrected to account for the characteristics of the sound, including having noticeable tonality, being intermittent / impulsive, or having any other distinct characteristics which would make it more noticeable.

Levels of impact are defined in terms of the Rating Level relative to the background noise level, as set out in Table 2 below.

Rating Level relative to background level	Assessment
0dB or less than background	'An indication of the specific sound source having a low impact, depending on context'
5dB or more than background	'Likely to be in indication of an adverse impact, depending on context'
10dB or more than background	'Likely to be in indication of a significant adverse impact, depending on context'

Table 2: BS4142 defined levels of impact

4 NOISE SURVEY

4.1 Methodology

A survey of environmental noise levels was carried out between Wednesday 4th and Thursday 5th October 2023. A weather-protected microphone was mounted on a tripod at a height of approximately 1.4m from the ground in the landscaped areas to the southwest of the existing garages at MP1 (see Figure 1). The survey position is considered to be free-field. The microphone was connected to a Class 1 sound level meter via an extension cable. The sound level meter was set up to automatically record noise levels at consecutive 5-minute intervals throughout the survey period.

Subsequently, attended noise measurements were taken on the access road which serves the rear of the commercial properties on Cockfosters Parade to the east of the site at positions MP2 and MP3. This area is publicly accessible and not sufficiently secure to leave equipment unattended, therefore short-term measurements were carried out over 10-minute periods. The sound levels meter was mounted on a tripod at a height of 1.3m. Both measurement positions were approximately 1m from the wall of the existing garages and were therefore affected by façade reflections.

Further details of the instrumentation used are provided in Appendix B.

Local weather station data indicates that there was no rain and light winds throughout the survey period. The weather conditions are not considered to have had a significant effect on the noise survey results.

4.2 Survey Results

A time-history of the noise survey data is provided graphically in Appendix C. A summary of the unattended noise survey measurement data is presented in Table 3 which sets out the results in terms of the $L_{Aeq,T,}$ and the typical L_{AFmax} and L_{AF90} parameters. The attended survey data is presented in Table 4.

The main noise sources observed at the start and end of the unattended survey period were items of plant equipment at the rear of the commercial premises on Cockfosters Parade and vehicles on Mount Pleasant.

Time Period	$L_{Aeq,T}$ dB	L_{AFmax} dB	L_{AF90} dB
Day (07:00-23:00)	48	-	42
Night (23:00-07:00)	42	60	34

Table 3: Unattended noise survey data summary (MP1)

Measurement Position	$L_{Aeq,T}$ dB	L_{AFmax} dB	L_{AF90} dB
MP2	57	63	57
MP3	50	58	49

Table 4: Attended noise survey data summary

4.3 Analysis

Noise levels at MP2 and MP3 were dominated by a number of items of kitchen extraction equipment associated with the commercial premises on Cockfosters Parade. It was observed that the noise from this equipment was constant and did not change in level during either site visit. It is therefore assumed that the noise level measured occurs continuously throughout the opening hours of the establishments on Cockfosters Parade, i.e. throughout the day and until 22:00 or 23:00 at night. Noise levels at MP2 and MP3 were measured 1m from the existing garage façade, therefore need to be corrected by -3dB to give the free-field level.

There are no other significant noise sources locally, therefore it is expected that the night-time noise levels measured at MP1 are representative of those occurring at MP2 and MP3 after the establishments on Cockfosters Parade have closed.

It is concluded on the basis of the noise survey data and assumptions outlined above that the noise exposure at the worst-case eastern elevation of the proposed development is as set out in Table 5.

Time Period	$L_{Aeq,T}$ dB	L_{AFmax} dB	L_{AF90} dB
Day (07:00-23:00)	54	-	54
Night (23:00-07:00)	42	60	34

Table 5: Unattended noise survey data summary (free-field)

5 ENVIRONMENTAL NOISE ASSESSMENT

5.1 Noise Exposure

The expected environmental noise exposure of the site is 54dB $L_{Aeq,day}$ and 42dB $L_{Aeq,night}$ (see Table 5).

The ProPG assessment scale indicates a **low risk** of an adverse effect at this elevation without mitigation.

5.2 Orientation and Layout

The bedrooms and living rooms are generally located away from the east elevation which is closest to the nearby commercial premises (the main local noise source). There are a small number of bedrooms and living rooms on this elevation, although all of these have at least one of their windows on another elevation facing away from the commercial premises. It is considered that this arrangement will provide effective mitigation against any noise generated at the commercial premises.

5.3 Building Façade Sound Insulation

Based on the incident façade noise levels, the corresponding internal noise levels have been calculated in accordance with BS 8233:2014. The calculations account for the individual room volumes, acoustic absorption provided by basic furnishing and the proposed window sizes.

The calculations have been used to derive a sound insulation performance specification for windows and balcony doors which will comfortably achieve the BS8233:2014 internal noise level recommendations as well as providing a reasonable level of privacy. See Table 4.

Typically, the performance specification could be met with standard thermal double or triple-glazed window units.

Room Type	Windows & Balcony Doors Sound Reduction Index	Trickle Ventilator Sound Element Normalized Level Difference
Bedroom	31(-4)dB R_w (+C_{tr})	29dB $D_{n,e,w}$
Living rooms	31(-4)dB R_w (+C_{tr})	29dB $D_{n,e,w}$

Table 4: Proposed sound insulation performance specification for windows, balcony doors and trickle vents

5.4 Ventilation and Overheating

When windows are opened (e.g. for increased ventilation), higher internal noise levels will inevitably occur. Guidance on the impact of external noise under different ventilation conditions is provided by the Association of Noise Consultant's 'Acoustics, Ventilation and Overheating Residential Design' (AVO) guide. Based on the relatively low levels of noise exposure of the site the AVO guide indicates that risk of adverse effect would be low. Furthermore, the resultant internal noise levels would not reach the threshold at which Approved Document Part O (overheating) advises that residents are likely to close their windows. As noted above, all bedrooms and living rooms will have windows facing away from the commercial premises at which noise exposure will be even lower.

It is therefore concluded that a natural ventilation strategy in which open windows are relied upon to control overheating would be appropriate for the development.

5.5 External Amenity Areas

Noise levels at the roof terraces are expected to be up to 54dB $L_{Aeq,16h}$. This is within the BS8233 upper guideline level for external amenity areas.

6 PLANT NOISE ASSESSMENT

6.1 Plant Equipment

We are advised that it is proposed to install air-source heat pumps (ASHPs) to provide heating to each of the residential units. The external units are to be located on the 2nd floor roof terraces. The exact location on the roof terraces is yet to be finalised, however for the purposes of this assessment it is assumed that the ASHPs will be located adjacent to the external walls at 2nd floor level.

The specification of the ASHPs is yet to be confirmed, although the project M&E consultant has advised that they are likely to be 6kW Mitsubishi Ecodan or similar air to water units.

6.2 Calculation

The resultant noise level due to the operation of the provisionally specified ASHP condenser units has been calculated at the nearest residential receptor (‘The Cottage’). The noise level has been calculated based on the manufacturer’s noise data, accounting for distance attenuation, façade reflections and screening. The individual noise contributions from each ASHP have been combined logarithmically to give an overall calculated noise level of 32dBA when all units are operating simultaneously, as the worst-case scenario. All other properties are at a greater distance and will experience lower noise levels.

Frequency, Hz			63	125	250	500	1000	2000	4000	8000	A
Unit 1 ASHP (PUHZ-W-VAA)	1	units									
SPL 1m, dB			46	49	45	43	40	36	31	23	45
Distance attenuation, dB:	9	m	-19	-19	-19	-19	-19	-19	-19	-19	
Directivity Effects, dB:			3	3	3	3	3	3	3	3	
Screening Effects, dB:											
SPL receptor, dB:			30	33	29	27	24	20	15	7	29
Unit 2 ASHP (PUHZ-W-VAA)	1	units									
SPL 1m, dB			46	49	45	43	40	36	31	23	45
Distance attenuation, dB:	23	m	-27	-27	-27	-27	-27	-27	-27	-27	
Directivity Effects, dB:			3	3	3	3	3	3	3	3	
Screening Effects, dB:			-7	-9	-11	-13	-16	-19	-22	-25	
SPL receptor, dB:			15	16	10	6	0	-7	-15	-26	7
Unit 3 ASHP (PUHZ-W-VAA)	1	units									
SPL 1m, dB			46	49	45	43	40	36	31	23	45
Distance attenuation, dB:	33	m	-30	-30	-30	-30	-30	-30	-30	-30	
Directivity Effects, dB:			3	3	3	3	3	3	3	3	
Screening Effects, dB:			-7	-9	-11	-13	-16	-19	-22	-25	
SPL receptor, dB:			12	13	7	3	-3	-10	-18	-29	4
Unit 4 ASHP (PUHZ-W-VAA)	1	units									
SPL 1m, dB			46	49	45	43	40	36	31	23	45
Distance attenuation, dB:	29	m	-29	-29	-29	-29	-29	-29	-29	-29	
Directivity Effects, dB:			3	3	3	3	3	3	3	3	
Screening Effects, dB:			-7	-9	-11	-13	-16	-19	-22	-25	
SPL receptor, dB:			13	14	8	4	-2	-9	-17	-28	5
Unit 5 ASHP (PUHZ-W-VAA)	1	units									
SPL 1m, dB			46	49	45	43	40	36	31	23	45
Distance attenuation, dB:	18	m	-25	-25	-25	-25	-25	-25	-25	-25	
Directivity Effects, dB:			3	3	3	3	3	3	3	3	
Screening Effects, dB:			-7	-9	-11	-13	-16	-19	-22	-25	
SPL receptor, dB:			17	18	12	8	2	-5	-13	-24	10
Unit 6 ASHP (PUHZ-W-VAA)	1	units									
SPL 1m, dB			46	49	45	43	40	36	31	23	45
Distance attenuation, dB:	10	m	-20	-20	-20	-20	-20	-20	-20	-20	
Directivity Effects, dB:			3	3	3	3	3	3	3	3	
Screening Effects, dB:											
SPL receptor, dB:			29	32	28	26	23	19	14	6	28
Total SPL at receptor, dB			33	36	32	30	27	23	18	9	**32**

Table 6: ASHP noise calculation

6.3 Assessment

Typically modern ASHPs emit noise with a broad-band spectrum, and the manufacturer's acoustic data provides no indication of significant tonality, therefore it is not considered necessary to add any 'character corrections'. The resulting BS4142:2014 noise rating level is 32dBA.

The representative background noise level measured during the 23:00-07:00 night-time period was 34dB L_{AF90} (see Table 3). BS4142:2014 advises that where the plant noise rating level does not exceed the background sound level "*this is an indication of the specific sound source having a low impact, depending on the context*."

It is therefore likely that the noise from the proposed ASHP units will be acceptable and not have any significant adverse impact. It is recommended that a final assessment is carried out when the final plant selections are available.

APPENDIX A - GLOSSARY OF ACOUSTIC TERMINOLOGY

SOUND PRESSURE LEVEL, SPL or L_P

A measure of the pressure caused by a sound wave at a point in space, given by:

$SPL(dB)=20.\log_{10}(\text{Sound Pressure (Pa)}/P_0)$

P_0 is the reference sound pressure of 20μPa, which corresponds to the approximate threshold of hearing at 1kHz.

SOUND POWER LEVEL, SWL or L_W

A measure of is the total sound energy radiated by a source in all directions, given by

$SWL(dB)=10.\log(\text{Sound Power(W)}/W_0)$

W_0 is the reference sound power of 1pW.

EQUIVALENT CONTINUOUS A-WEIGHTED, $L_{Aeq,T}$

The level of a notional continuous sound that contains the same sound energy as the actual fluctuating sound over the time period, T. Weighted over frequencies to approximate the sensitivity curve of human hearing (A-weighted).

BACKGROUND NOISE LEVEL, $L_{AF90,T}$

The A-weighted sound pressure level of a fluctuating sound that is exceed for 90% of the time interval, T.

A-WEIGHTED MAXIMUM NOISE LEVEL, L_{AFmax}

The maximum A-weighted sound pressure level in a given period, measured using the “fast” time constant.

SOUND REDUCTION INDEX, R

The quantity which describes the level by which a material or building element reduces noise transmission at a given frequency, derived from laboratory measurement.

WEIGHTED SOUND REDUCTION INDEX, R_W

Single Integer number found by comparing the measured Sound Reduction Index spectrum with the 'standard' curves for airborne sound insulation, according to a weighting method described in BS EN ISO 717-1.

ELEMENT NORMALIZED LEVEL DIFFERENCE, $D_{n'e'w}$

A measure of the sound reduction of a particular element, with the equivalent area of acoustic absorption in the receiver room normalized to the reference absorption area ($10m^2$).

SPECTRUM ADAPTATION TERMS, C and C_{tr} (dB)

These are the values to be added to D_w, R_w or $D_{n'e'w}$ values to take account of the characteristics of a particular sound spectra. C corresponds to pink noise spectra and C_{tr} corresponds to typical urban traffic noise spectra.

APPENDIX B - NOISE MONITORING EQUIPMENT DETAILS

The measurements were made with an NTi XL2 acoustic analyser, using a GRAS weather protection kit. This equipment complies with BS EN IEC 61672 class 1. The meter used a NTi MC230 free-field response microphone and NTi MA220 microphone pre-amplifier.

The calibration of the sound level meter was checked at the beginning and end of measurements with a Larson Davis CAL200 sound calibrator, complying with BS EN IEC 60942 class 1. No significant calibration deviation occurred.

The table below lists the serial numbers and last calibration dates of the equipment used.

Description	Serial No.	Calibration Date
NTi XL2 Sound Level Meter	A2A-16249-E0	08/09/2023
NTi MC230A Condenser Microphone	A17342	08/09/2023
NTi MA220 Pre-Amplifier	8450	08/09/2023
Larson David CAL200 Sound Calibrator	16795	08/09/2023

APPENDIX C - NOISE SURVEY RESULTS