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Building Services Engineering | Sustainability | Acoustics

The Hoo, Hampstead
Jaga Developments (London) Ltd

Noise Impact Assessment

Revision 02

09/02/2022

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1 Introduction

- 1.1 Plans to remodel 17 Lyndhurst Gardens, Hampstead, London involve the installation of new indoor building services plant. A noise impact assessment has been undertaken in support of the Minor Material Amendment Planning submission for these works.
- 1.2 This report presents an assessment of the noise emission of new building services equipment, based on the findings of an environmental noise survey that has been undertaken at the site. Guidance from the Local Authority (Camden Council) sets down noise thresholds, and these are used to inform the assessment.
- 1.3 The noise survey used to inform the assessment is described in Section 2 of this report along with the results and findings. A discussion of the relevant criteria and assessment methodology is presented in Section 3 and the assessment of noise emission is presented in Section 4.

2 Noise Survey

2.1 Site Description

- 2.1.1 The property known as The Hoo is located at 17 Lyndhurst Gardens, London NW3 5NU. It is a detached property with three neighbouring dwellings immediately to the north and one to the south.
- 2.1.2 Across the road are two schools; Lyndhurst House Preparatory School and Maria Montessori School. These schools may generate intermittent noise on weekdays, but there is no source of significant background noise close to the site.
- 2.1.3 Lyndhurst Road to the north connects A502 and B511 but is not itself a busy road. A labelled map of the area is given in Figure 2.1.



Figure 2.1 Wide site context with neighbours, schools and main roads highlighted

2.2 Measurement methodology

- 2.2.1 Continuous, unattended noise level measurements were conducted at a single location in at the rear (west) of the property. The measurement microphone was positioned at the edge of the site, over 4m from the western building façade.
- 2.2.2 The measurement microphone was secured to a fence post and raised on a pole approximately 3.5m above ground level. The measurement location is shown in Figures 2.2 and 2.3.



Figure 2.2 Aerial photograph of site with measurement position circled

2.2.3 Measurements recorded at this position are considered to be representative of the noise at the nearest neighbour's window due to the global nature of background noise around the site. Due to the height and distance from the nearest wall, the measurement conditions are considered to be free-field.

2.2.4 The measurements were undertaken between 12:00 on Friday 19th November and 16:00 Sunday 21st November 2021. Statistical and spectral data were recorded continuously throughout the measurement period in 15-minute samples.

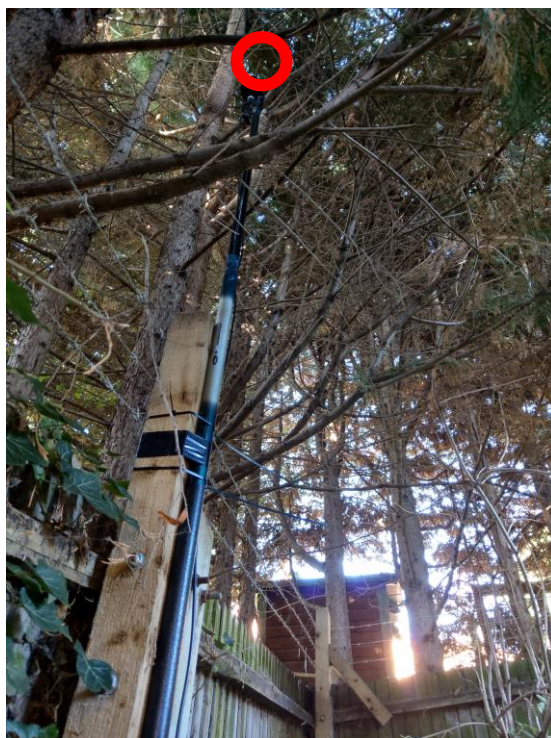


Figure 2.3 Microphone on pole at site perimeter

2.2.5 The following equipment was used for the survey:

Equipment	Type	Serial No.
Norsonic 139	Environmental noise meter	1392774
Norsonic 1218	Microphone protection system	12182561
Norsonic 1251	Calibrator	34926
Brüel & Kjær 4231	Calibrator	2291098

Table 2.1 Equipment list

2.2.6 The calibration of the sound level meter and associated microphone were checked prior to and on completion of the survey in accordance with recommended practice. No significant drift in calibration occurred during the survey. The accuracy of the calibrator can be traced to National Physical Laboratory Standards.

2.2.7 There was no rainfall during the survey. Weather data from a nearby station is available at [wunderground.com: https://www.wunderground.com/dashboard/pws/ILONDO416/graph/2021-11-19/2021-11-19/weekly](https://www.wunderground.com/dashboard/pws/ILONDO416/graph/2021-11-19/2021-11-19/weekly). The weather is not considered to have had an adverse impact on the results of the survey.

2.3 Measurement Results

2.3.1 The lowest background noise levels measured during the daytime and night-time are shown in Table 2.2.

Time period	Background noise level
Daytime (07:00-19:00)	30 dB $L_{A90,15min}$
Night-time (23:00-07:00)	29 dB $L_{A90,15min}$

All values are sound pressure levels in dB re: 2×10^{-5} Pa

Table 2.2 Summary of lowest measured background noise levels

2.3.2 A graph summarising the noise level history for the measurements is given in Figure 2.3.

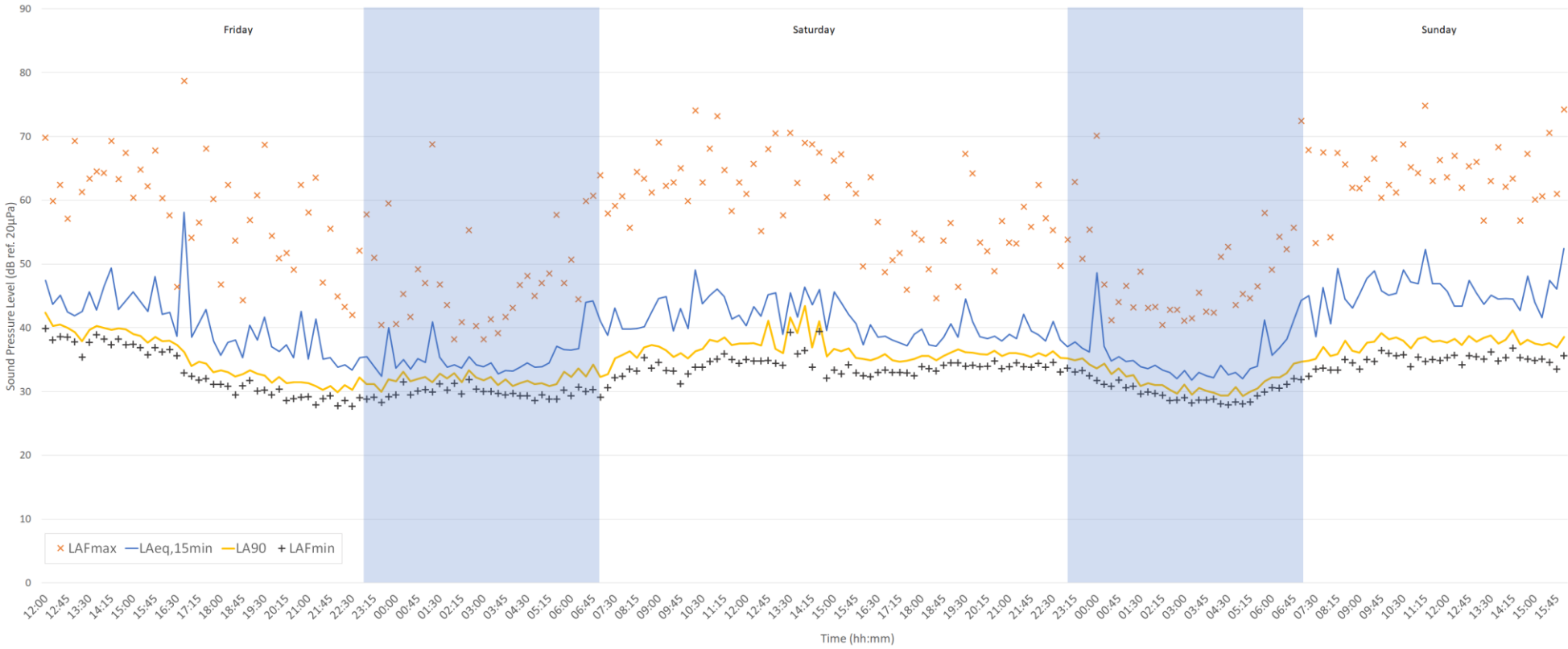


Figure 2.3 External noise levels, Friday 19 - Sunday 21 November 2021

2.4 Commentary

- 2.4.1 Middle-distant road traffic is the primary noise source at the site. This exists as a relatively constant low-level noise from distant roads with occasional vehicle movements on Lyndhurst Gardens.
- 2.4.2 The predicted 'school run' on Friday afternoon did not generate a significant amount of noise at the measurement position; audio recordings gathered automatically during the survey indicate a steady acoustic environment throughout.
- 2.4.3 Diurnal variation in noise level at the site is minimal. The lowest measured night-time L_{A90} is only 1dB lower than the equivalent daytime level.

3 Assessment Methodology

3.1 Local Authority Criteria

3.1.1 The Local Authority’s planning policies are set down in the *Camden Local Plan 2017*.

3.1.2 Policy A4 of the Local Plan addresses the issue of noise and vibration and reads:

“The Council will seek to ensure that noise and vibration is controlled and managed. Development should have regard to Camden’s Noise and Vibration Thresholds (Appendix 3). We will not grant planning permission for: a. development likely to generate unacceptable noise and vibration impacts; or b. development sensitive to noise in locations which experience high levels of noise, unless appropriate attenuation measures can be provided and will not harm the continued operation of existing uses. We will only grant permission for noise generating development, including any plant and machinery, if it can be operated without causing harm to amenity. We will also seek to minimise the impact on local amenity from deliveries and from the demolition and construction phases of development.”

3.1.3 The noise thresholds from Appendix 3 of the Local Plan are presented below:

“A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 ‘Methods for rating and assessing industrial and commercial sound’ (BS 4142) will be used. For such cases a ‘Rating Level’ of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion.”

Table C: Noise levels applicable to proposed industrial and commercial developments (including plant and machinery)

Existing Noise sensitive receptor	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings**	Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)	Day	‘Rating level’ 10dB* below background	‘Rating level’ between 9dB below and 5dB above background	‘Rating level’ greater than 5dB above background
Dwellings**	Outside bedroom window (façade)	Night	‘Rating level’ 10dB* below background and no events exceeding 57dBL _{Amax}	‘Rating level’ between 9dB below and 5dB above background or noise events between 57dB and 88dB L _{Amax}	‘Rating level’ greater than 5dB above background and/or events exceeding 88dBL _{Amax}

Figure 3.1 Camden Local Plan Noise Thresholds

3.1.4 The Green, Amber, Red system used in Table C of the Local Plan draws from guidance given in the National Planning Policy Framework, evaluating noise in terms of “effect levels”, as shown in Table 3.1:

Category	Definition
Green	Lowest Observed Adverse Effect (LOAEL) where noise is considered to be at an acceptable level.
Amber	Lowest to Significant Observed Adverse Effect Level (LOAEL – SOAEL) where noise is observed to have an adverse effect but which may be considered acceptable.
Red	Significant Observed Adverse Effect Level (SOAEL) where noise is observed to have a significant adverse effect.

Table 3.1 'Effect levels' described in the National Planning Policy Framework and Noise Policy Statement for England

3.2 Proposed assessment methodology: BS 4142:2014

3.2.1 BS 4142:2014 *Methods for Rating and assessing industrial and commercial sound* presents a method of rating noise levels by comparing the noise level of a new source (the Specific sound level) with the existing background noise level in the area in the absence of the new source (the Background sound level).

3.2.2 The methodology requires consideration be given to all aspects of the assessment process and it must also account for any unusual acoustic features, such as tonal, impulsive, or intermittency characteristics, by the addition of various decibel corrections to the Specific sound level. This corrected Specific sound level is the Rating level.

3.2.3 The greater the positive difference between the Rating level and the Background sound level, the greater the magnitude of the impact. BS 4142:2014 gives the following descriptions with regards to the potential impact:

- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending upon the context.
- A difference of around +5db or more is likely to be an indication of an adverse impact, depending upon the context.
- Where the Rating level does not exceed the background sound level, this is an indication of a low impact, depending upon the context.

3.3 Summary

- 3.3.1 The methodology within BS 4142 will be adopted for assessment of plant noise associated with the development.
- 3.3.2 In order to satisfy the Green (LOAEL) requirements of the Local Authority all plant will need to be selected or controlled so that the Rating sound level arising from equipment is at least 10dB below the Background sound level at the nearest noise-sensitive neighbour.
- 3.3.3 In the event this cannot be met, the Rating sound level must be no more than the Background sound level at the neighbouring window, in accordance with the 'low impact' categorisation in BS 4142. This would be classified as Amber within the Noise Thresholds of the Local Plan, and so would need to be agreed to by the Local Authority.

4 Noise Impact Assessment

4.1 Introduction

4.1.1 To assess the potential noise impact from building services plant associated with the proposed development, consideration has been given to the objective requirements of Camden Council, alongside the type and location of the plant and the location of noise sensitive neighbours.

4.2 Equipment proposals

4.2.1 The mechanical services equipment proposed for the development consists of one MVHR unit (Nuair MRXBOX-AB) and one VRF condenser unit (Mitsubishi PUMY-P200YKM2). These are to be located in a small plant room.

4.2.2 The Hoo is to be divided into separate dwellings as shown in Figure 4.1. The plant room is to be within the pitched roof of the Annexe, with louvred dormer windows on either side. The north window is to be used for intake and the south for exhaust. The plant will serve the link only.



Figure 4.1 Layout of separate buildings within The Hoo

4.2.3 Manufacturer’s data for the Mitsubishi PUMY-P200YKM2 VRF unit is provided in Figure 4.2. This unit will have a sound pressure level of 56 dBA when measured at 1m in cooling mode.

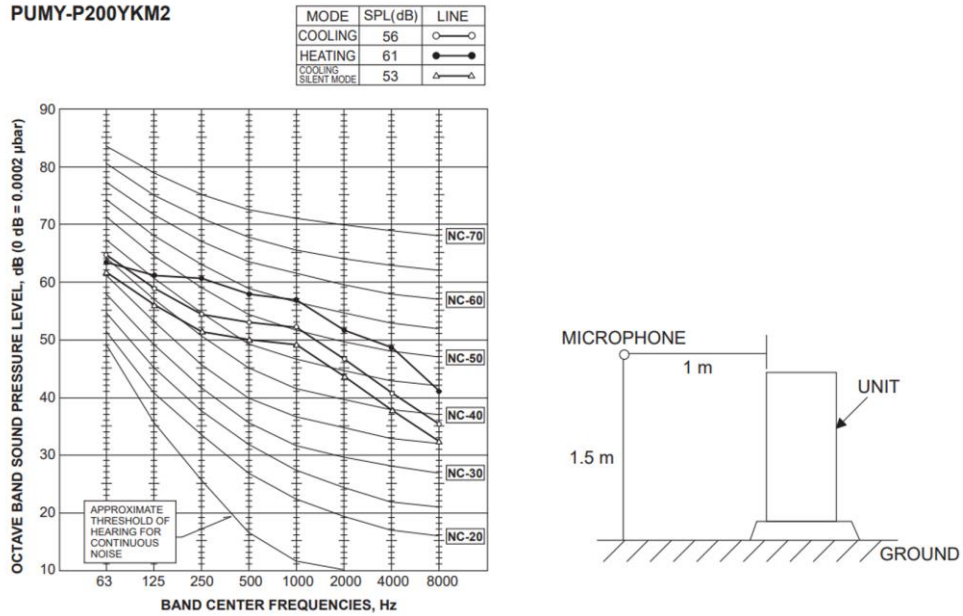


Figure 4.2 Manufacturer’s data and measurement diagram for the VRF unit

4.2.4 Manufacturer’s data for the Nuair MRXBOX-AB in its specified use condition is shown in Figure 4.3.

	Sound Power Levels dB re 1pW (Frequency Hz)								dBA @3m
	63	125	250	500	1k	2k	4k	8k	
Open inlet	44	48	45	43	37	33	19	<16	
Open outlet	51	58	58	55	49	47	38	31	
Breakout	50	55	54	44	36	29	17	<16	30

Figure 4.3 Manufacturer's data for the MVHR unit

4.2.5 A plenum constructed within the plant room will separate intake and exhaust. The MVHR's inlet unit is to use a one-metre long duct to reach the plenum, while its outlet is expected to be open.

4.2.6 The current proposals include 300mm deep acoustic louvres at both dormer windows. Due to the louder equipment and proximity to neighbours, the north window requires a louvre with greater attenuation. The performance required is summarised in Table 4.1.

Frequency	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
North louvre, dB <i>R</i>	7	10	17	29	30	27
South louvre, dB <i>R</i>	6	7	9	13	15	14

Table 4.1 Performance specification for plant room louvres

4.3 Noise-sensitive neighbours

- 4.3.1 According to the requirements of the Camden Local Plan, the Rating level during the daytime must be assessed at the 'Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)', and during the night-time must be assessed outside a bedroom window.
- 4.3.2 The nearest noise-sensitive receiver will be the eastmost bedroom window within the Annexe, which is directly below the plantroom. As this is to be let as a separate residence to the Link, which the plant serves, it is considered to be a neighbour. A brick wall, running parallel to the Annexe's north façade, will reflect sound from the plant room towards the Annexe bedroom window below.
- 4.3.3 For propagation calculations, a mirror image of the source has been imagined behind the brick wall. A simplified diagram of this, using a section drawing of the Link building, is given in Appendix 1 of this report.
- 4.3.4 Nearby properties will also be assessed to ensure compliance with expected planning requirements. During the daytime (0700-2300hrs), the south edge of the garden at 21 Lyndhurst Road will be assessed. This is approximately 7 metres from the nearest louvre of the proposed plant room. During the night time (2300-0700hrs), the furthest east window at the rear of 22 Lyndhurst Road will be assessed. This is approximately 24 metres from the near edge of the proposed plant room.

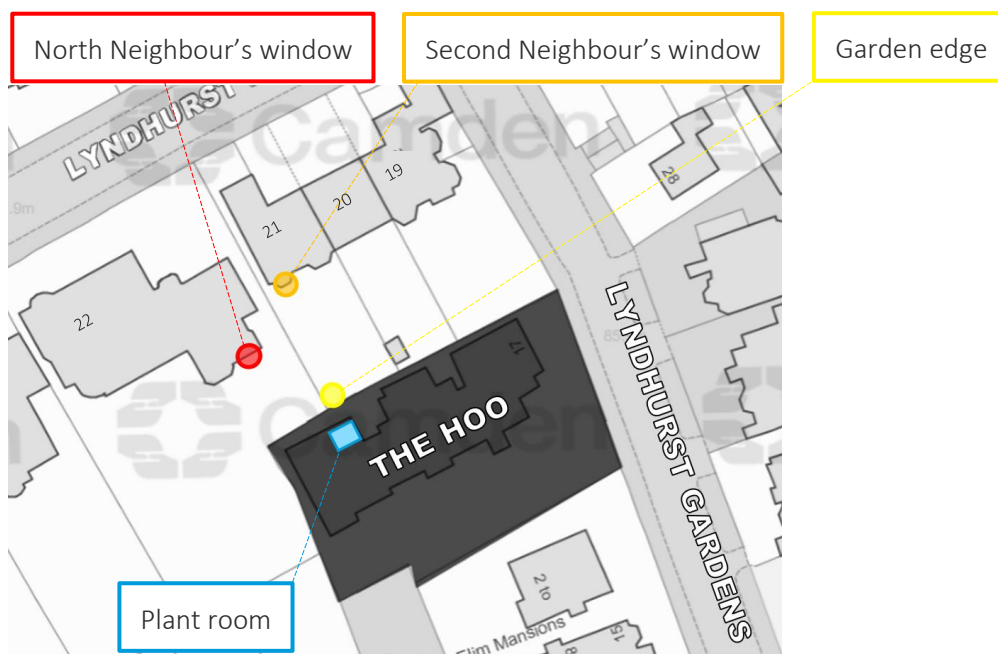


Figure 4.4 Site plan with neighbours annotated. For clarity, the Annexe bedroom (directly below the plant room) is excluded.

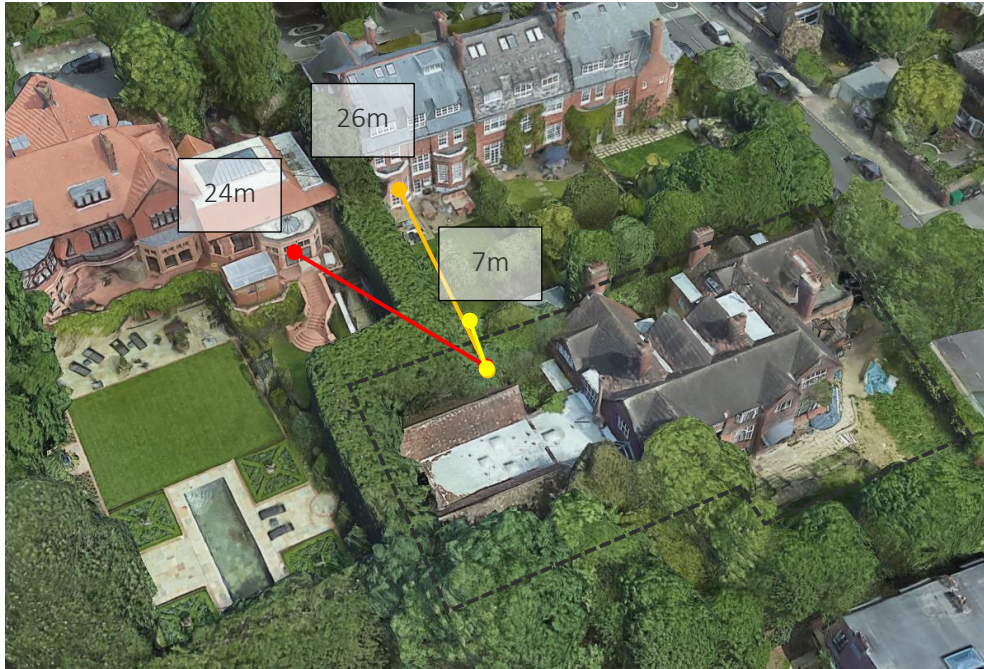


Figure 4.5 Aerial photograph (from Google Earth) showing nearest neighbours and plan distances

4.4 Predicted Specific sound levels

- 4.4.1 It has previously been specified that the heat pumps will operate in cooling mode only but could operate during the daytime and night-time.
- 4.4.2 The predicted Specific levels are given in Table 4.2.

Assessment location	Specific level, dB L_{Aeq}
Annexe window	22
Neighbouring garden edge	27
22 Lyndhurst Road window	16

Due to the low specific level at 22 Lyndhurst Road, the window at 20 Lyndhurst Road, which is further away, has not been included.

Table 4.2 Specific noise levels by location (all values are given in dB re: 20µPa)

4.5 Predicted Rating levels

- 4.5.1 To establish the Rating level in accordance with the methodology in BS 4142:2014, the Specific sound level is corrected to account for any acoustic features that may be present in the equipment noise. If such features are considered to be present, then various corrections are applied to the Specific sound level to give the Rating level.
- 4.5.2 A correction of +2dB has been applied, given that there is some possibility that there will be a perceivable tonal feature.
- 4.5.3 The unit operates with a continuous noise level so corrections for impulsivity and intermittency have not been applied.
- 4.5.4 The Rating level is therefore 2dB higher than the Specific sound level.

4.6 Background sound level

4.6.1 The background sound levels has been taken as the lowest background noise level measured during the survey. The lowest background noise level recorded during the survey was 29dB $L_{A90,15min}$ during the night-time and 30dB $L_{A90,15min}$ during the daytime.

4.6.2 A summary of the assessed and calculated levels is given in Table 4.3.

Design Period	Receiver location	Background level, dB $L_{A90,15min}$	Rating level, dB L_{Ar}	Difference
Daytime	Annexe window	30	24	-6
	Neighbouring garden edge	30	29	-1
Night-time	Annexe window	29	24	-5
	North neighbour's window	29	18	-11

Table 4.3 Assessment summary for daytime and night-time assessment.

4.7 Comparison with planning requirements

4.7.1 Interpretation of the guidance from the Local Authority presented in Section 3 concludes the following:

4.7.2 The Rating level at all receivers, from 2300-0700hrs, must be no greater than 19dB L_{Ar} for Green rating according to the Local Authority, and no greater than 29dB L_{Ar} for a 'low impact' according to BS 4142:2014. From 0700-2300hrs, this rises to 20dB L_{Ar} and 30dB L_{Ar} respectively.

4.7.3 The Rating level at the Annexe window is 6dB below the background noise level during the day, and 5dB below the background noise level during night-time.

4.7.4 The Rating level at the neighbouring garden is 1dB below the daytime background noise level. These levels fall within the Amber category of the Local Plan. Guidance given in BS 4142:2014 suggests this will have a 'low impact, depending on context'.

4.8 Context

- 4.8.1 The existing acoustic environment at the site and at the neighbouring properties is quiet, with no sources of noise that may be considered similar to that of the proposed plant. Considering that the noise is likely to be distinctive against the prevailing background sound, greater importance must be placed on reducing noise emissions below the background level.
- 4.8.2 Propagation calculations to the Annexe bedroom window have assumed a direct sound path between the mirror-image source and the receiver. In practice, it is expected that a combination of physical effects (most importantly the directionality of the source, the limited size of the reflective wall, and interfering reflections from the building itself) will further reduce the level reaching the window. To estimate these effects, which may be known as *partial visibility*, a conservative value of 6dB has been deducted.
- 4.8.3 The resulting Rating level of the plant at the Annexe window, 24 dB L_{Ar} , falls within the Amber category specified within the Camden Local Plan. In practice, this is unlikely to be perceptible within the bedroom.
- 4.8.4 A typical cautious estimate for sound attenuation provided by an open window is 10 dB. [1] The resulting Rating level of the equipment inside the Annexe bedroom - 14 dB L_{Ar} - falls far below typical ambient noise levels in most spaces. BS 8233:2014, *Guidance on sound insulation and noise reduction for buildings*, provides recommended levels for noise levels in buildings. Section 7.7.2 of BS 8233, concerned with internal ambient noise levels for dwellings, recommends that bedrooms do not exceed 30 dB $L_{Aeq,8hour}$ overnight. [2]

5 Conclusions

- 5.1.1 An assessment has been undertaken of the noise from proposed plant associated with the remodelling of the property at 17 Lyndhurst Gardens. The assessment has been undertaken in line with guidance provided by Camden Council.
- 5.1.2 It has been established that the current equipment proposals would generate noise that is within the *Green* threshold advised by the Local Authority when assessing the noise to windows of neighbouring properties, and within the *Amber* range at neighbouring gardens and at the Annexe window. In all assessment conditions, the equipment is predicted to have a low impact, in line with guidance given in BS 4142:2014.
- 5.1.3 It is concluded that noise levels can be controlled in line with the expected requirements of the Council, provided noise control measures achieving or exceeding the given performances are implemented successfully.

6 References

- [1] T. Waters-Fuller and D. Lurcock, "Open/Closed Window Research; Sound Insulation Through Ventilated Domestic Windows," The Building Performance Centre, Napier University, Edinburgh, 2007.
- [2] BSI Technical Committee B/564 Subcommittee EH/1/6, *BS 8233:2014. Guidance on sound insulation and noise reduction for buildings*, BSI Standards Limited, 2014.

7 Appendices

7.1 Appendix 1

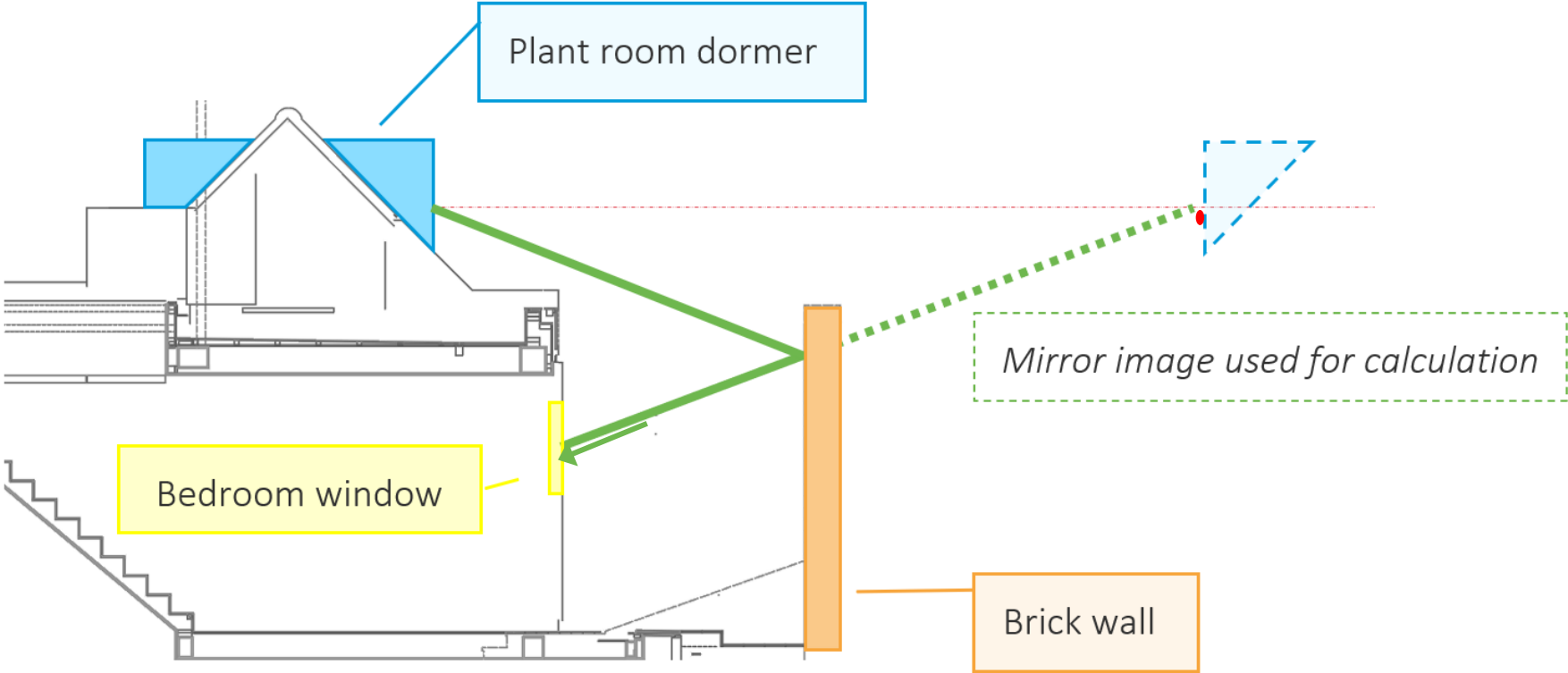


Figure 7.1 Diagram of propagation calculation from plant room to Annexe bedroom window

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