

**PROPOSED NEW ROOFTOP AIR HANDLING UNIT
MATERNITY UNIT (SOUTH), ROYAL BERKSHIRE HOSPITAL, READING**

NOISE ASSESSMENT

On behalf of:
Gray Baynes + Shew



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1. INTRODUCTION

- 1.1 Hepworth Acoustics was commissioned by Gray Baynes + Shew to carry out a noise impact assessment in connection with a planning application for the installation of a new air handling unit (AHU) at the south end of the on the rooftop of the maternity unit of Royal Berkshire Hospital at Craven Road, Reading.
- 1.2 The proposed new plant is to be located towards the southern part of the Level 7 flat roof of the Maternity building, adjacent to the south of an existing rooftop plant room.
- 1.3 The fresh air intake of the supply air system is to be fitted with a set of downward arcing cowls and is to be oriented north, in proximity to south elevation of the rooftop plant room.
- 1.4 The extract system will exhaust to atmosphere towards the south.
- 1.5 At this stage, no additional provision has been made for incorporation of atmosphere-side attenuators to the intake and exhaust duct terminations
- 1.6 The plant will be mounted on a new framework, raising the equipment off the existing roof surface by about 1.2m.
- 1.7 It is understood that the proposed plant will have the potential to operate 24-hours a day.
- 1.8 The nearest residential property to the proposed plant is understood to be at No.25 Craven Road. This single-storey property is located at a minimum distance of ~110m laterally from the proposed plant, to the south of the maternity unit building and to the opposite side of the road.
- 1.9 The site location and nearest residential premises are identified in Figure 1.
- 1.10 The proposed AHU layout is shown in Figure 2.
- 1.11 The noise assessment has included:
 - An inspection of the site and environs;
 - A survey of the existing noise climate at the site during a representative worst-case period;
 - Assessment of the potential noise impact on the proposed plant.
- 1.12 The various acoustics indices referred to in this report are described in Appendix I. All noise levels in the text have been rounded to the nearest decibel as fractions of a decibel are imperceptible.

2. BASELINE NOISE SURVEY

- 2.1 A baseline noise survey was undertaken at the site in the early night-time, over a continuous 2-hour period commencing at 2315hrs on Tuesday 27 January 2026, to determine prevailing ambient/background noise levels at the nearest noise sensitive property to the proposed plant.
- 2.2 As the proposed plant will have the potential to operate 24-hours a day, this survey period is considered to represent the most sensitive period and hence forms a suitable basis for robust assessment.
- 2.3 Noise measurements were undertaken in 15-minute samples at a single location, identified in Figure 1, immediately adjacent to the nearest residence at No.25 Craven Road.
- 2.4 The noise measurements were undertaken using a NTi Audio XL2-TA 'Class 1' sound analyser (serial no. A2A-23512-E1). Calibration checks were carried out using a Norsonic Acoustic Calibrator, Type 1251 (serial no. 20804) before and after the survey, and no variation in calibration level was observed.
- 2.5 The measurement microphone was fitted with a windshield and mounted at about 3m above local ground to eliminate potential reflections from nearby surfaces, and hence in free-field conditions. The weather during the survey was dry and calm, with windspeeds typically below 4m/s.
- 2.6 The measured noise levels are set out in Table 1.

Table 1: Measured Noise Levels

Time	Noise Level (dB)	
	$L_{Aeq,15min}$	$L_{A90,15min}$
2315 – 2330hrs	55	52
2330 – 2345hrs	55	52
2345 – 0000hrs	56	52
0000 – 0015hrs	55	52
0015 – 0030hrs	55	52
0030 – 0045hrs	54	52
0045 – 0100hrs	55	52
0100 – 0115hrs	53	52

- 2.7 The measured background noise levels (L_{A90}) were generally due to existing hospital building services plant noise emissions, from the south, i.e. mostly from around the vicinity of the Maternity building. Ambient noise (L_{Aeq}) was also attributable to vehicular activity, including buses and taxis, on Craven Road.
- 2.8 The background noise level was steady at **52dB L_{A90}** .

3. ACOUSTIC CRITERIA

NPPF / NPSE

- 3.1 The *National Planning Policy Framework* (NPPF), December 2024, states at paragraph 187 that *“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 ... noise pollution ...”*.
- 3.2 Paragraph 198 states that *“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 ...”*.
- 3.3 The Noise Policy Statement for England (NPSE) 2010, as referred to in the NPPF, includes three aims:
- Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
 - Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
 - Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- 3.4 However, there is as yet no specific guidance on numerical acoustic assessment/design criteria provided in the NPPF, accompanying Technical Guidance document, National Planning Practice Guidance ‘Noise’, nor the NPSE.

BS 4142

- 3.5 British Standard 4142: 2014 +A1:2019, *Methods for rating and assessing industrial and commercial sound* provides methods for rating and assessing sound of an industrial nature from industrial or commercial premises.
- 3.6 This requires the sound from a specific source (in L_{Aeq}) to be compared with the existing background sound level (L_{A90}) outside residential locations. The standard also puts weight on the importance on the context in which the sound will occur.

- 3.7 The noise 'rating' level ($L_{A,r,T}$) is derived based on the 'specific' L_{Aeq} sound level attributable to the operation with an 'acoustic feature' penalty added for any sound sources which give rise to tonal, impulsive, intermittent, or other characteristics readily distinctive against the residual acoustic environment.
- 3.8 BS 4142 stipulates that impacts should be assessed over a reference time interval 'T' of 1-hour during the daytime (0700-2300hrs) and 15-minutes during the night-time.
- 3.9 An initial estimate of the impact of the operation is determined by subtracting the background level from the 'rating' level. BS 4142 states that:
- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context
 - A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context
 - Where the '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
- 3.10 Where the initial estimate of the impact needs to be modified due to the context, BS 4142 states that all pertinent factors should be taken into account in determining whether the initial estimate of the impact needs to be modified, including:
- The absolute level of noise
 - The character and level of the residual noise
 - The sensitivity of the receptor

4. NOISE ASSESSMENT

- 4.1 Noting the prevalence of existing hospital plant noise at the nearest residences to the proposed plant on Craven Road, and notwithstanding the stated provisions of BS 4142, it is considered appropriate in this case to adopt a design 'rating' limit of 10dB below the existing background noise level. This represents a particularly robust approach.
- 4.2 Given the background noise level of 52dB L_{A90} , a plant noise rating level limit of up to **42dB $L_{Ar,Tr}$** therefore applies in this case.
- 4.3 Manufacturer's noise emissions data for the proposed AHU has been provided. This includes specific octave band sound power levels for the exhaust termination and also for case radiated noise. Specific data for the fresh air intake opening is absent from the published data, however suitably robust assumptions have been applied based on the wider set of data provided by the manufacturer. It is noted that intake sound power levels are invariably lower than corresponding exhaust values, primarily due to the direction air flow in each case.
- 4.4 The reference source noise data is provided in Table 2.

Table 2: AHU Sound Power Level Data

Component	Sound Power Level dB L_w								A wtd
	Octave Band Centre Frequency Hz								
	63	125	250	500	1k	2k	4k	8k	
Exhaust	83	90	85	87	83	80	77	74	89
Intake	77	90	83	79	75	72	67	67	82
Casing	73	78	70	61	55	54	51	39	66

- 4.5 From the proposed rooftop location, it is expected that there will just be no direct line-of-sight from the plant to the nearest residence at No. 25 Craven Road, which is single storey. Indeed, the neighbouring residences at Nos. 27-31 Craven Road are also single storey. However further south, at Nos. 33-35 Craven Road there is a 3-storey apartment block which, although somewhat further away from the proposed plant, may have some limited line-of-sight to the plant from upper floors.
- 4.6 Accordingly, to ensure a robust assessment, no inclusion for acoustic screening has been included in the calculation of plant noise propagation to the nearest residences for the exhaust duct and case radiated noise. However, for the intake, which is located further to the north, and is oriented northwards with airflow directed downwards by way of proposed cowls, a conservative overall 10dB(A) acoustic screening correction has been applied.
- 4.7 Due to the fairly large proposed cross-sectional area of the exhaust and intake openings, only very limited end reflection losses would be anticipated, limited to 1-2 dB in the lowest frequency bands only. Accordingly, no account of this potential attenuation has been considered.

- 4.8 Further limited attenuation is likely due to the directivity of the noise emissions, noting that the nearest residences are at an approximate 30° off axis to the exhaust duct termination. Again, however, this is likely to be limited by the size of the duct, and hence no allowance has been taken for this to ensure a robust assessment.
- 4.9 For the intake opening, directivity factors will be more significant, however for a cautious approach no additional correction to the acoustic screening correction described above has been taken in this case.
- 4.10 In view of the foregoing, there are no frequency-dependent factors to the plant noise calculations, and hence this has been carried out based on overall A-weighted values, based on a distance of 110m for all items, and assuming hemi-spherical radiation.
- 4.11 The calculation is set out in Table 3.

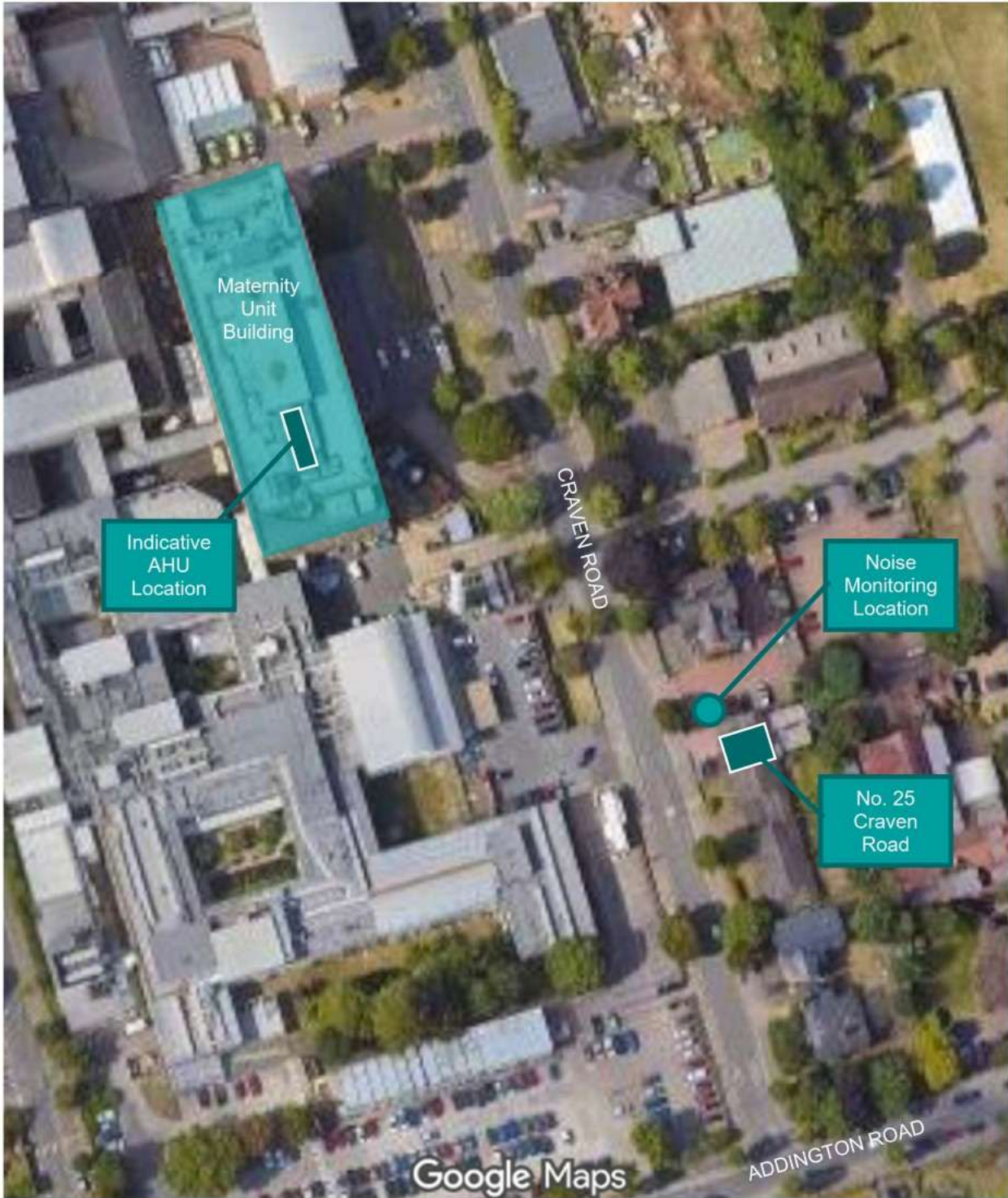
Table 3: Specified MVHR Duct Attenuator Insertion Losses

	Component		
	Exhaust	Intake	Casing
Source Sound Power Level, dB L_{WA}	89	82	66
Distance Correction (based on 110m, incorporating -8dB correction for hemispherical radiation)	-49	-49	-49
Acoustic Screening Correction	0	-10	0
Sound Pressure Level at Nearest Residence dB $L_{Aeq,T}$	40	23	17

- 4.12 Based on the above, as would be expected based on normal AHU noise emissions and the proposed installation, the overall plant noise will be dictated by the exhaust termination, i.e. noise components from the intake and casing will not contribute to the overall value, which is hence predicted to be **40dB $L_{Aeq,T}$**
- 4.13 In terms of acoustic characteristics of the proposed plant, the noise emissions will be steady and continuous with no impulsive or tonal features. Therefore the 'rating' level, as defined in BS 4142 will be **40dB $L_{Ar,Tr}$** .
- 4.14 The predicted 'rating' level is therefore more than 10dB below the prevailing background noise level at the nearest residence, without additional mitigation and attenuation and based on a highly conservative set of assumptions. This is therefore within the recommended noise limit.

5. SUMMARY

- 5.1 Hepworth Acoustics was commissioned by Gray Baynes + Shew to carry out a noise impact assessment in connection with a planning application for the installation of new air handling unit (AHU) on the rooftop at the south end of the maternity unit of Royal Berkshire Hospital, Craven Road, Reading.
- 5.2 An assessment has been carried out based on the results of a baseline noise survey at the site, manufacturers' technical data for the noise emissions from the proposed plant, and upon a highly cautious interpretation of the provisions of the relevant British Standard.
- 5.3 It has been demonstrated that the proposed plant will not result in any unacceptable noise impact at nearby residences, without the need for additional noise mitigation measures.

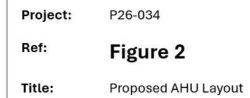


Key:

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Project: P26-034
Ref: **Figure 1**
Title: Site Location

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APPENDIX A: ACOUSTICS UNITS & INDICES

Sound and the decibel

A sound wave is a small fluctuation of atmospheric pressure. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. In order to cope with this wide range of pressure variations, a logarithmic scale is used to convert the values into manageable numbers. Although it might seem unusual to use a logarithmic scale to measure a physical phenomenon, it has been found that human hearing also responds to sound in an approximately logarithmic fashion. The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120dB (threshold of pain).

Due to the logarithmic nature of decibels, when two noises of the same level are combined together, the total noise level is (under normal circumstances) 3 dB(A) higher than each of the individual noise levels e.g. 60 dB(A) plus 60 dB(A) = 63 dB(A). In terms of perceived 'loudness', a 3 dB(A) variation in noise level is a relatively small (but nevertheless just noticeable) change. An increase in noise level of 10 dB(A) generally corresponds to a doubling of perceived loudness. Likewise, a reduction in noise level of 10 dB(A) generally corresponds to a halving of perceived loudness.

The ear is not equally sensitive to sound at all frequencies. It is less sensitive to sound at low and very high frequencies, compared with the frequencies in between. Therefore, when measuring a sound made up of different frequencies, it is often useful to 'weight' each frequency appropriately, so that the measurement correlates better with what a person would actually hear. This is usually achieved by using an electronic filter called the 'A' weighting, which is built into sound level meters. Noise levels measured using the 'A' weighting are denoted dB(A) or dBA.

Frequency and Hertz (Hz)

As well as the loudness of a sound, the frequency content of a sound is also very important. Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or hertz (Hz). Sometimes large frequency values are written as kiloHertz (kHz), where 1 kHz = 1000 Hz.

Young people with normal hearing can hear frequencies in the range 20 Hz to 20 kHz. However, the upper frequency limit gradually reduces as a person gets older.

Glossary of Terms

When a noise level is constant and does not fluctuate, it can be described adequately by measuring the dB(A) level. However, when the noise level varies with time, the measured dB(A) level will vary as well. In this case it is therefore not possible to represent the noise climate with a simple dB(A) value.

In order to describe noise where the level is continuously varying, a number of other indices can be used. There are also a number of ways to describe sound insulation performance.

The indices used in this report are described below:

- L_p** **Sound Pressure Level:** A logarithmic ratio between a squared sound pressure quantity and the square of the human threshold of hearing (2×10^{-5} Pa). This relates to the sound level at a specific position at a single point in time.
- L_{pA}** **A-weighted Sound Pressure Level:** The Sound Pressure Level (L_p) with the frequency spectrum adjusted to account for the average human hearing response at difference frequencies for a moderate sound pressure range.
- L_w** **Sound Power Level:** A logarithmic ratio between a sound power quantity and a reference value of 10^{-12} W. Sound power is a measure of the total acoustic energy output of a source and is independent of location. Sound power is what gives rise to a sound pressure level at a specific point away from the source.
- L_{wA}** **A-weighted Sound Power Level:** The Sound Power Level (L_w) adjusted to account for the average human hearing response at difference frequencies for a moderate sound power range.
- $L_{Aeq,T}$** **A-weighted Equivalent Continuous Sound Level:** An average of the total sound pressure measured over a specified time period (T). In other words, $L_{Aeq,T}$ is the level of a steady sound which has the same total A-weighted sound pressure as the real fluctuating noise, measured over the same time period. It is increasingly being used as the preferred parameter for most forms of environmental noise.
- L_{Amax}** **Maximum A-weighted Sound Level with Fast Time-weighting:** The maximum A-weighted sound pressure level during the measurement period, using the Fast time-weighting of 125ms. L_{Amax} used in this report refers throughout to L_{AFmax} with the Fast time weighting, denoted L_{AFmax} or $L_{Amax,f}$ in other documents but L_{Amax} in BS 8233:2014 standard notation.
- $L_{A90,T}$** **A-weighted 90 Percentile Level:** The A-weighted sound level exceeded for 90% of a measurement time period (T). $L_{A90,T}$ is generally used as a measure of Background Sound Level.
- $L_{A,T}$** **Rating Level:** An A-weighted value most commonly used in BS 4142 assessments, which is the sound level of the noise source under assessment, at the assessment location, evaluated over the reference assessment period (T_r) and includes numerical adjustments for the characteristic features of the sound.