Care Home
Warren Road
Worthing

Noise Impact Assessment

On behalf of

Lawrence Baker Limited

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1	12 Apr 2024	Clarification of plant compound construction	JS	NAC

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1.0 Introduction

1.1. Noise Solutions Ltd has been commissioned to undertake a noise assessment for proposed external plant serving a proposed care home to be located on Warren Road, Worthing.

1.2. A planning application for the site has previously been permitted (application number AWDM/0769/20) with Conditions. This report addresses the Condition pertaining to noise from external plant.

1.3. To assist with the understanding of this report a brief glossary of acoustic terms can be found in **Appendix A**. A more in-depth glossary of acoustic terms can be assessed at the following web address http://www.acoustic-glossary.co.uk/.

2.0 Site description

2.1. The development site is located on the north east side of Warren Road, between the junctions with Links Road and Hillside Avenue. The site was formerly occupied by two detached properties at numbers 106 and 108 Warren Road.

2.2. The proposed care home building sits toward the rear (north) of the site, with a landscaped garden area forming a buffer to the boundary with the road. It is proposed to install four external air conditioning units in a dedicated compound alongside the east elevation of the building. Three of these units will run only during daytime hours, with the fourth potentially running 24hr.

2.3. Manufacturer's plant noise levels for the units are given in **Appendix C**.

3.0 Nearest noise sensitive receptors

3.1. The surrounding area is predominantly occupied by other existing detached residential dwellings. There are residential buildings (receptor R1) to the east, at a distance of around 50m from the plant area. Additional residences are located to the south east, also at a distance of around 50m.

3.2. It is assumed that all receptors will have unobstructed line of sight of the plant compound.

3.3. An aerial photograph showing the site and surrounding area, the nearest noise sensitive properties and noise monitoring location used in this assessment is presented in **Appendix B**.

4.0 Planning Condition

Planning permission AWDM/0769/20

4.1. The application was granted permission in September 2020. Condition 14 relates to noise and states:

> *"No external fixed plant, or mechanical vent or duct shall be installed until details have first been submitted to and approved in writing by the Local Planning Authority. The design shall have regard to the principles of BS4142:2014 and aim to achieve a rating level which is no greater -5dB above existing background noise level, shall include any necessary anti-vibration mountings and any necessary odour control (such as for the extraction and disposal of cooking odours where serving a kitchen or food preparation area).*
>
> *"Reason: To protect residents and neighbours from noise and odour."*

5.0 Acoustic standards and guidance

BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound

5.1. BS 4142:2014+A1:2019 is intended to be used to assess the likely effects of sound on people residing in nearby dwellings. The scope of BS 4142:2014+A1:2019 includes *"sound from fixed plant installations which comprise mechanical and electrical plant and equipment"*.

5.2. The procedure contained in BS 4142:2014+A1:2019 is to quantify the "specific sound level", which is the measured or predicted level of sound from the source in question over a one hour period for the daytime and a 15 minute period for the night-time. Daytime is defined in the standard as 07:00 to 23:00 hours, and night-time as 23:00 to 07:00 hours.

5.3. The specific sound level is converted to a rating level by adding penalties on a sliding scale to account for either potentially tonal or impulsive elements. The standard sets out objective methods for determining the presence of tones or impulsive elements, but notes that it is acceptable to subjectively determine these effects.

5.4. The penalty for tonal elements is between 0dB and 6dB, and the standard notes: "Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible."

5.5. The penalty for impulsive elements is between 0dB and 9dB, and the standard notes: "Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible."

5.6. The assessment outcome results from a comparison of the rating level with the background sound level. The standard states:

- *Typically, the greater this difference, the greater the magnitude of the impact.*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context;*
- *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. 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.*

5.7. The standard does state that "adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact."

5.8. The standard goes on to note that: "Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."

5.9. In addition to the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, the 2014 edition places emphasis upon an appreciation of the context, as follows:

> *"An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context."*

5.10. BS 4142:2014+A1:2019 requires uncertainties in the assessment to be considered, and where the uncertainty is likely to affect the outcome of the assessment, steps should be taken to reduce the uncertainty.

Existing noise levels

5.11. ACA Acoustics have previously undertaken an assessment of noise levels at the site. Their report reference 200303-R001 dated 26th March 2020 gives incident noise levels. Robustly representative daytime and night-time background noise levels are considered to be 45dB and 30dB L_{A90} for daytime and night-time periods, respectively.

Low background sound levels

5.1. Due to the exceptionally low prevailing environmental noise levels measured during the survey night-time period, it is proposed that the plant noise design criteria at the nearest residences should be capped at 30dBA. This proposed criterion is based on guidance found in Section 11 of BS 4142:2014 which states:

> *Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.*

5.2. A plant noise level of 30dBA at the façade would result in an internal noise level of 15dBA, which is likely to be lower than self-generated noise internally (for example, from domestic refrigerators). This assumption is based on guidance found in BS 8233:2014, which states that approximately 15dB of insulation is provided by a partially open window.

5.3. The applicable plant noise emission limits are therefore as given in Table 1 below:

Table 1 Plant noise emissions limits at the nearest noise sensitive receptor

Period	Cumulative plant noise rating level, dB(A)
Daytime (07.00 – 23.00 hours)	40
Night-time (23.00 – 07.00 hours)	30

6.0 Plant noise impact assessment

6.1. Plant noise levels have been predicted at the nearest and most affected nose sensitive receptors.

6.2. The plant compound is to be enclosed by a timber hit-and-miss fence or similar construction and a nominal and pessimistic 1dBA attenuation value has been included in the assessment. No roof is necessary to provide acoustic mitigation. Noise levels have been calculated taking into account distance and screening losses, and reflections where appropriate.

6.3. Table 2 summarises the results of the plant noise impact assessment. A series of calculations can be found in **Appendix D**.

Table 2 Plant noise impact assessment

Receptor	Period	Predicted noise rating levels at receptor, L_{Aeq} (dB)	Plant noise criterion (dB)	Difference (dB)
R1	Daytime (07.00 - 23.00 hours)	36	40	-4
	Night-time (23.00 – 07.00 hours)	30	30	0
R2	Daytime (07.00 - 23.00 hours)	36	40	-4
	Night-time (23.00 – 07.00 hours)	30	30	0

6.4. The predictions demonstrate that cumulative noise emissions from the proposed equipment will comply with the proposed limits, with no specific mitigation measures required.

Context and uncertainties

6.5. As BS 4142:2014 advises, the impact must be considered within the context of the site and the surrounding acoustic environment. The following must, therefore, also be taken into consideration when determining the potential impact that may be experienced:

- The assessment is undertaken at the nearest residential windows. The impact on all other nearby residential windows will be lower due to screening and distance attenuation.
- The noise level predictions are based on the proposed plant running at maximum daytime and night-time duty. The plant will not run in this manner at all times (for example, when demands for heating/cooling are lower) and, therefore, this is a robust assessment.

6.6. Where possible, uncertainty in the above assessment has been minimised by taking the following steps:

- Uncertainty in the calculated impact has been reduced by the use of a well-established calculation method.

7.0 Summary

7.1. Noise Solutions Ltd has been appointed to undertake an assessment of the impact of noise from proposed external plant to be installed at a care home on Warren Road in Worthing.

7.2. Noise from the proposed plant has been assessed and found to be within suitable limits, with no specific mitigation measures required. The proposed installation should therefore be acceptable to the local authority.

Appendix A Acoustic terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 $\log_{10}$ (s1/s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A –weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.

Appendix B Aerial photograph of site showing areas of interest



Appendix C Manufacturer noise data

Plant Item	Quantity	Plant Make/Model	Operating period	Sound pressure level, dBA at 1m
Cond1	1	Toshiba MMY-MAP1606FT8P	24hr	62
Cond2	1	Toshiba MMY-MAP1406FT8P	Daytime only (07.00 – 23.00)	64
Cond3	1	Toshiba MMY-MAP1006FT8P	Daytime only (07.00 – 23.00)	61
Cond4	1	Toshiba MMY-MAP0806FT8P	Daytime only (07.00 – 23.00)	61

Appendix D Calculations

Receptor R1

Unit	L_{pA}	at / m	Dist to receptor, m	Dist correction	Directivity	Screening	Feature correction	Rating level at receptor, dBA
COND-01	62	1	50	-34	0	-1*	3	30
COND-02	64	1	50	-34	0	-1*	3	32
COND-03	61	1	50	-34	0	-1*	3	29
COND-04	61	1	50	-34	0	-1*	3	29
							Cumulative Daytime	**36**
							Cumulative Night-time (COND-01 only)	**30**

Receptor R2

Unit	L_{pA}	at / m	Dist to receptor, m	Dist correction	Directivity	Screening	Feature correction	Rating level at receptor, dBA
COND-01	62	1	50	-34	0	-1*	3	30
COND-02	64	1	50	-34	0	-1*	3	32
COND-03	61	1	50	-34	0	-1*	3	29
COND-04	61	1	50	-34	0	-1*	3	29
							Cumulative	**36**
							Cumulative Night-time (COND-01 only)	**30**

**Nominal screening loss from hit-and-miss fence surrounding plant installation*