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Dear John

Former RBL Social Club, Woodland Road, Hassocks, West Sussex BN6 8HE Noise Impact Assessment (NIA) Report – ASHP/Condenser

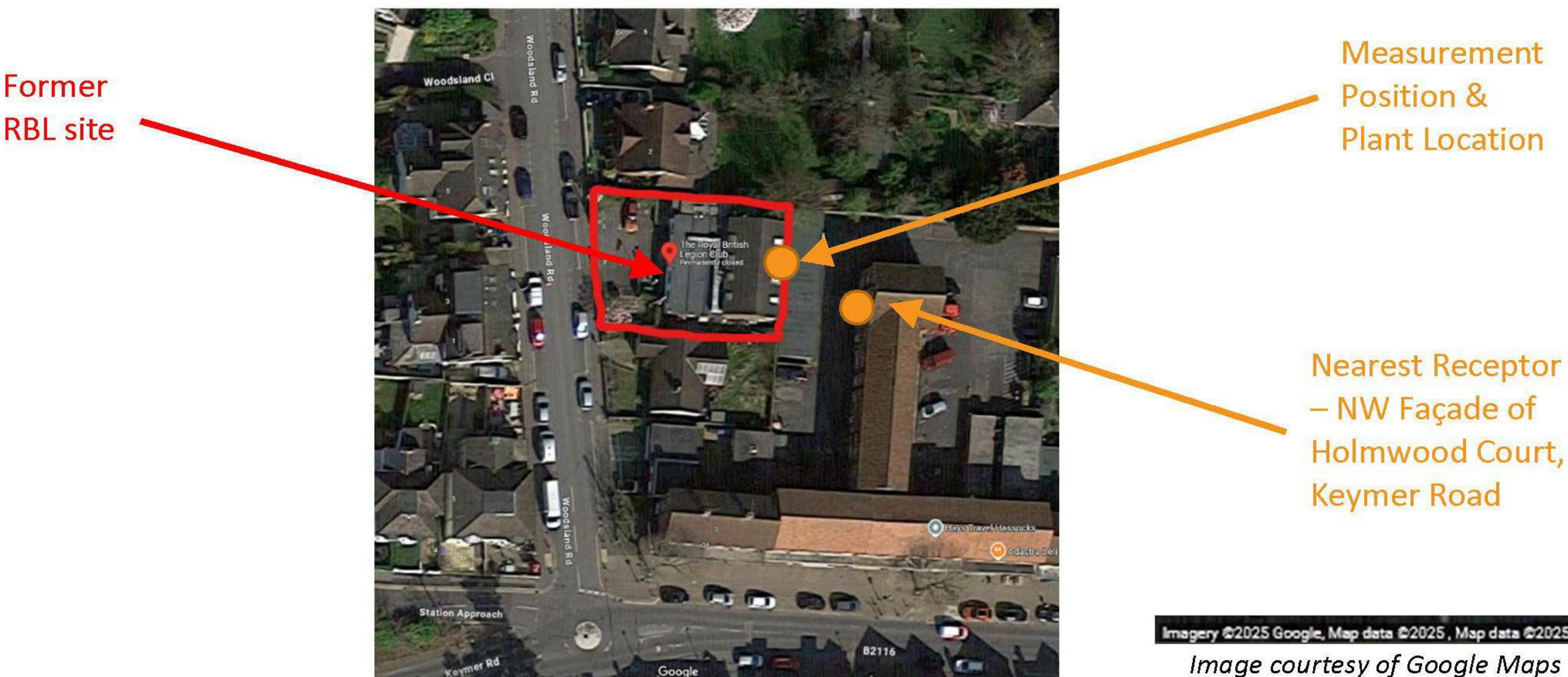
Planning permission is being sought for the conversion of the former Royal British Legion Social Club on Woodland Road in Hassocks, West Sussex, to create multi-tenant workspaces, e.g. offices. The works include the installation of either Air Conditioning Condensers and/or Air Source Heat Pumps (ASHPs) to serve the workspaces and supply the heating/cooling. Blackbird Acoustics Limited (BAL) have been appointed by PermiServ to supply acoustic input to the project. BAL have undertaken environmental noise surveying at the site to establish the typical prevailing environmental noise levels. This report details the findings of the noise surveying and provides a detailed assessment of the proposed units.

Noise Surveying

Site was attended to undertake environmental noise surveying of the prevailing noise levels. Automated long-term noise monitoring was conducted over a 24hr period between 11:15 hours on Monday 6th to 13:40 hours on Tuesday 7th January 2025.

The surveying was undertaken in general accordance with BS 7445 and the ANC's Environmental Noise Measurement Guide. Weather conditions throughout the surveys were conducive with obtaining representative noise measurements, being generally dry with light winds, albeit cold. The measurements were made using a Type 1 sound level meter, Norsonic Nor140, which was calibrated both prior to and on completion of the surveying, with no significant calibration drift observed. Equipment calibration details available upon request.

Measurements were undertaken over 5-minute sampling periods at one position to the rear of the plot with the microphone mounted on the fire escape railing approximately at first floor level in the free-field.



The measured levels are summarised below;

Table 1 – Summary of Measured Noise Levels

Measurement Period	Pos 1 – Rear	
	Typical Lowest L_{A90} (dB) *	Period-Averaged L_{Aeq} (dB)
Extended Office Hours (07:00 – 19:00 hours)	45	50.0
Daytime (07:00 – 23:00 hours)	43	49.4
Night-time (23:00 – 07:00 hours)	28	44.7

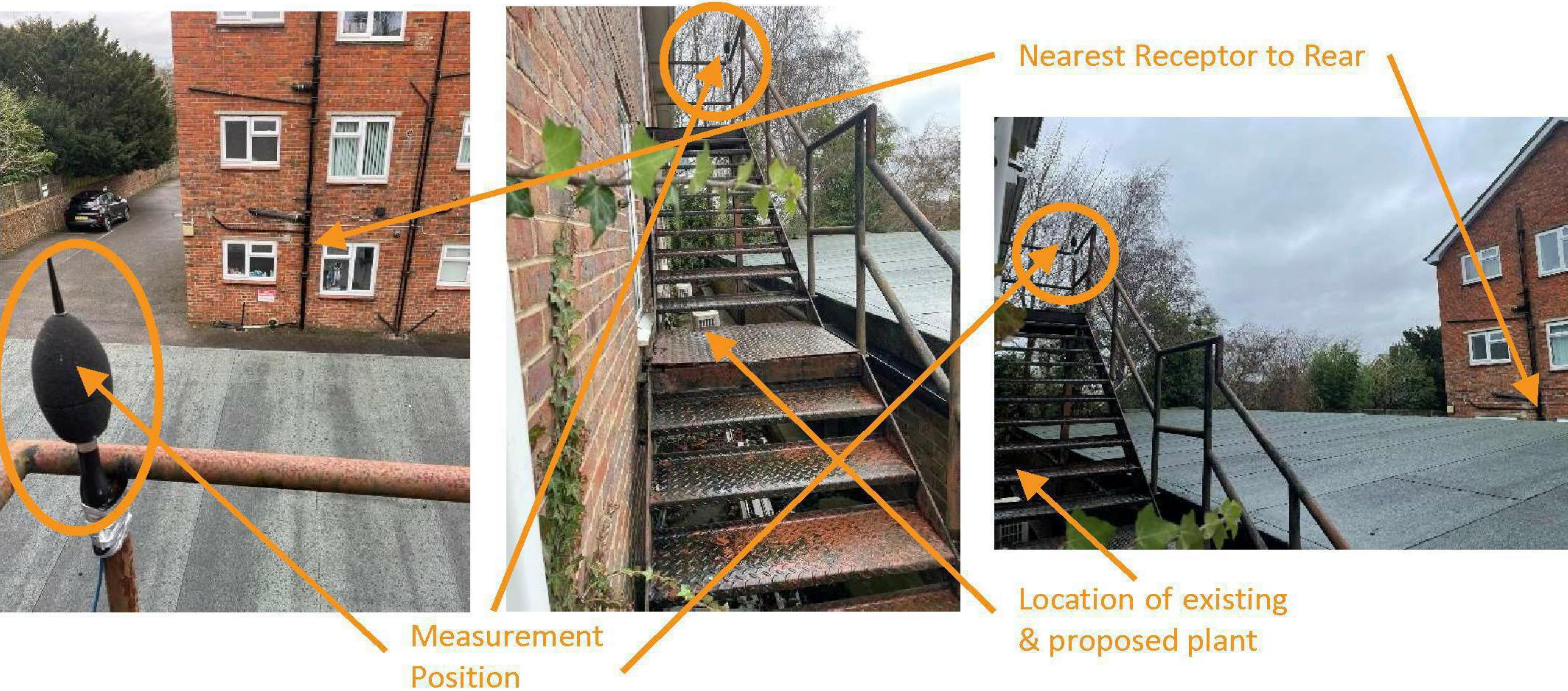
* The typical lowest L_{A90} value is calculated from the 10th percentile of the 5-minute samples.

It should be noted that noise levels at the position were generally very quiet and dominated by local road traffic movements primarily along Woodland Road (to the west), Keymer Road (to the south, B2116, ‘high street’) and Chancellors Park (to the east); the other surrounding road networks, as well as local neighbour noise from adjacent residential buildings, and pedestrians.

The measured noise levels from the surveying are graphically represented in the attached Graphs;

- Graph 1 indicates the L_{eq} & L_{90} overall dBA value time-histories.
- Graph 2 indicates the L_{90} histograms used to derive the “typical lowest” values & thus the plant noise criteria.

Photos of the measurement position and nearest receptor are as follows;



“Typical-Lowest” Background Levels

When considering the existing background levels at a site, BS 4142:2014 “Methods for Rating and Assessing Industrial and Commercial Sound” recommends assessing to the “typical” measured $L_{A90, 15mins}$ background levels, BS 4142:2014 goes on to state:

In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods.

BS 4142:2014 suggests that statistical analysis is a suitable method to determine the “typical” background level. This can be carried out by calculating the level of the most-commonly occurring $L_{A90, 15mins}$ period during the proposed operating hours of equipment.

We generally consider that designing to the most-commonly occurring $L_{A90, 15mins}$ period is not sufficient during those slightly quieter periods. In our opinion, a more representative value would be the “typical-lowest” level, which can be determined statistically as the lowest rounded $L_{A90, 15mins}$ level which occurs for at least 10% of the assessment period.

The “typical-lowest” background noise levels ($L_{A90, 5mins}$) at the measurement position are therefore summarised in Table 1 above, based upon the L_{A90} histogram attached in Graph 2. This data can be used to set plant noise emission criteria for use in the assessment of noise emissions from any proposed plant at the development.

Plant Noise Emissions Criteria

It is understood that air conditioning condensers and/or Air Source Heat Pumps (ASHPs) are likely to be proposed on the scheme to supply the cooling and/or heating requirements to the workspaces. Suitable plant noise emission criteria have been stated in the below sections, to which the proposed plant can be designed.

Local Authority Requirements

Mid Sussex District Council (MSDC) Planning Authority updated their Noise Advice website on 21 August 2023: <https://www.midsussex.gov.uk/environment-net-zero/noise-advice/>

The relevant paragraphs are extracted below:

“Noise resulting from the use of the ASHP shall not exceed a level of 5dB L_{Aeq} below the existing background level when measured according to British Standard BS4142:2019 (or as updated), at a point one metre external to the nearest noise sensitive premises.”

They go on to state that the MCS assessment is acceptable as long as background levels are 40dB or higher, inferring the above criterion should be targeted. However, where very low background levels exist, they mention:

“Refer to the IOA and CIEH [Professional Advice Note on Heat Pumps \(405 KB, PDF\)](#) which gives further guidance on minimising the likelihood of noise complaints and recommends a maximum sound rating level of <35dB at any noise sensitive neighbouring premises.”

It should be noted this Advice Note goes on to state that this value can be relaxed if the local context supports this (i.e. background levels are louder), but the rating sound level should not exceed 40dBA.

To this end, in setting plant noise emissions criteria to a ‘target’ level 5dB below the otherwise prevailing typical-lowest background noise level, the following criteria would therefore be formulated.

Table 2 – LA Plant Noise Emission Criteria at Receptors

Time Period	Plant Noise Emission Criterion (dBA) at Nearest Noise Sensitive Receptor
	Pos 1 – Rear
Extended Office Hours (07:00 – 19:00 hours)	40
Daytime (07:00 – 23:00 hours)	38
Night-time (23:00 – 07:00 hours)	23

In line with BS 4142:2014+A1:2019, should the proposed plant be identified as having intermittent or tonal characteristics, a further penalty should be subtracted from any of the above proposed noise emission limits.

As can be seen from Table 2, the Extended Office Hours period plant criterion is 40dBA, which is in line with the IOA/CIEH Advice Note suggested maximum limit. However, the night-time period criterion is exceptionally low.

Low Background Noise Levels

Due to the low background noise levels present on site at the rear of the building during the night-time, this results in a very low criterion being formulated. We suggest that imposing a noise emission limit as low as 23dBA is both; unnecessary to achieve acceptable conditions at the nearest existing noise-sensitive properties, and unenforceable with regard to the ability of normal (Class 1) instrumentation to measure the noise contribution of new plant.

The current version of BS 4142:2014+A1:2019 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.”

In addition, Section 1 of the ‘old’ version of BS4142:1997 stated:

“The method is not suitable for assessing the noise measured inside buildings or when the background and rating noise levels are both very low...For the purposes of the standard, background noise levels below about 30dB...are considered to be very low.”

BS 4142:2014 ‘Methods for rating and assessing industrial and commercial sound’ states, “Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.”

Therefore, designing the plant to meet the otherwise prevailing background noise levels (with a minimum value of 30dBA) would result in an “indication of having a low impact”.

Under such circumstances, we propose a criterion that mechanical services be designed so that noise emissions from the plant *meet* the background, but are limited to 30dBA min., during the night-time period (if they’re even operating then? See below). Notwithstanding this, all reasonable efforts will be made to reduce noise levels as much as is reasonably practicable.

Proposed Criterion

It is therefore proposed to design plant to a level of **40dBA** and **35dBA** (extended office hours and night-time, respectively) at the nearest receptors to the rear of site in line with the IOA/CIEH limits, with an ideal target of 30dBA during the night-time. Based on the sound reduction given by a partially open window, as outlined in BS 8233:2014, internal noise levels are anticipated to be approximately 15dB lower than external noise levels, which would mean that resultant internal noise levels would still easily comply with guidance values as per BS 8233, i.e. 35/30dBA L_{eq} in a bedroom during the day/night-time (10dBA below criteria in fact).

For information, the Guideline Values for Community Noise from WHO state a level of 45dB L_{Aeq} outside a bedroom with an open window as acceptable to prevent sleep disturbance.

Proposed Plant & Assessment

The new building will likely have either Air Source Heat Pumps (ASHPs) or air-conditioning condensers to provide the heating/domestic hot water and/or heating/cooling, and we therefore do not anticipate that the units will be operating at full load capacity during the night-time, if in fact they are even ‘on’ at all, being a commercial premises.

It is understood it is likely that up to 2No. Mitsubishi 14kW heat pumps or condensers will be installed at the rear of the building, in a similar location as to the existing units on site, i.e. tucked behind the garage structure adjoining the rear of the site, which will provide at least line-of-sight screening (5dB losses), even to the top floor of the nearest receptor (Holmwood Court), which is approximately 13m from the units’ location.

The spec of a similar heat pump was provided by the Client:
<https://midsummerwholesale.co.uk/buy/mitsubishi-heat-pumps/mitsubishi-ecodan-14kw-ashp>
which states a Sound Power Level (SWL) of 67dBA.

Previously for another scheme, Blackbird have obtained data for the Mitsubishi Ecodan 6kW unit, which stated a SWL of 58dBA and a Sound Pressure Level (SPL) at 1m of 45dBA. This infers a SPL of 54dBA at 1m for the 14kW unit is likely, which is commensurate with past data received for other similar sized units. A typical ASHP/Condenser sound spectrum has been adopted in the calculations based upon other similar units’ datasheet spectral values.

Calculations have been made to assess the proposed units to the nearest adjacent receptor, accounting for:

- Source Term SPL
- 20LogR Distance Attenuation
- Reflections (situated up against wall/garage)
- Barrier losses/screening, e.g. top of garage
- Directivity

Table 3 below indicates the worst-case calculation and results of the assessment.

Table 3 –Calculation of Proposed Units to Nearest Receptor (Holmwood Court) Window (2nd floor)

Parameter	Octave-band Noise Level (dB) at Octave-band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Mitsu 14kW	61	60	57	51	48	42	37	34	54
Mitsu 14kW	61	60	57	51	48	42	37	34	54
Total Sound Pressure Level at 1m	64	63	60	54	51	45	40	37	57
Distance Loss @ 13m	-22.3	-22.3	-22.3	-22.3	-22.3	-22.3	-22.3	-22.3	-
Reflections	3	3	3	3	3	3	3	3	-
Barrier (garage roof)	5.0	5.1	5.2	5.3	5.7	6.3	7.4	9.0	-
Directivity (0° / 45°)	-0.3	-0.3	-0.5	-1	-4.5	-5	-6	-6	-
Resultant Noise Level at Receiver	49.5	48.5	45.4	39.1	32.9	27.0	22.1	20.8	41.3

The above calculation indicates that the predicted resultant noise level at the nearest receptor’s façade is 41dBA. This is considered the worst-case scenario, as resultant levels at other receptor windows will be lower due to increased distance/screening/directivity losses applicable to further afield and ‘off-axis’ receptors. This predicted level is only marginally (1dB) over the ‘daytime’ (extended office hours) criterion of 40dBA.

Source noise levels for the units ASHPs are assumed to be for 100%, full duty. The units will be ‘inverter driven’, so they ramp up and down dependent on the load. Reductions in noise level of at least 3 to 6dBA (if not more) are typical for these types of units when operating in ‘low noise’ or ‘night setback’ or ‘silent’ modes (based on others’ datasheets), which tends to approximately equate to 35 to 50% duty typically.

Also, the units proposed are either for Heating/Hot Water (ASHP) or heating/cooling (in the case of adopting an air-to-air FCU system) and serve 'commercial' units which are only occupied during the 'daytime' (office hours), so they are not likely to be operating during the night-time period anyway, although it would be advisable to set-up the system such that the unit's "night setback" mode is applied during the night-time period, just as a precautionary measure to assist in minimising any potential impact on the neighbours in the case of random "auto-operation". Assuming a reduction of 5-6dBA in this mode, the predicted façade level at the Receptor would be approximately 35dBA and thus in line with the IOA/CIEH 'limit'. However, it is likely that the units can be forced 'off' during the night-time period, as no load will be imposed on the systems due to the lack of occupancy of the spaces.

On the basis of the above, it is considered that the proposed units are likely to be generally acceptable for extended office hours operation at full duty at most receptors in the vicinity.

Alternatively, suitably selected ASHP units can be procured, along with mitigation measures as required by the District Council in order to meet any stipulated/preferred criteria. The mitigation may be in the form of an attenuation package or kit, which typically achieves circa 8dB reduction with inlet side attenuators and a top pod attenuator to vertical fan discharges, or 3dB for top pod only kits. Alternatively, a full acoustic enclosure can typically achieve circa 12dB (10-15dBA) reduction. [For information, to achieve "meeting the background" during the night-time (28dBA) an enclosure achieving a reduction of (41-28=) 13dBA would be required, i.e. a full enclosure.

Conclusion

Therefore it is concluded that the units proposed at site should generally achieve compliance with Mid Sussex District Council (-5dBA below background) criterion (40dBA) at the vast majority of properties in the vicinity, but in the worst-case will likely be 1dBA above at the adjacent Holmwood Court property, but this would still be significantly below WHO guidance for external noise levels outside a window (45dBA) and would still result in acceptable noise conditions internally, even with a partially open window. This conclusion holds provided the proposed units total a maximum of 2No. with each achieving 54dBA at 1m (SPL) as a maximum at 100% duty/load. The units should not need to operate during the night-time period due to the usage class proposed, but provided "low noise" mode is activated the units will likely comply with the maximum limit of 35dBA from the IOA/CIEH guidance.

Ducted Fans

Due to the proposed workspace usage is anticipated that mechanical ventilation (supply & extract) may likely be required – others to confirm. Any ducted fan systems (MVHR, HRU and EF) can be readily mitigated via the inclusion of suitably selected in-line attenuators, designed to meet suitable criteria, dependent on the final selection and operating speed/duty/flow rates of the fan units. Over-attenuating the fan systems will be of benefit to "take them out of the equation", so as to allow more "head room" for the other larger items of plant, e.g. the condensers/ASHPs, which tend to be more difficult to attenuate. Provided any ducted fan systems are designed and attenuated such that the atmospheric duct terminations achieve a level of 45dBA at 1m on-axis, they will not 'add' to the prevailing noise climate at the Receptor.

Vibration Isolation

In addition to the control of airborne noise transfer, it is also important to consider the transfer of noise as vibration to adjacent properties (as well as to any sensitive areas of the same building). It is good practice to isolate items of plant, and, to this end, it is advised to isolate the ASHP using neoprene in-shear mounts with a minimum 10mm static deflection. Where there are cased fans located across the development, such as MVHR, HRU and extract fans, these should be isolated using neoprene in-shear isolators or hangers with neoprene turrets with a 10mm static deflection.

We trust the above is clear and of assistance, but should you have any queries, please do not hesitate to contact the undersigned.

Yours sincerely,
For Blackbird Acoustics Limited



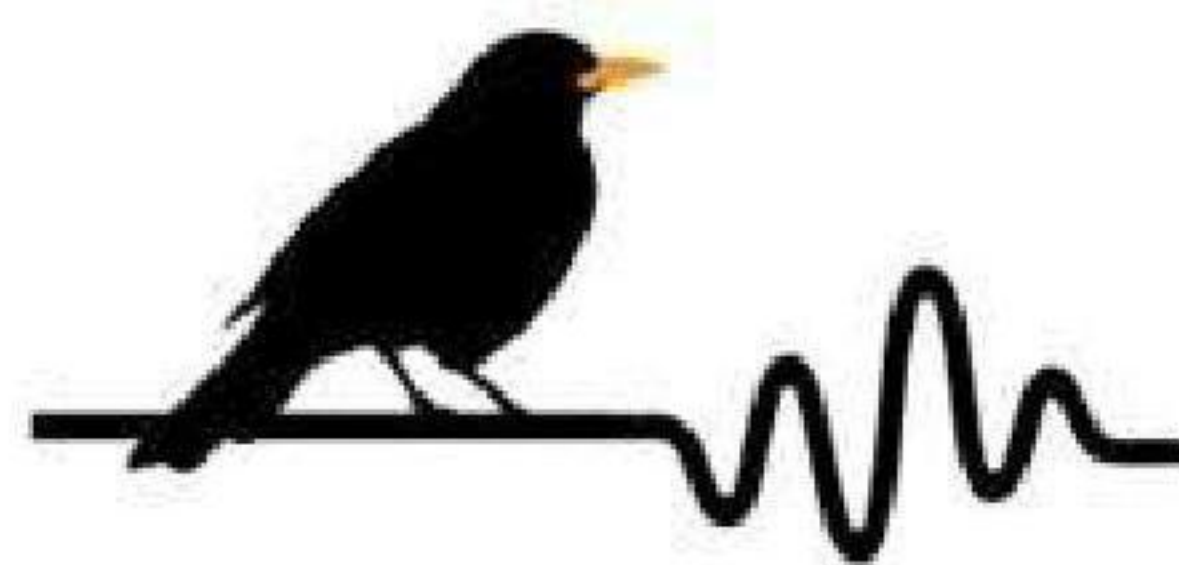
Alex J Wyatt
Director

Att.

Former RBL, Woodland Road, Hassocks, West Sussex BN6

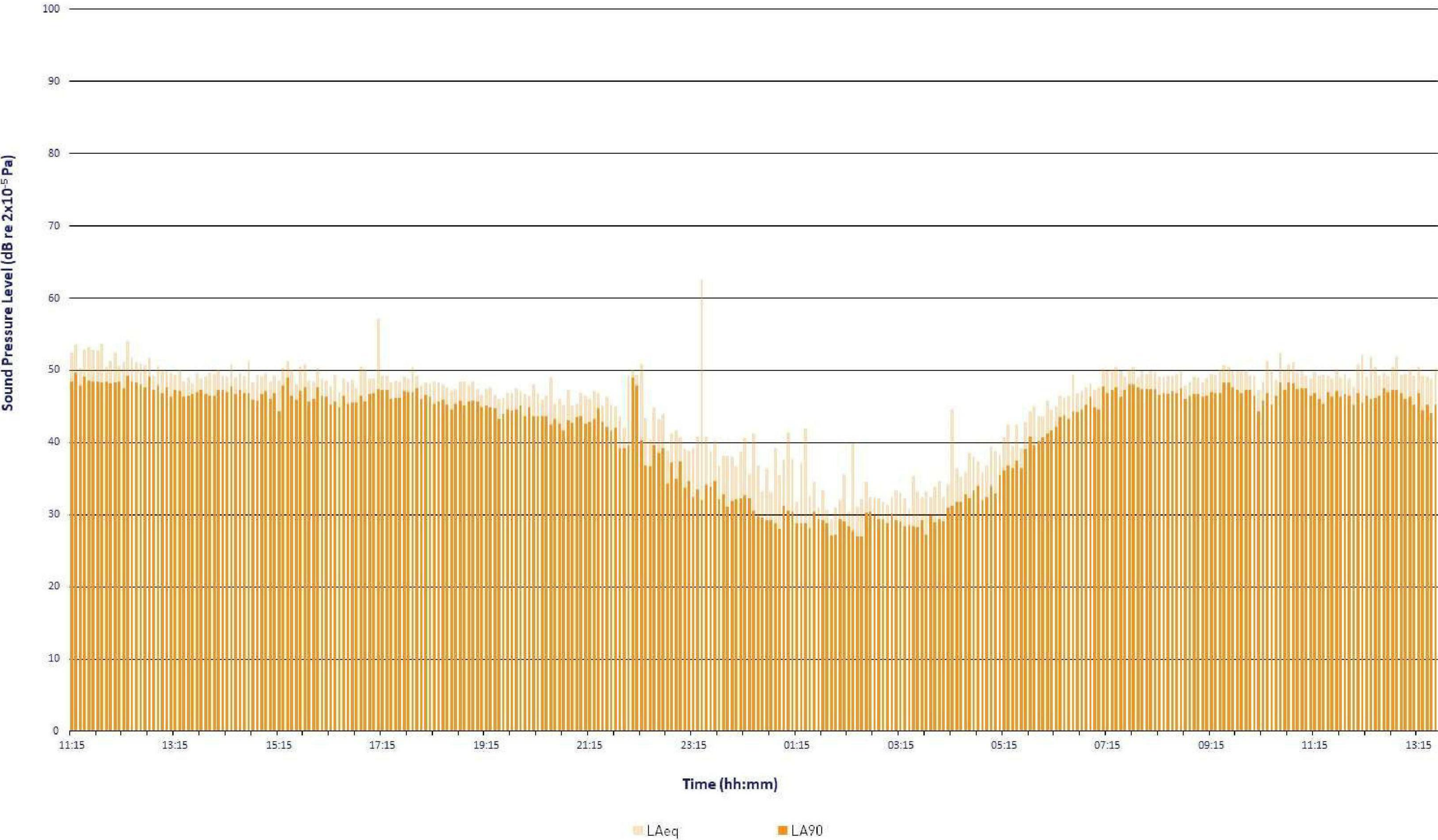
L_{Aeq} and L_{A90} Time History (5-mins)

Measurement Position 1, Rear, Monday 6th to Tuesday 7th January 2025



Project: 2127

Graph 1



Former RBL, Woodland Road, Hassocks, West Sussex BN6

L_{A90,5 minutes} Histogram

Measurement Position 1, Rear, Monday 6th to Tuesday 7th January 2025

