

**PROPOSED BATTERY ENERGY STORAGE SYSTEM
LEEWAY INDUSTRIAL ESTATE, NEWPORT**

NOISE IMPACT ASSESSMENT

Aldustria Ltd

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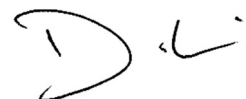
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1.0 INTRODUCTION

- 1.1 Hepworth Acoustics Ltd was commissioned by Aldustria Ltd to carry out a noise impact assessment in connection with a planning application for a proposed battery energy storage system (BESS) at a site at Leeway Industrial Estate, Newport.
- 1.2 The site is currently an open hardstanding area adjacent to the east of a large industrial warehouse type building.
- 1.3 The site is otherwise bounded by the A4810 Queensway Meadows to the north, with a leisure/retail area beyond, and other existing industrial premises to all other sides.
- 1.4 The surrounding area generally is heavily industrialised.
- 1.5 The site location is shown in Figure 1.
- 1.6 The nearest residences to the site, and the only residences of relevance to this assessment, are those at Spencer Way, about 260m to the east and slightly north from the nearest part of the site boundary, but at somewhat greater separation distances from proposed noise emitting equipment.
- 1.7 The nearest residential location at Spencer Way has been adopted as the Assessment Location for the purposes of this report, as identified in Figure 1.
- 1.8 The proposal is for installation of nine identical Energy Storage Cabinets and nine BESS Inverters (MV Skid units).
- 1.9 The proposed site layout is shown in Figure 2.
- 1.10 It is noted that the proposed plant is to be concentrated within the southwest part of the site and as such the line-of-sight from the Assessment Location to some plant items will be restricted by intervening structures.
- 1.11 The proposed plant will have the potential to be in operation 24 hours a day. However, whilst the plant will be 'live' for 24 hours a day, the functioning window will be a fraction of this time. This is because energy will be imported into the site when it is available and/or cheap, over just a 2-hour period. Whilst this 2-hour period is varied, in summer, it is likely to begin at 1pm when solar farms are producing large amounts of energy. The batteries will then discharge for 2 hours at peak demand, which is typically around 1700-1900hrs.

- 1.12 The sound created is proportionate to the current running through the technology at that time so it follows that the worst-case sound pressure levels will only be feasible for 4 hours in any 24-hour period, outside of this, sound levels will be appreciably lower.
- 1.13 To an event greater extent, the sound created is proportionate to the ambient external temperature, as the principal sound source is the thermal control components of the units. Therefore it follows that worst-case sound pressure levels only have the potential to occur during the middle parts of the day during the hottest times of the year, and appreciably lower levels will occur later in the evening and at night during the summer, even during warm spells, and at all times of day away from the summertime.
- 1.14 Nevertheless, to provide a robust assessment, potential 24hr operation at full capacity has been considered in this assessment.
- 1.15 The various noise units and indices referred to in this report are described in Appendix II. All noise levels mentioned in the text have been rounded to the nearest decibel, as fractions of decibels are imperceptible.

2.0 BASELINE NOISE SURVEY

- 2.1 Due to the nature of the site location and remoteness of the nearby residences from the site, it was not practicable to deploy automated noise monitoring equipment in a safe and secure manner at a location representative of the Assessment Location for a protracted period of time.
- 2.2 Accordingly, our assessment has been based on continuous baseline ambient/background noise monitoring undertaken at a single representative location in sequential 15-minute samples over the most critical assessment period, that being the late evening period (i.e. the final part of the daytime) and the early night-time period.
- 2.3 The monitoring was undertaken at Location 1, identified in Figure 1, over the period of 2100hrs on Thursday 7 November 2024 until 0100hrs the following morning.
- 2.4 The measured noise level data is detailed in full in Appendix II. The data has been analysed and summarised for assessment purposes into 'daytime' and 'night' periods.
- 2.5 The summarised data is set out in Table 1.

Table 1 : Summary of Baseline Noise Monitoring Results

Measurement Index		Day (0700-2300hrs)	Night-time (2300-0700hrs)
		Based on monitoring: 2100-2300hrs	Based on monitoring: 2300-0100hrs
$L_{Aeq,T}$ 'residual'	Range	53-57	49-53
	Logarithmic Average	55	51
$L_{A90,T}$ 'background'	Range	43-48	36-43
	Mean	47	39
	Mode	48	37

- 2.6 The noise climate during the survey was due to road traffic on the A4810 and surrounding road network as well as residual noise from surrounding industry.
- 2.7 The measured noise levels are moderately high, reflective of the heavily industrialised area and busy main road passing in fairly close proximity to the nearby residences, with the proposed development site to the opposite side.

- 2.8 It is noted that background L_{A90} noise levels are appreciably reduced during the night-time period compared to the daytime, as more noticeable lulls in traffic emerge moving into the night-time. However, even at night the A4810 remains fairly busy, including a high proliferation of HGVs and consequently, as would be expected, the reduction in the residual ambient L_{Aeq} noise levels at night is less substantial.
- 2.9 The noise monitoring was undertaken using a NTi Audio XL2-TA Class 1 Sound Analyser (serial no. A2A-23512-E1). The equipment was field calibrated before and after the survey using a Norsonic 1251 class 1 acoustical calibrator (serial no. 20804), with no calibration drift observed.
- 2.10 The measurement microphone was fitted with a windshield and mounted in free-field conditions at about 1.5m above local ground.
- 2.11 The weather during the monitoring was dry with light winds of speeds typically below 3m/s, of easterly direction.

3.0 PREDICTED NOISE EMISSIONS

- 3.1 Calculations have been undertaken in order to determine potential worst-case noise levels attributable to the proposed development at the adopted Assessment Location.
- 3.2 We understand that the design is based on use of Risen SYL Energy Storage Cabinets, for which manufacturers' noise output data states a noise emissions level of $\leq 80\text{dB}$ at 1m.
- 3.3 For the Inverter units, Risen SYL units are also proposed. No noise emissions data is currently available for these units, however the applicant has used similarly sized Delta Electronics EPCS-1500IEC Inverter units at other sites, for which manufacturers' noise output data states a noise emissions level of $< 79\text{dB}$ at 1m. This is consistent with our experience of similar units and, as such, we have assumed that the quoted noise levels correspond to L_{Aeq} values.
- 3.4 In both cases, noise output for full operational duty has been considered. As set out in Section 1.0, in reality lower operational noise levels would be expected most of the time, and always at night, however in the absence of acoustic test data for reduced duty, full duty has been considered to ensure a robust assessment.
- 3.5 Calculations of the L_{Aeq} noise levels attributable to the proposed plant are based on the lateral distance between the various components of the proposed development. This has been based on location of each individual item of plant.
- 3.6 Across the propagation path, greater than 50% of the intervening ground is acoustically soft (i.e. the public open space between the residences at the Assessment Location and the A4810). Accordingly, in line with the provisions of ISO 9613-2, a highly cautious -2dB ground absorption correction has been applied. However, also, there will be no direct line-of-sight from the Assessment Location to at least five of the proposed plant items. In those cases, therefore, a highly cautious -5dB acoustic screening correction has been applied, and ground absorption correction discounted.
- 3.7 The predicted worst-case noise levels are summarised in Table 2.

Table 2 : Predicted Worst-case Noise Levels at Nearest Dwellings

Item	Predicted Noise Level dB $L_{\text{Aeq,T}}$
Energy Storage Cabinets	36
Inverter Units	34
Total	38

4.0 NOISE CRITERIA

NPPF

- 4.1 The National Planning Policy Framework (NPPF), December 2023, states at paragraph 180 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 ...”*.
- 4.2 Paragraph 191 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 ...”*.
- 4.3 However, there is as yet no specific guidance on numerical acoustic assessment/design criteria for developments such as this provided in the NPPF, accompanying Technical Guidance National Planning Practice Guidance ‘Noise’, nor the NPSE.

BS 4142

- 4.4 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.
- 4.5 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.
- 4.6 The noise ‘rating’ level 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.
- 4.7 BS 4142 stipulates that impacts should be assessed over a reference time interval of 1-hour during the daytime (0700-2300hrs) and 15-minutes during the night-time (2300-0700hrs).

4.8 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.

4.9 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, including *"where background noise levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds background. This is especially true at night"*
- The character and level of the residual noise
- The sensitivity of the receptor

4.10 Regarding background sound levels, BS 4142 requires that *"values are reliable and suitably represent the particular circumstances and periods of interest... the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods"*. It is also stated that *"diurnal patterns can have a major influence on background sound levels and, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night-time period for sleep purposes"*.

BS 8233

4.11 British Standard 8233: 2014 *Guidance on sound insulation and noise reduction for buildings* provides guidelines on design criteria for acceptable noise levels within residential accommodation for the daytime (0700-2300hrs) and night-time (2300-0700hrs) periods, as summarised in Table 3.

Table 3 : BS 8233 Recommended Acoustic Design Criteria

Activity	Location	Internal Noise Levels	
		Daytime 0700-2300hrs	Night-time 2300-0700hrs
Resting	Living room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining room / area	40 dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$

- 4.12 BS 8233 clarifies that the above guidance relates only to noise without specific character (e.g. noise that does not have a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content) and that where such characteristics are present, lower noise limits might be appropriate.
- 4.13 Regarding outdoor living areas, BS 8233 states that *“it is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB L_{Aeq} , which would be acceptable in noisier environments.*

5.0 NOISE ASSESSMENT

- 5.1 Based on the results of the baseline noise survey and the predicted worst-case noise levels from the development, a set of 'initial estimate' assessments of the potential noise impact of the development, as per BS 4142 guidelines, has been undertaken.
- 5.2 No spectral data is available for the proposed equipment, however based on experience of similar equipment, no tonal features are anticipated to be audible at the nearby residences. The units emit steady noise and hence no intermittent characteristics would be anticipated. The fans on the Energy Storage Cabinets and Inverters are expected to operate intermittently, however individual units will switch in and out independently of each other, such that these steps would not be expected to be noticeable at the nearby residences above the ambient/background noise. Therefore no acoustic feature penalties are applicable in line with BS 4142 in this case.
- 5.3 Based on an analysis of the full data set, the representative background noise level for each assessment period has been taken as the mean value in each case.
- 5.4 The initial estimate assessment is summarised in Table 4.

Table 4 : Initial BS 4142 Assessments

Assessment Parameter		Sound Level
Specific Level, $L_{Aeq,T}$ dB		38
Acoustic Feature Correction, dB		0
Rating Level, $L_{Ar,Tr}$ dB		38
Daytime (0700-2300hrs) Assessment	Background Level, $L_{A90,T}$ dB	47
	Difference: Rating minus Background	-9
Night (2300-2300hrs) Assessment	Background Level, $L_{A90,T}$ dB	39
	Difference: Rating minus Background	-1

- 5.5 The initial assessment in line with BS 4142 in Table 4 indicates that, even accounting for the highly conservative assumptions on which the assessment is based, the rating level at the Assessment Location will be below the background noise level for all periods.

- 5.6 In accordance with BS 4142, this is an *“indication of the specific sound source having a low impact, depending on the context.”*
- 5.7 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 this case, the most critical contextual element to consider is the character and level of the residual noise, which is dominated by road traffic noise.
- 5.8 Noting that the plant noise from the proposed development will be generally benign of acoustic features and characteristics, a comparison of the absolute (i.e. specific) worst-case predicted noise levels and the averaged residual noise levels for each period, is set out in Table 5.

Table 5 : Summary of Context of Residual Noise Levels

Assessment Parameter		Sound Level
Specific Level, $L_{Aeq,T}$ dB		38
Daytime (0700-2300hrs) Assessment	Residual Level, $L_{Aeq,T}$ dB	55
	Difference: Specific minus Residual	-17
Night (2300-2300hrs) Assessment	Residual Level, $L_{Aeq,T}$ dB	51
	Difference: Specific minus Residual	-13

- 5.9 Based on the summary in Table 5, it is demonstrated that worst-case predicted noise levels are appreciably lower than residual noise levels.
- 5.10 It is therefore concluded that no modification to the initial BS 4142 assessments is warranted in this case and hence no unacceptable noise impact, and consequently no harm to residential amenity, is anticipated as a result of proposed development.

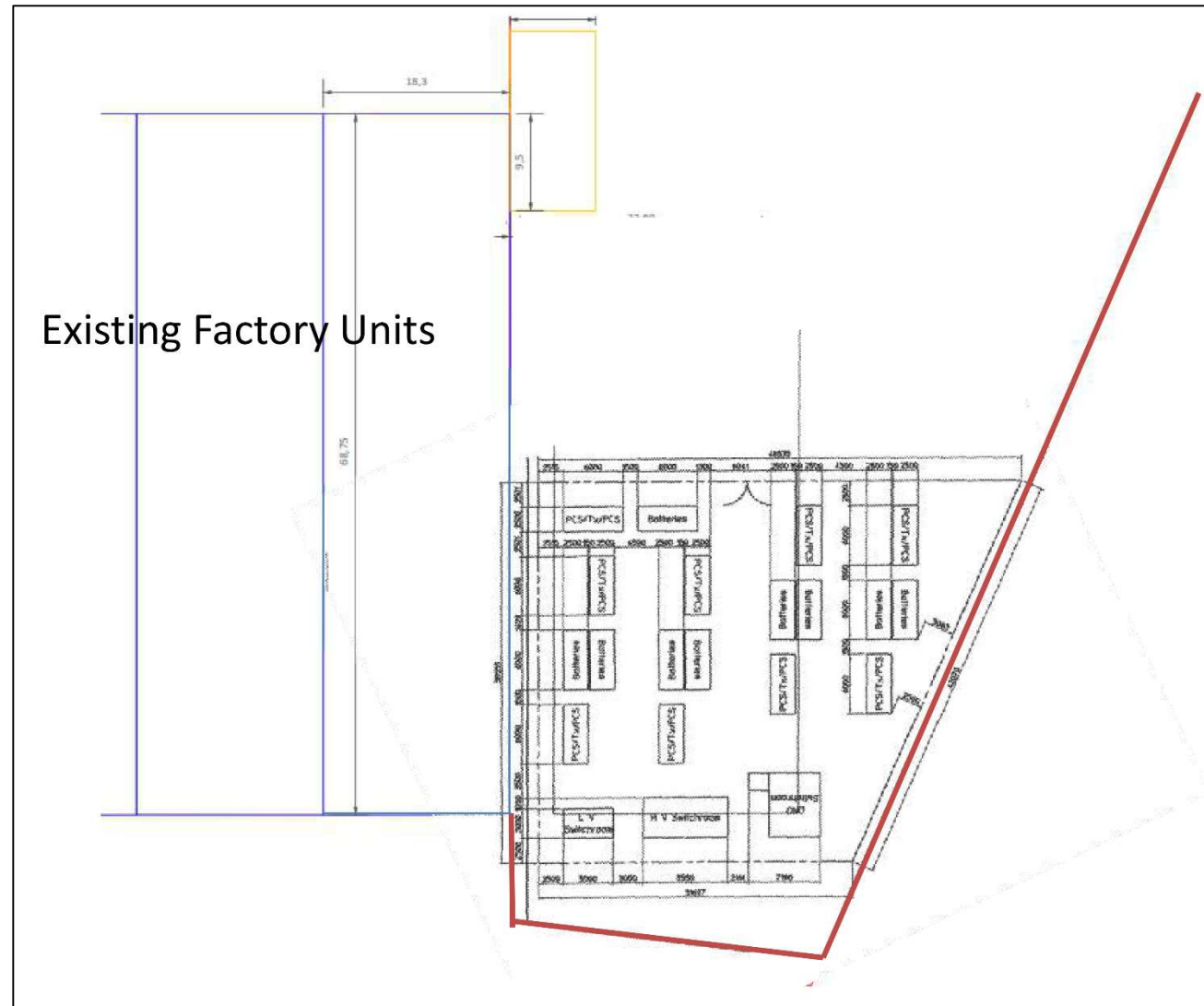
6.0 SUMMARY AND CONCLUSION

- 6.1 Hepworth Acoustics Ltd has carried out a noise impact assessment in connection with a planning application for a proposed battery energy storage system (BESS) at a site at Leeway Industrial Estate, Newport.
- 6.2 Baseline noise monitoring has been undertaken at locations representative of the nearest residential properties to the proposed development to determine prevailing background and residual noise levels.
- 6.3 A noise assessment has been undertaken in accordance with the guidelines set out in relevant British Standard guidelines.
- 6.4 It has been concluded that, no unacceptable noise impact, and consequently no harm to residential amenity, is anticipated as a result of proposed development.

Figure 1: Site Location



Existing Factory Units



Appendix I: Noise 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. The indices used in this report are described below.

- L_{Aeq} This is the A-weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period. In other words, L_{Aeq} is the level of a continuous noise which has the same total (A-weighted) energy as the real fluctuating noise, measured over the same time period. It is increasingly being used as the preferred parameter for all forms of environmental noise.
- L_{Amax} This is the maximum A-weighted noise level that was recorded during the monitoring period.
- L_{A90} This is the A-weighted noise level exceeded for 90% of the time period. L_{A90} is used as a measure of background noise.

Appendix II: Noise Survey Results

Date	Time		Noise Level dB		
	Start	End	L_{Aeq}	L_{Amax}	L_{A90}
07/11/2024	21:00	21:15	55	77	48
07/11/2024	21:15	21:30	54	70	46
07/11/2024	21:30	21:45	56	73	48
07/11/2024	21:45	22:00	57	86	47
07/11/2024	22:00	22:15	54	73	48
07/11/2024	22:15	22:30	53	74	43
07/11/2024	22:30	22:45	53	78	42
07/11/2024	22:45	23:00	52	71	41
07/11/2024	23:00	23:15	52	76	43
07/11/2024	23:15	23:30	52	72	42
07/11/2024	23:30	23:45	53	74	41
07/11/2024	23:45	00:00	50	75	37
08/11/2024	00:00	00:15	51	74	38
08/11/2024	00:15	00:30	50	77	36
08/11/2024	00:30	00:45	50	76	37
08/11/2024	00:45	01:00	49	69	36