

Newburn BESS

Noise Impact Assessment

For Fig Power

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Contents

1.	Introduction	4
2.	Description of the Development and Site	5
3.	Assessment Methodology	6
3.1	<i>Policy and Guidance</i>	6
3.2	<i>Local Policy</i>	6
3.3	<i>Proposed Plant Noise Limits</i>	6
4.	Environmental Noise Survey	8
4.1	<i>Survey Methodology</i>	8
4.2	<i>Survey Results - Long Term Measurements</i>	9
5.	Noise Impact Assessment	10
5.1	<i>Plant Source Noise Levels</i>	10
5.2	<i>Computer Noise Modelling</i>	10
5.3	<i>Acoustic Mitigation</i>	13
6.	Operational Noise Assessment	14
6.1	<i>Daytime Assessment</i>	14
6.2	<i>Night-time Assessment</i>	15
6.3	<i>Uncertainty</i>	15
6.4	<i>Substation</i>	15
7.	Construction Noise	16
7.1	<i>Best Practicable Means</i>	16
7.2	<i>Construction Phase and Likely Plant Requirements</i>	16
7.3	<i>General Noise and Vibration Control Measures</i>	16
8.	Summary and Conclusions	19

Tables

Table 1: Proposed plant noise rating limits for the development	7
Table 2: Summary of Long Term Broadband Measured Noise Levels	9
Table 3: HVAC Unit Noise Levels	10
Table 4: Mitigation requirements for each plant item	13
Table 5: Daytime Assessment	14
Table 6: Night-time assessment	15
Table 7: Likely plant equipment to be used for construction activities on site	16
Table 8: Thresholds of Significant Effect at Residential Receptors in Accordance with the ABC Method of BS5228-1	21

Figures

Figure 1: Proposed Development	5
Figure 2: Survey locations and nearest receptor	8
Figure 3: Ground floor façade noise level at the nearest noise sensitive receptors	11
Figure 4: First floor façade noise level at the nearest noise sensitive receptors	12

Appendices

<i>Appendix A</i>	<i>Guidance Documents</i>
<i>Appendix B</i>	<i>Measurement Time Histories and Background Sound Level Distribution</i>
<i>Appendix C</i>	<i>Manufacturer Correspondent</i>
<i>Appendix D</i>	<i>HVAC Test Data</i>
<i>Appendix E</i>	<i>Example Acoustic Louvre For PCS</i>

1. Introduction

Hydrock Consultants is appointed to provide acoustic consultancy services in relation to the proposed Battery Energy Storage System (BESS) development located in Newburn, off Walbottle Road, NE15 9RU

The site is located within the administrative boundaries of Newcastle City Council.

A noise survey of the site was carried between the 21/11/23 and the 26/11/23 to determine Background Sound Levels at existing noise sensitive receptors.

A noise assessment has been carried out based on the methodology described in BS4142:2014+A1 2019. Noise limits for residential properties from BS 8233:2014 and the World Health Organisation Guidelines for Community Noise, Berglund et. al. 1999 (WHO Guidelines), have also been used.

2. Description of the Development and Site

The BESS development is located off Walbottle road and will comprise significant noise generating plant:

- 36no. battery cabinet strings
 - Each cabinet is served by a built-in HVAC unit.
- 18no. PCS units
 - Each PCS is served by a separate transformer.
- Substation

The proposed development is located in an area containing both residential dwellings and existing industrial developments, including North East Concrete, Alloypro Wheel Repairs, MJM Fabrications and the Newcastle City Council Waste Department.

Figure 1 shows the proposed development as per the latest architectural drawing at the time of writing

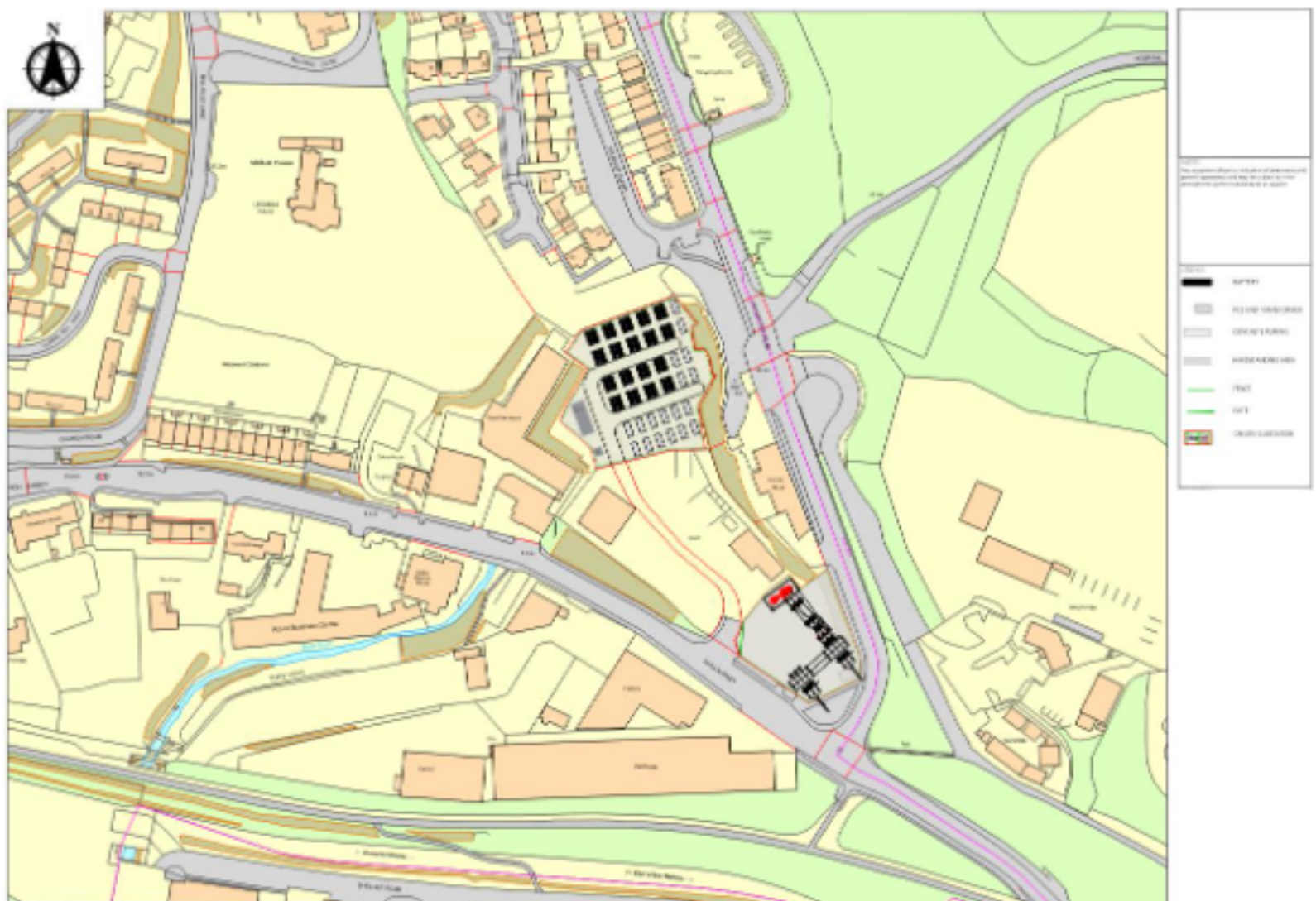


Figure 1: Proposed Development

3. Assessment Methodology

3.1 Policy and Guidance

The assessment methodology is based on the following guidance documents:

- » World Health Organisation "Guidelines for Community Noise", Berglund et. al., 1999 ("WHO Guidelines");
- » BS 4142:2014+A1:2019 ("BS 4142")
- » BS 8233:2014 – "Guidance on sound insulation and noise reduction for buildings" ("BS 8233");
- » BS 5228 – "Code of practice for noise and vibration control on construction and open sites" – Part 1: Noise

A review of the relevant planning policy and acoustics guidance is provided in Appendix A.

3.2 Local Policy

The development falls under the local planning authority of Newcastle City Council. The joint Newcastle Upon Tyne and Gateshead Development Plan, adopted March 2015, provides no specific guidance in relation to noise so mentioned guidance above will be used.

3.3 Proposed Plant Noise Limits

In lieu of any formal guidance from the local authority, Hydrock have determined plant noise rating limits for the proposed development based on guidance provided in BS 4142:2014, BS 8233:2014 and the WHO Guidelines.

The standard method for assessing the noise impact from industrial and commercial activity is BS 4142 "Method for rating and assessing industrial and commercial sound". A BS 4142 assessment is made by determining the difference between the intrusive noise under consideration (known as 'the specific sound level') and the background sound level at the receptor.

The sensitivity of receptors and the affected times of day are relevant when considering the impact of noise. At night, when people are generally inside and asleep, the audibility of a specific sound is less important than the absolute level which may cause sleep disturbance. Therefore, recommended levels for good sleeping conditions from WHO Guidelines and BS 8233 may be more appropriate to the assessment of night-time noise than the level relative to background, unless they are already exceeded by existing noise sources. This point is noted in BS 4142 as follows:

"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."

The WHO Guidelines recommend that "at night-time, outside sound levels about 1 metre from facades of living spaces should not exceed 45 dB L_{Aeq} , so that people may sleep with bedroom windows open". This was based on a 15 dB sound level difference between inside and outside with a window slightly open. However, recent guidance from the Association of Noise Consultants (ANC), providing advice on complying with the new Approved Document O to the Building Regulations, finds that a 9 dB level difference is more realistic for a typical bedroom when the window is open sufficiently to provide summertime cooling.

Therefore, to confidently avoid exceeding the best available current advice on good sleeping conditions in bedrooms at all times, a level of 39 dB L_{Aeq} should not be exceeded outside any residential receptor at night. During daytime periods, a standard BS 4142 assessment methodology is likely to be more appropriate, as nearby residents may be using external amenity areas.

The table below summarises the proposed plant noise rating limits for the development:

Table 1: Proposed plant noise rating limits for the development

Period	Plant Noise Rating Limit Methodology
Daytime (07:00 - 23:00)	Parity with the existing typical background sound level in accordance with BS 4142.
Night-time (23:00 - 07:00)	39 dB L_{Aeq} or the background sound level, whichever is greater, to avoid exceeding current advice on good sleeping conditions in bedrooms at all times.

Plant noise rating limits apply at the nearest receptor dwellings, to continuous noise (such as from cooling plant) without any specific character which is likely to attract attention. I.e. continuous broadband noise which is not readily distinguishable from the residual acoustic environment.

4. Environmental Noise Survey

4.1 Survey Methodology

A noise survey of the site was conducted between the 21st of November 2023 and the 26th of November 2023 to measure background and ambient sound levels at existing receptor dwellings.

The noise measurement locations, ML1 and ML2, as well as the proposed development site and noise-sensitive receptors (NSR), are illustrated in Figure 2. The survey took place under favourable wind conditions, with wind speeds below 5 m/s.

The existing noise climate on site was found to be dominated by existing industrial noise sources during daytime periods, but these cease operations during night time periods.



Figure 2: Survey locations and nearest receptor

4.2 Survey Results - Long Term Measurements

Two main acoustic parameters were measured using a time interval as stated in Table 2:

- » $L_{Aeq,T}$ dB, defined as the 'A' weighted equivalent continuous sound pressure level over a defined time period 'T', it is the sound pressure level equivalent to the acoustic energy of the fluctuating sound signal over the same time period. It is often referred to as the 'ambient noise level' and can be considered an average.
- » $L_{A90,T}$ dB, defined as the 'A' weighted sound pressure level exceeded for 90% of the measurement period 'T'. It is used to describe the underlying background noise level within BS4142:2014.

A summary of the 16-hour daytime (07:00 – 23:00 hours) and 8-hour night time (23:00 – 07:00 hours) $L_{Aeq,T}$ are presented in 2. The $L_{Aeq,T}$ levels presented are the logarithmic average of the measured $L_{Aeq,15minute}$ values for the period. The mode average 15-minute background sound levels (L_{A90}) during the day (07:00 – 23:00 hours) and night-time (23:00 – 07:00 hours) are also presented.

Table 2: Summary of Long Term Broadband Measured Noise Levels

Measurement Location	Period	Average (dB, $L_{Aeq,T}$) 16hour day, 8hour night	Background mode (dB, $L_{A90, 15min}$)
ML 1	Daytime	51	42
	Night time	47	26
ML2	Daytime	55	45
	Night time	49	27

The noise level time histories over the full measurement period for each day are presented in Appendix B for both ML1 and ML2. ML1 will be used to establish background noise for this assessment, as it is the most representative, being situated within the red line boundary of the proposed site.

5. Noise Impact Assessment

5.1 Plant Source Noise Levels

Noise levels for plant associated with the proposed development are presented in Table 3. Manufacturers specifications can be found in Appendix C.

The client plans on using Hithium's 2nd Generation Battery Cabinet product. The test data for the generation 2 unit is still under development but the manufacturer, Hithium, have set an acoustic design target of 65 dB L_{WA} for the unit, which has been used within the assessment included within this report. Appendix C contains correspondence with the manufacturer confirming their acoustic design intentions.

The computer aided noise model used in this assessment includes a calibrated representation of the first-generation Hithium Battery Cabinet, derived from manufacturer's test data (see Appendix D) with noise level correction made for the new design target of 65 dB L_{WA} for the 2nd generation unit.

Table 3: HVAC Unit Noise Levels

Item	Manufacturer	Product Name	Dimensions in metres (LxWxH)	Noise Levels
				Sound Power Level dB L_{AW} used in model
Power Conversion System (PCS)	SMA	SC-4600-UP	3x2x2.2	93
Battery Cabinets	Hithium	2nd Generation product, full details TBC	6.1x2.4x2.9	65
Transformer	ABB	3500 kVA	2.2x1.3x3	74

5.2 Computer Noise Modelling

In order to determine the noise impact of the proposed battery site on nearby sensitive receptors, a noise model has been created using Soundplan 8.2, an industry standard environmental noise prediction and mapping software which utilises the environmental noise propagation algorithms from ISO 9613-2:1996.

The modelling was carried out on the following basis:

- » Ground absorption set to 0.75, representative of soft ground surfaces and 0.2 for any paved surfaces (i.e., roads)
- » Reflection loss from buildings: 1.0 dB
- » For night time, noise levels are shown as worst case at the first-floor level.
- » For daytime, the ground-floor façade level is modelled, this is indicative of worst case private outdoor amenity 1m from the facade. For this scheme, noise levels away from the façade in receptor gardens are generally lower than this.
- » The noise model was set up to apply the noise prediction methodology set out in ISO 9613-2 'Acoustics – Attenuation of Sound propagation outdoors – Part 2: General method of calculation';
- » The model was set up to include up to first order reflected noise from solid structures;
- » Noise modelling results for all noise sources are presented in Figure 3 and 4 for daytime and night time assessments.

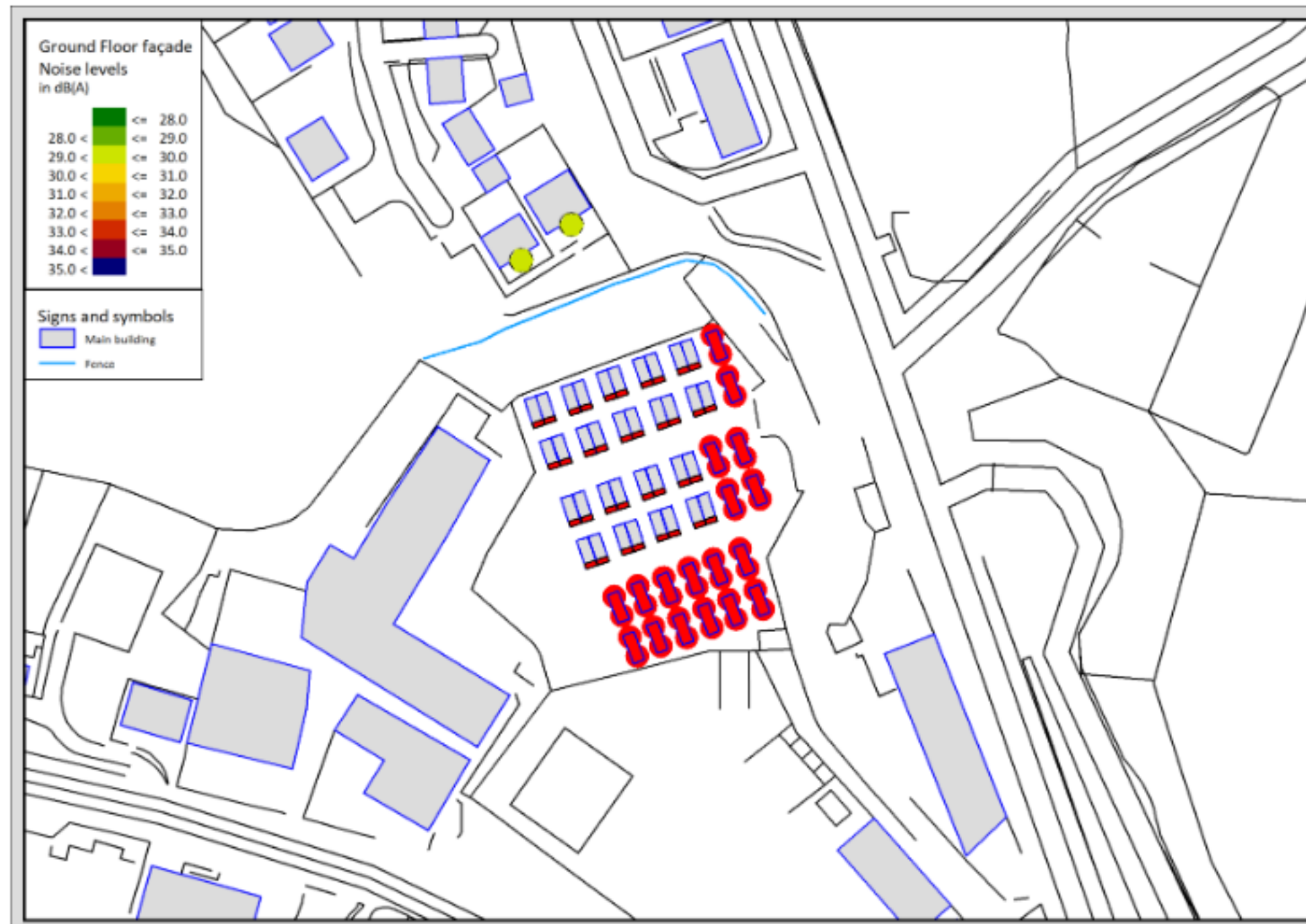


Figure 3: Ground floor façade noise level at the nearest noise sensitive receptors

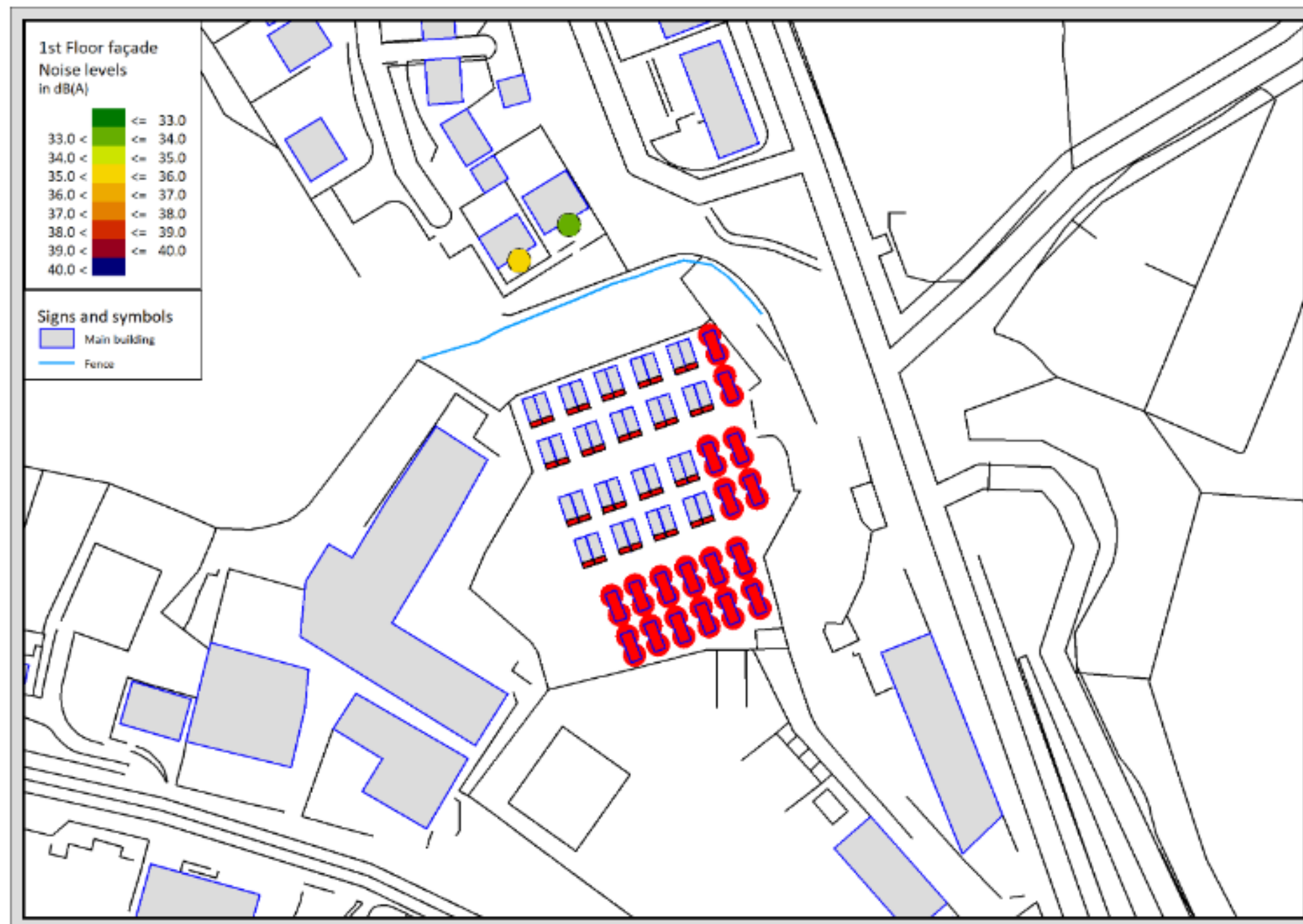


Figure 4: First floor façade noise level at the nearest noise sensitive receptors

5.3 Acoustic Mitigation

- » The model utilizes a 2.5m barrier, depicted in blue in figures 3 and 4. Consequently, a close-boarded fence of this height should be installed in the modelled location. The fence should achieve a surface mass of at least 10 kg/m². While there is an existing slatted timber fence in place, the client will need to inquire about upgrading this fence, as it is not currently part of their site.
- » The PCS and transformer units must be enclosed within a full acoustic enclosure on all sides (including the top) formed from an acoustic louvre achieving a minimum insertion loss of 25 dB, as is assumed in the presented modelling results.
- » Battery Cabinets to achieve a sound power level of 65 dB L_{WA}.
- » Insertion loss requirements for PCS enclosures and the HVAC attenuators are presented in Table 4. Any tonal AC hum from PCS units is not expected to be significant due to the enclosure.

Table 4: Mitigation requirements for each plant item

Plant Item	Sound power per Item L _w (dB) without attenuation	Insertion loss (dB)	Sound power per Item L _w (dB) with attenuation
Transformers	73	25	48
PCS	93	25	68
Battery Cabinet	65	-	-

6. Operational Noise Assessment

An operational noise assessment has been conducted for the proposed development based on modelling results and previously set out assessment methodologies.

The daytime assessment is based on predicted ground floor façade levels, while the night-time assessment considers noise levels at the first-floor façade.

6.1 Daytime Assessment

An assessment based on the methodology described in Section 3.3 for daytime (07:00 to 23:00 hours) period is presented in Table 5.

Table 5: Daytime Assessment

Results	Level	Commentary
Measured Background Sound Level (L_{A90} , dB)	42 dB	Day-time typical L_{A90} levels at ML1
Specific Sound Level (L_{Aeq} , dB)	30 dB	Levels predicted at receptor ground floor level which benefits from significant acoustic screening provided by the proposed 2.5m fence.
BESS Rating Level (L_{Ar})	30 dB	No character correction is deemed to apply as noise from the dominant battery cabinets is expected to be relatively steady and broadband.
BESS Excess of Rating Level over Background Sound level (dB)	$(30 - 42) = -12$ dB	The assessment indicates a low impact.

The predicted noise rating level is 12 dB below the existing daytime background noise levels at the nearest noise sensitive receptor. Therefore, noise levels of the proposed BESS development indicate a low impact.

6.2 Night-time Assessment

An assessment based on the methodology described in Section 3.3 for the night-time (23:00 to 07:00 hours) period is presented in Table 6.

Table 6: Night-time assessment

Results	Level	Commentary
Measured Background Sound Level (L_{A90} , dB)	26 dB	Night-time typical L_{A90} levels at ML1. Background sound levels considered to be low in line with BS 4142. Therefore, plant noise criteria set using alternative guidance documents.
Proposed plant noise rating limit (L_{Aeq} , dB)	39 dB	Limit set to avoid exceeding current advice on good sleeping conditions in bedrooms with windows open for overheating mitigation.
Specific Sound Level - (L_{Aeq} , dB)	36 dB	Levels predicted at receptor first floor level which benefits less than ground floor from the acoustic screening provided by the proposed 2.5m fence.
BESS Rating Level (L_{Ar})	36 dB	No character correction is deemed to apply as noise from the dominant battery cabinets is expected to be relatively steady and broadband.
BESS Excess of Rating Level over proposed plant noise rating limit (dB)	(36 – 39) = -3dB	The assessment indicates a low impact, depending on the context. See discussion below.

The predicted noise rating level is 3 dB below the proposed plant noise rating limits at the nearest noise sensitive receptor. Although the predicted plant noise rating level is above the measured background sound level, it is low in absolute terms. With an open window the contribution of noise from the proposed BESS would typically be around 27 dB in bedrooms. This would have no impact on amenity and would often not be noticeable considering the ambient noise climate in the area.

The predicted plant noise rating level is 11 dB below the measured ambient sound level at night (47 dB $L_{Aeq, 8\text{ hour}}$).

6.3 Uncertainty

Although the limited data acquired for the battery cabinets showed a broadband level, it has not been possible to determine conclusively that tonal noise will not arise from the PCS and Transformer units. However, should later measurements reveal a significant tonal content to the noise, this can be mitigated through the design of the proposed enclosures, attenuators, and final equipment selections.

It has not been possible to review uncertainty related to the source sound level data provided by equipment manufacturers. However, the developer is committed to achieving the rating noise levels indicated in this report and will apply necessary margins within the design of mitigation solutions or seek data with greater certainty as required.

6.4 Substation

Noise from the proposed substation on site must be controlled such that the cumulative noise contribution from BESS sources and the substation does not exceed the 39 dB limit set by Hydrock during night-time periods. The 100 Hz tone, which is a common to all transformers, will be controlled such that it is not

significant at receptors based on the tonal assessment methods described in BS4142:2014. If necessary, the substation can be enclosed in a masonry building to ensure that noise limits are met at the noise sensitive receptor.

7. Construction Noise

7.1 Best Practicable Means

The Principal Contractor must use 'best practicable means' ('BPM') to minimise the impact of noise and vibration. BPM is defined in Section 72 of the Control of Pollution Act 1974 and Section 79 of the Environmental Protection Act 1990 as those measures which are:

'... reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to financial implications.'

7.2 Construction Phase and Likely Plant Requirements

It is not possible at this stage to accurately determine the specific noise levels during the construction phase as no contractor is on board, and no construction programme has been produced. However, the following list of expected plant types would be typical for construction of a BESS. It should be noted that the type of construction activity required for a BESS are not significantly different from residential or small commercial buildings.

Receptor daily construction noise exposure will depend on the location of plant on site, the specific model and size of plant, and the operating time. None of this can be accurately determined at this time. It is the responsibility of the contractor to take a best practicable means approach to minimising noise by considering plant selections, alternative quiet methods, positioning, shielding, operating hours, operating duration and other control methods outlined in Section 7.3.

Table 7 provides a list of likely plant equipment that may be used on site during different activities over the course of the construction phase.

Table 7: Likely plant equipment to be used for construction activities on site

Construction Activity	Likely Plant Equipment
Substation Fencing, Earthwork, Drainage, Road Construction, Site Clearance	Generator, Excavator, Dozer, Roller, Crusher, Concrete mixer
Substation Foundations and Buildings	Concrete truck mixer, Concrete pump, Crane, Poker Vibrator, MEWP, Excavator, Impact Wrench
Installation of Electrical Infrastructure	MEWP, Telehandler, Crane
Site Maintenance Activities	Telehandler, Road Sweeper, Wheeled Excavator, Main Compound generator

7.3 General Noise and Vibration Control Measures

General recommended noise and vibration control measures are listed, with reference to British Standard (BS) 5228 'Code of practice for noise and vibration control on construction and open sites', Part 1: Noise (+A1:2014), and Part 2: Vibration (+A1:2014):

- Construction will be confined to the permitted hours;

- b. Loading/unloading activities will be located away from residential properties and shielded from those properties, where practicable;
- c. Materials will be handled in a manner that minimises noise and drop heights of materials will be minimised;
- d. Careful selection of plant and construction methods. Only plant conforming to relevant national, EU or international standards, directives and recommendations on noise and vibration emissions will be used. The Principal Contractor will ensure that each item of plant used on the project complies with the noise limits quoted in the relevant European Commission Directive 2000/14/EC/United Kingdom Statutory Instrument (SI) 2001/1701 (as amended). The Principal Contractor's Environmental Manager will maintain a register of plant and equipment and statutory certification;
- e. Design and use of acoustic screening measures where practicable and necessary, at the earliest opportunity to meet the noise limits within the acoustic report. Acoustic screening measures include site hoardings, acoustic barriers, acoustic enclosures, acoustic housing for plant and temporary stockpiles. Such measures can be particularly appropriate for stationary or near-stationary plant such as pneumatic breakers, piling rigs and compressors. Barriers will be located as close to the plant as possible and, in order to provide adequate attenuation, and must have a mass per unit area of at least 7 kg/m²;
- f. All vehicles and mechanical plant used for the purpose of the work will be fitted with effective exhaust silencers and shall be maintained in good and efficient working order and operated to minimise noise emissions;
- g. All compressors and generators will be "sound reduced" models fitted with properly lined and sealed acoustic covers which shall be kept closed whenever the machines are in use, and all pneumatic percussive tools will be fitted with mufflers or silencers of the type recommended by the manufacturers;
- h. All machines in intermittent use will be shut down in the intervening periods between works or throttled down to a minimum. Lorry engines will be switched off when vehicles are stationary. Noise emitting equipment which is required to run continuously will be housed in a suitable acoustic enclosure;
- i. Plant and equipment liable to create noise and/or vibration whilst in operation will, as far as reasonably practicable, be located away from sensitive receptors and away from walls which could reflect noise towards sensitive receptors;
- j. Where reasonably practicable, fixed items of construction plant will be electrically powered in preference to diesel or petrol driven;
- k. Vehicles will not wait or queue on the public highway with engines idling; construction traffic movements will be undertaken in accordance with the Construction Traffic Management Plan ("CTMP");
- l. All appropriate contractor personnel will be instructed on BPM measures to reduce noise and vibration as part of their induction training, and followed up by 'tool box' talks;
- m. Noisy activities will be staggered in time and space where feasible;
- n. Only designated access routes (on site) will be used;
- o. Reversing alarms incorporating one of more of the features listed below or any other comparable system will be used where reasonably practicable:
 - Highly directional sounders;

- Use of broad band signals;
- Self-adjusting output sounders;
- Flashing warning lights; and
- Reversing alarms will be set to the minimum output noise level required for health and safety compliance.

All site personnel will receive training appropriate to the nature of their roles and responsibility; the training will include specific information in relation to noise and vibration management. If their work activities are assessed as being particularly noise/vibration emission prone, all staff will receive induction training that will incorporate environmental awareness training, plus specific training in relation to noise and vibration.

8. Summary and Conclusions

Hydrock Consultants are appointed to undertake a noise impact assessment for the proposed Battery Energy Storage System (BESS) located on land off Walbottle Road, Newburn. To establish the existing background sound level at the site, a survey was undertaken from 21/11/23 to 26/11/23.

A mitigation strategy has been developed. This report presents an assessment of the residual impact which is expected to be low. Daytime noise levels from the proposed BESS development will be substantially below the existing background sound levels. Night-time BESS levels will be below the level recommended for good sleeping conditions in bedrooms at night, even when windows are open, and are not expected to be noticeable in the context of the ambient noise climate.

Therefore, noise from the proposed development is not expected to have a significant impact on residential amenity at existing receptors.

Appendix A Guidance Documents

British Standard 4142:2014+A1:2019

The standard method for assessing noise from commercial and industrial premises is British Standard BS 4142 *“Method for rating and assessing industrial and commercial sound”*. The standard is applicable for assessing noise affecting *“dwellings or premises used for residential purposes”*.

A BS 4142 assessment is made by determining the difference between the specific noise under consideration and the background sound level, as represented by the L_{A90} parameter, determined in the absence of the commercial sound. The L_{A90} parameter is defined as the level exceeded for 90% of the measurement time. This parameter therefore excludes short duration noise events, such as individual vehicle movements, and represents the underlying continuous noise.

The commercial or industrial sound is assessed in terms of the equivalent continuous noise level, L_{Aeq} . The equivalent continuous noise level (L_{Aeq}) of the commercial or industrial sound, over the applicable assessment period, is known as the specific sound level.

A character correction penalty can be applied to the specific sound level where the commercial noise exhibits distinguishable tones, impulsiveness, intermittency or other characteristics which *“are otherwise readily distinctive against the residual acoustic environment”*.

The specific noise level with the character correction (if necessary) is known as rating level (L_{Ar}) and the difference between the background noise and the rating level is determined to make the BS 4142 assessment. The following is then considered.

- a) Typically, the greater this difference, the greater the magnitude of the impact.*
- b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
- d) 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.”*

The standard highlights the importance of considering the context in which a sound occurs. Factors including the absolute sound level, the character of the sound, the sensitivity of the receptor and the existing acoustic character of the area should be considered when assessing the noise impact. The use of the proposed premises for short term holiday rentals is also pertinent to the consideration of context.

The standard notes the need to consider absolute sound levels where background sound levels are low:

“For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.

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

BS 8233:2014 and World Health Organisation (WHO) Guidelines for Community Noise, 1999

For dwellings the main considerations are to protect sleep in bedrooms at night and to protect resting, listening and communicating in all rooms during the day. For noise without a specific character

BS8233:2014 identifies desirable internal limits during the 8-hour night (2300-0700 hours) or 16-hour day time (0700-2300 hours) of 30dB L_{Aeq} and 35dB L_{Aeq} respectively.

For dwellings where windows may be opened, an internal target of 35 dB L_{Aeq} during the day, and 30 dB L_{Aeq} during the night, equates to around 50 dB L_{Aeq} and 45 dB L_{Aeq} during the day and night respectively outside noise sensitive rooms.

The BS8233:2014 noise limits are for noise without a specific character. The standard notes that people are often more tolerant of noise without a specific identifiable character and that noise from neighbours (or a specific businesses) can trigger *“complex emotional reactions”*. Therefore, in the UK, the BS8233:2014 noise limits (which are derived from WHO Guidelines) are often applied only to what is termed *“anonymous noise”*. That is, noise without a specific character and that cannot be easily identified as emanating from a single business, building, or neighbour.

It should be noted that the BS8233:2014 noise limits are derived from limits identified in the World Health Organisation (WHO) *“Guidelines for Community Noise”*, which are applicable to annoyance:

“The effects of noise in dwellings, typically, are sleep disturbance, annoyance and speech interference. For bedrooms the critical effect is sleep disturbance. Indoor guideline values for bedrooms are 30 dB L_{Aeq} for continuous noise and 45 dB L_{Amax} for single sound events. Lower noise levels may be disturbing depending on the nature of the noise source. At night-time, outside sound levels about 1 metre from facades of living spaces should not exceed 45 dB L_{Aeq} , so that people may sleep with bedroom windows open. This value was obtained by assuming that the noise reduction from outside to inside with the window open is 15 dB. To enable casual conversation indoors during daytime, the sound level of interfering noise should not exceed 35 dB L_{Aeq} .”

BS4142:2014 +A1 2019 is the standard method for assessing commercial and industrial noise in the UK. However, in certain circumstances BS4142:2014 + A1 2019 notes that alternative noise limits such as those contained in BS8233:2014 and WHO Guidelines may be applicable.

It is considered that the BS8233:2014 noise limits are applicable where the intrusive noise is from a single identifiable source (e.g. the proposed battery storage site) but, the affected residents are unlikely to exhibit *“complex emotional reactions”*; for example, because it is an existing and welcome development. It is further considered that BS8233:2014/WHO may be more applicable to night-time noise affecting bedrooms than BS4142:2014+A1 2019 as the critical effect is sleep disturbance.

British Standard BS5228 Part 1: 2009+A1:2014 – Construction Noise

BS5228 Part 1 provides practical guidance on the control of noise from construction sites. The legislative background to noise control is described and recommendations are given regarding procedures for creating effective liaison between developers, site operators and Local Authorities.

Methods for predicting and assessing construction noise are presented. Annex E of BS5228 introduces the 'ABC' assessment method, which defines the threshold of likely significant effects at receivers.

This method defines category threshold values which are determined by the time of day and existing ambient noise levels at receptors (rounded to the nearest 5dB). The noise level likely during construction and demolition activities, known as the 'total noise level', is then compared with the 'threshold value'. If the total noise level exceeds the 'threshold value', then a potentially significant effect is indicated. However, it is necessary to consider receptor sensitivity, the number of affected receptors, and the duration of the exceedance to determine the significance of the effect.

Table 8 below summarises the construction noise significant effect threshold values at receptors, recommended by BS5228-1.

Table 8: Thresholds of Significant Effect at Residential Receptors in Accordance with the ABC Method of BS5228-1

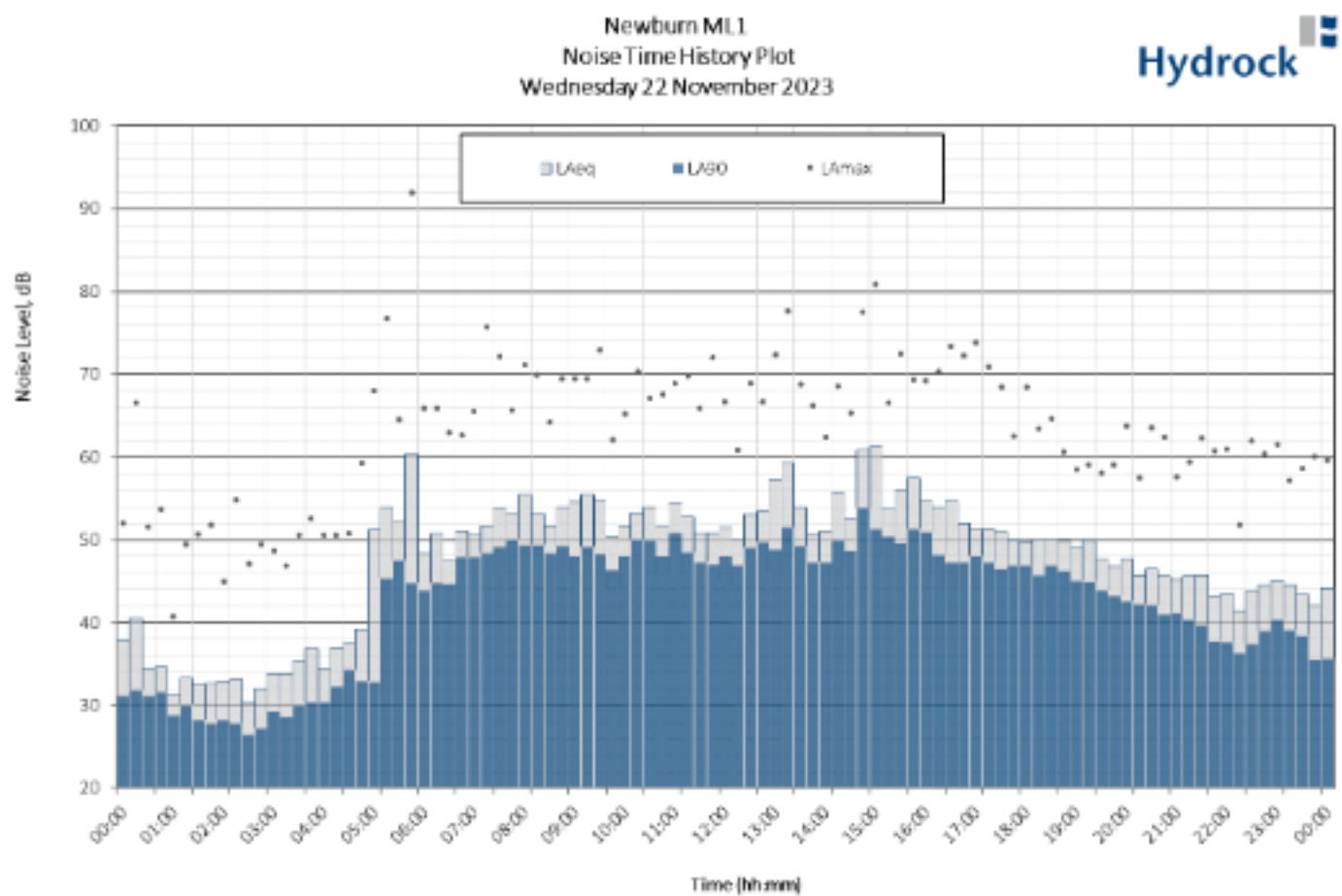
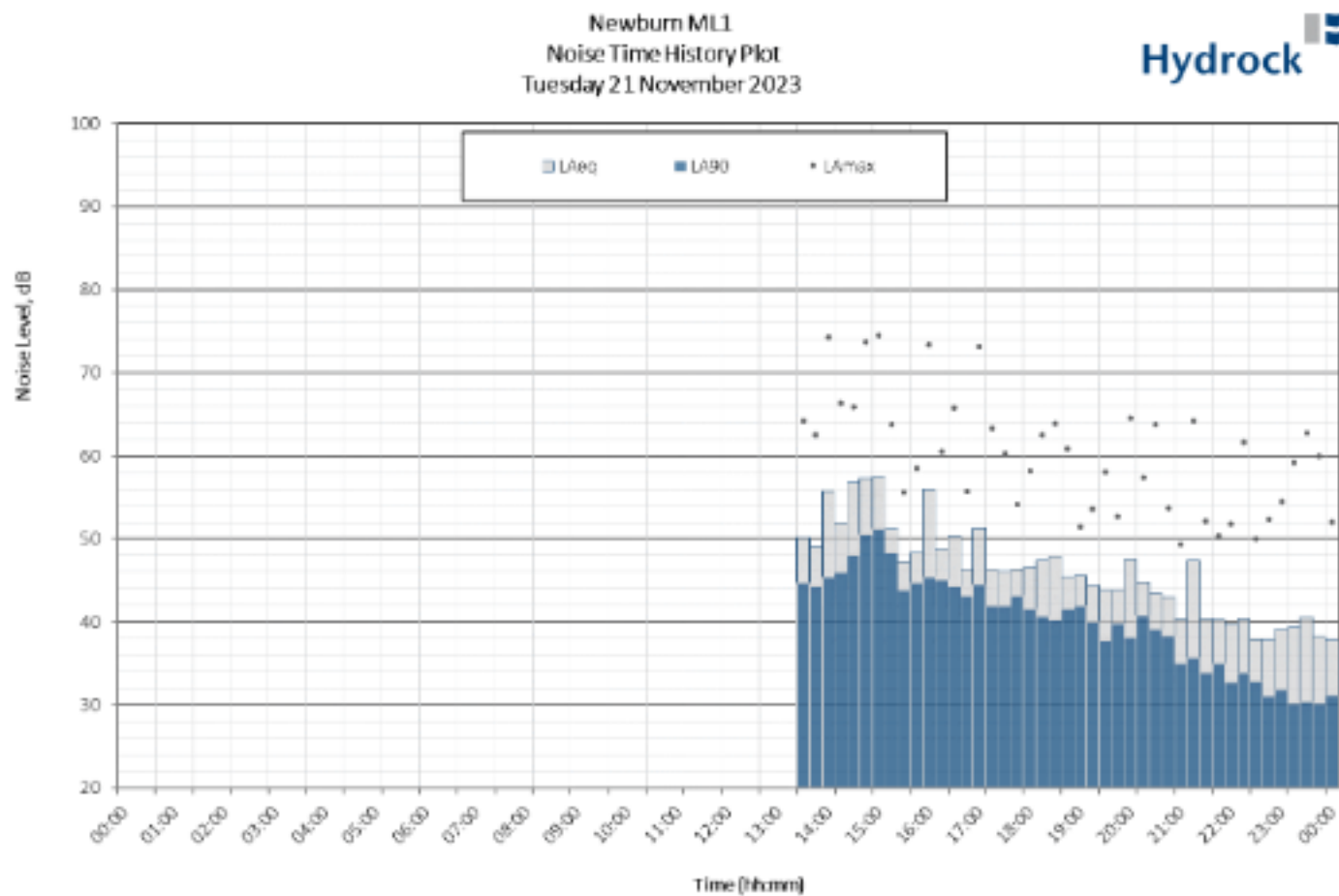
Assessment Category Threshold Value Period	Threshold Value, dB		
	Category A *1	Category B *2	Category C *3
Weekday Daytime (07:00 to 19:00) and Saturdays (07:00 to 10:00)	65	70	75

*1 Category A: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than this value.

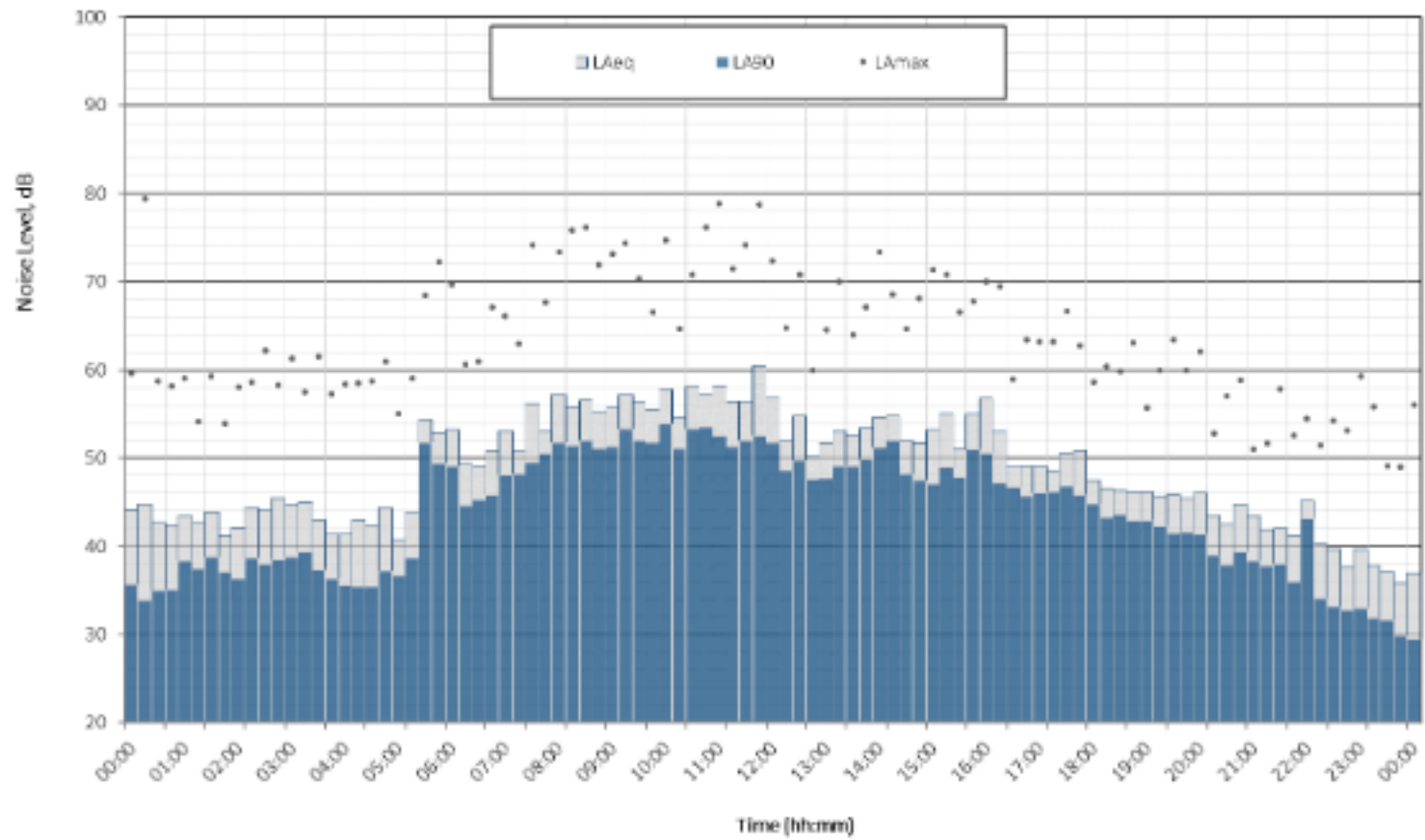
*2 Category B: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.

*3 Category C: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are more than this value.

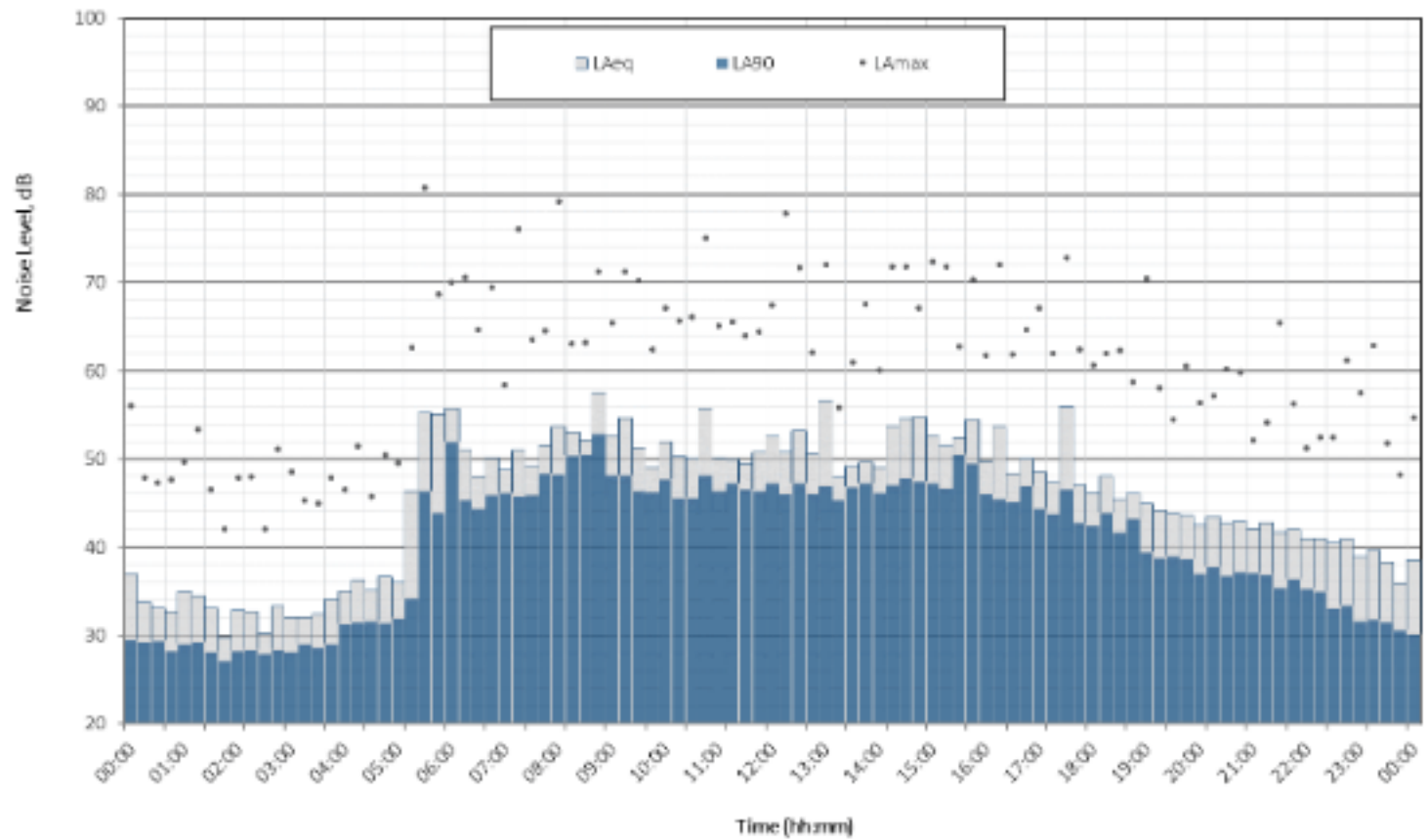
Appendix B Measurement Time Histories and Background Sound Level Distribution



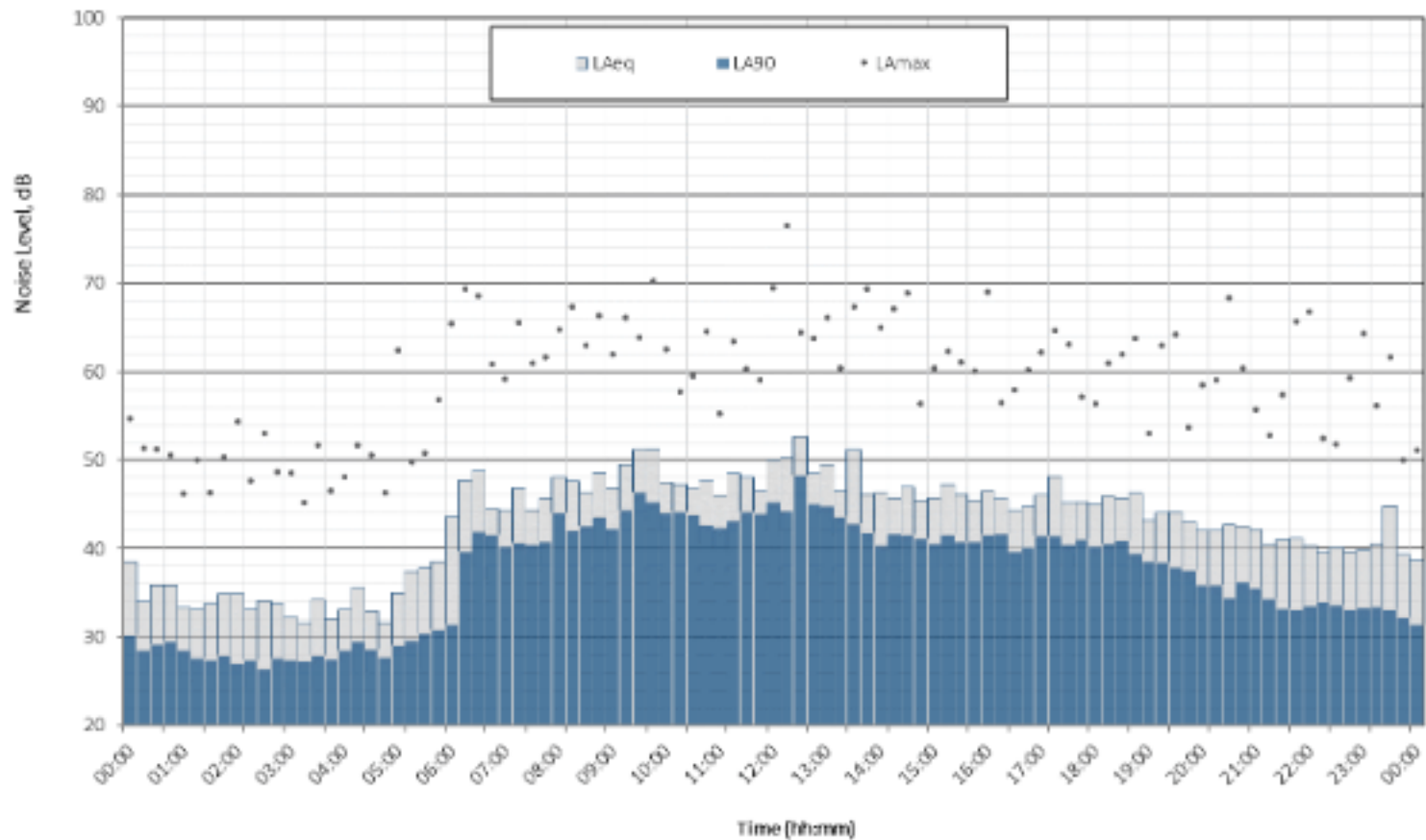
Newburn ML1
Noise Time History Plot
Thursday 23 November 2023



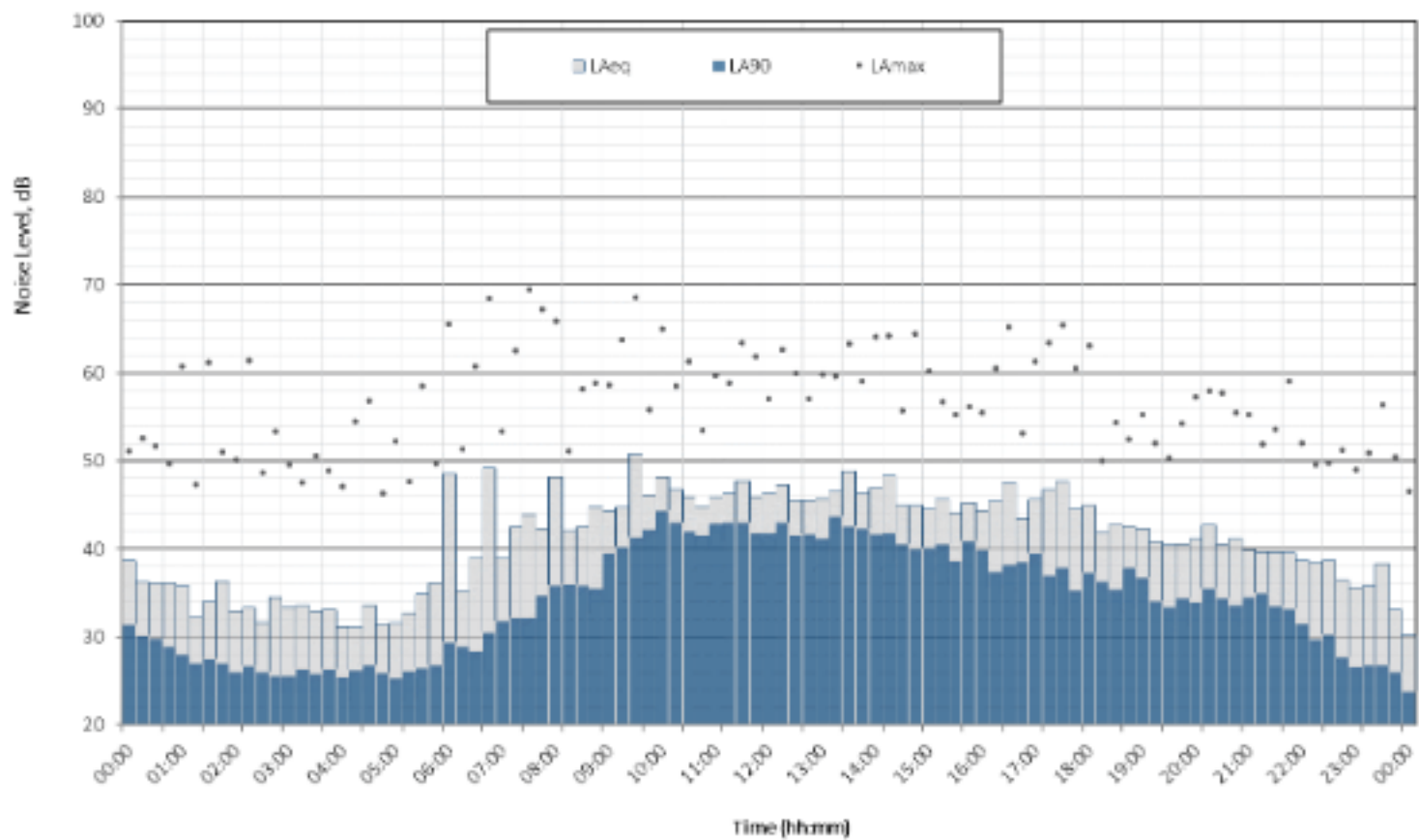
Newburn ML1
Noise Time History Plot
Friday 24 November 2023



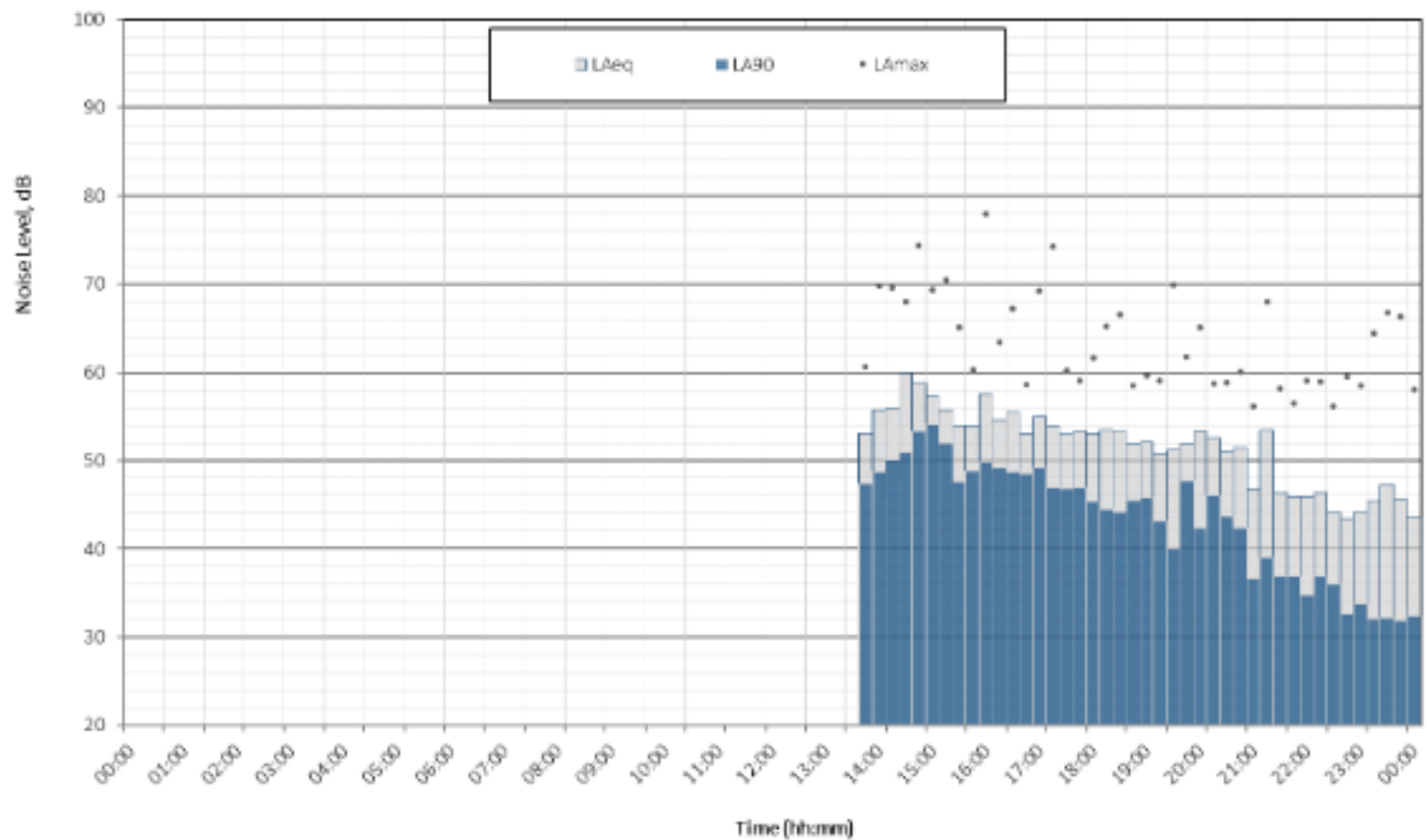
Newburn ML1
Noise Time History Plot
Saturday 25 November 2023



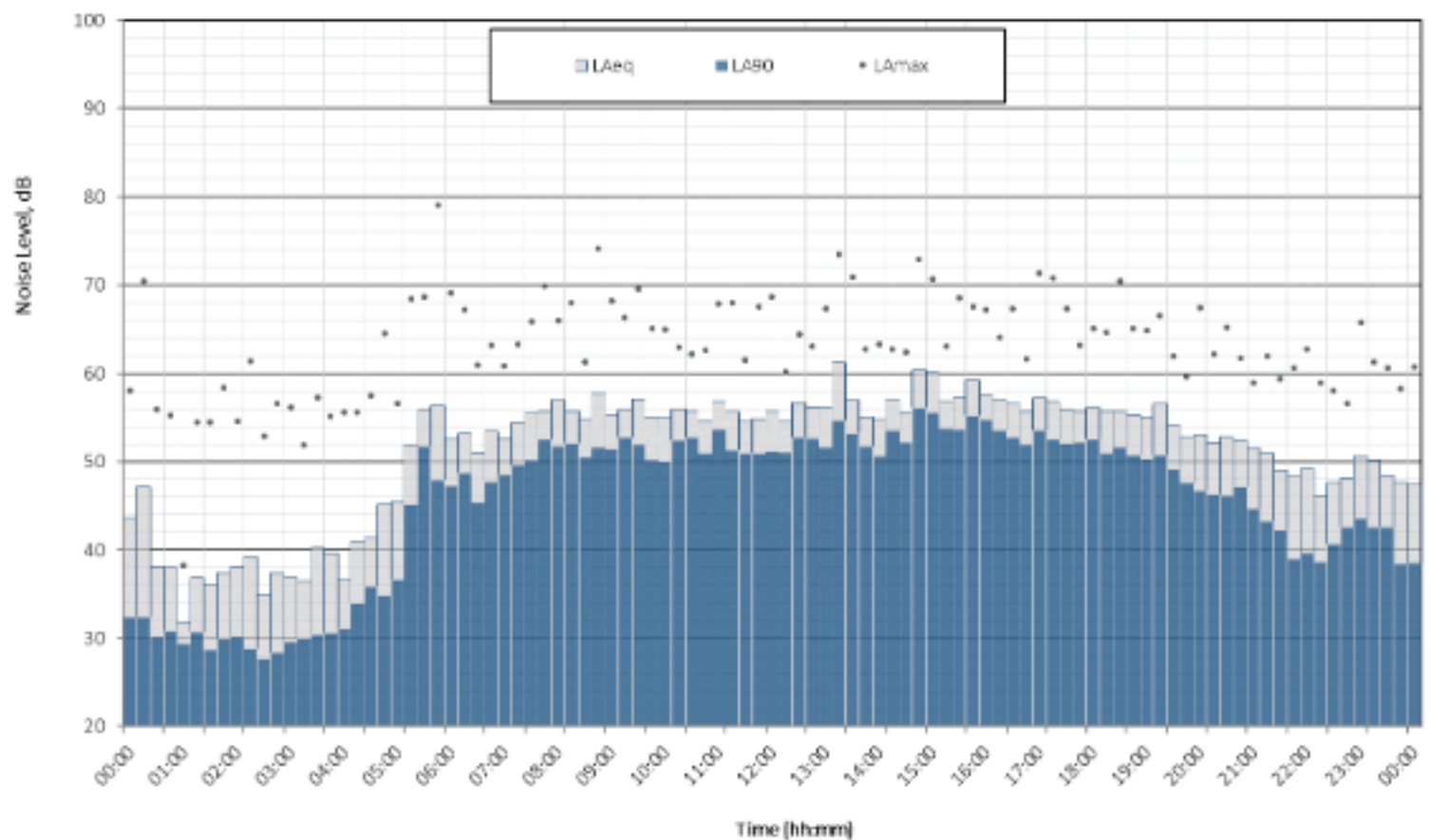
Newburn ML1
Noise Time History Plot
Sunday 26 November 2023



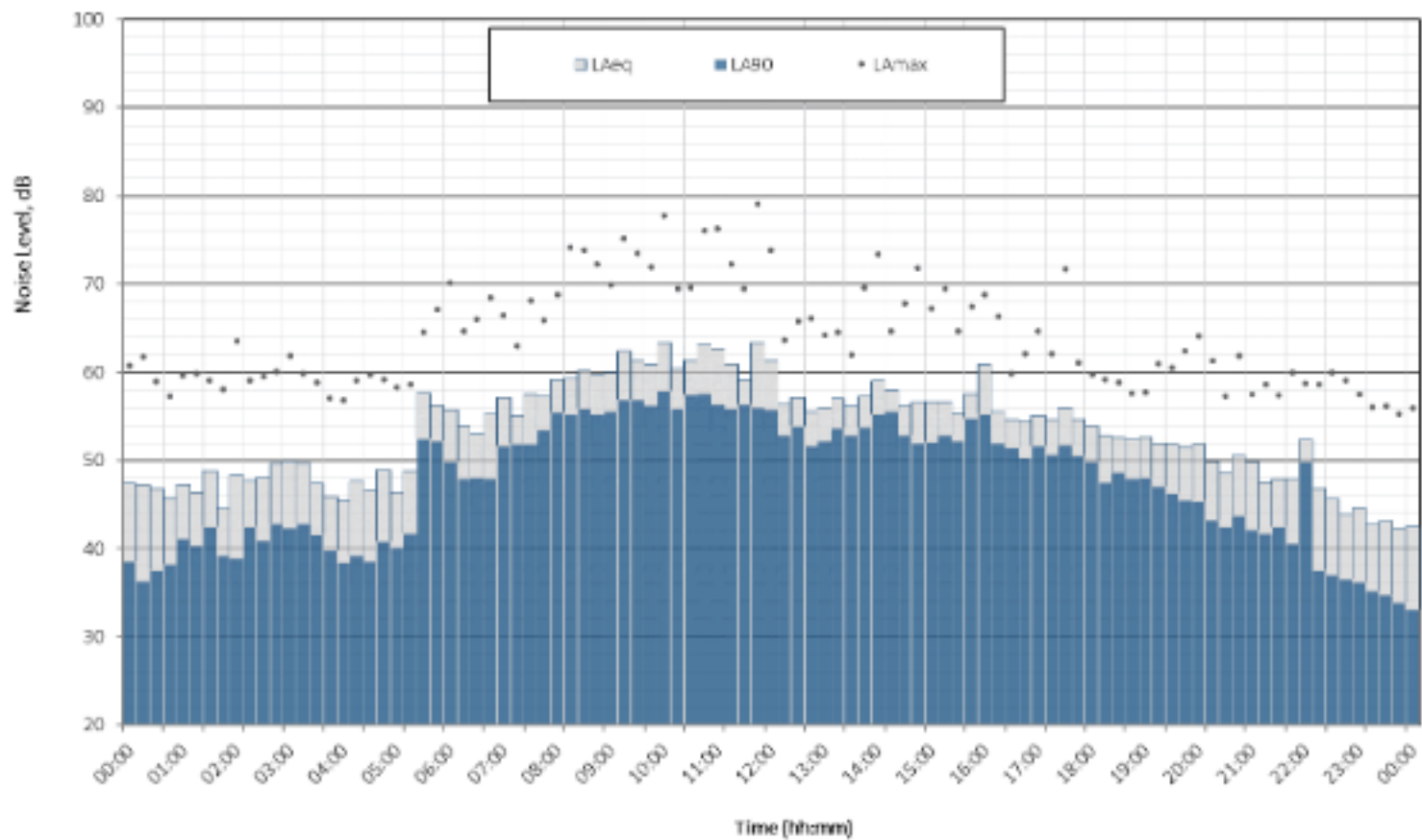
Newburn ML 2
Noise Time History Plot
Tuesday 21 November 2023



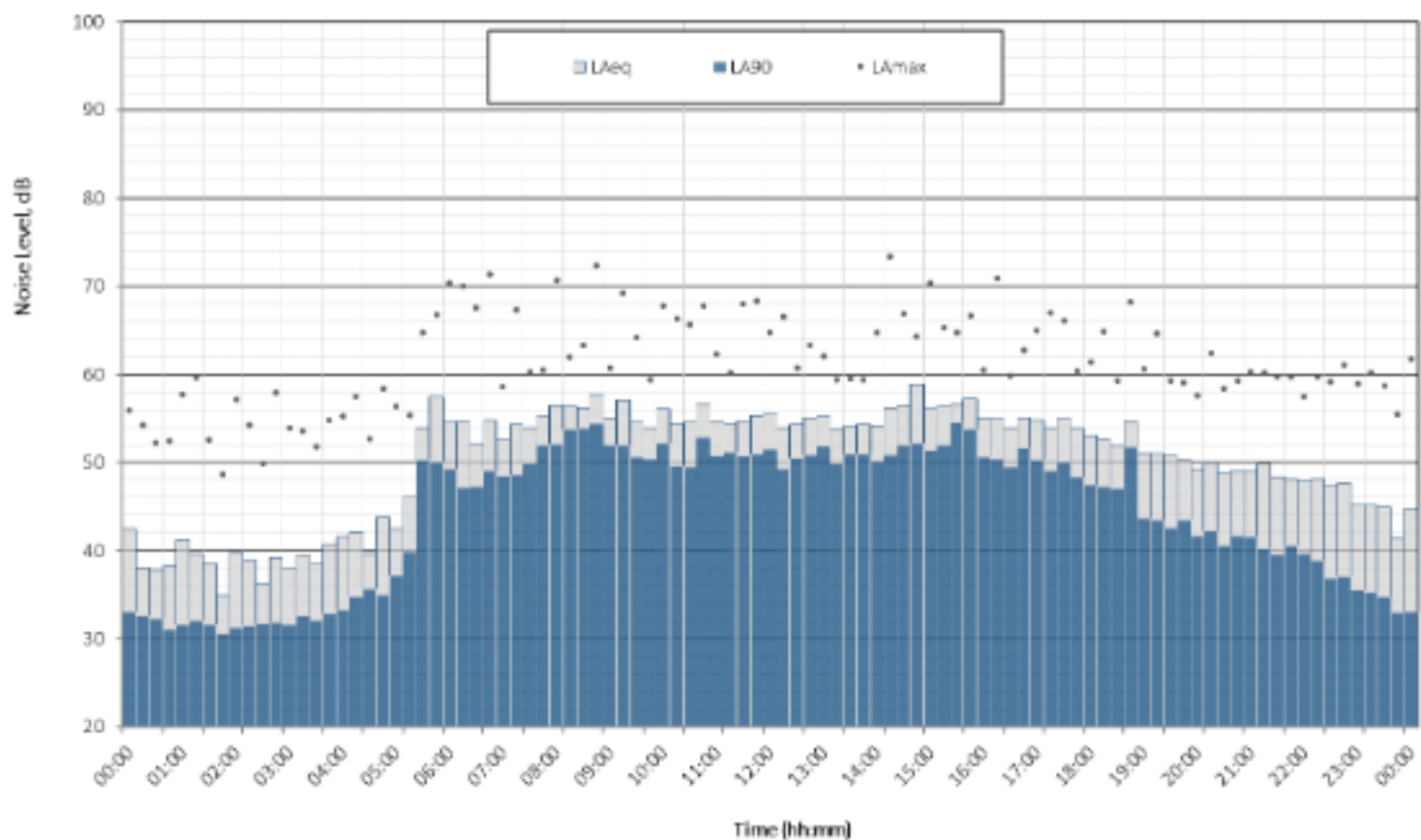
Newburn ML 2
Noise Time History Plot
Wednesday 22 November 2023



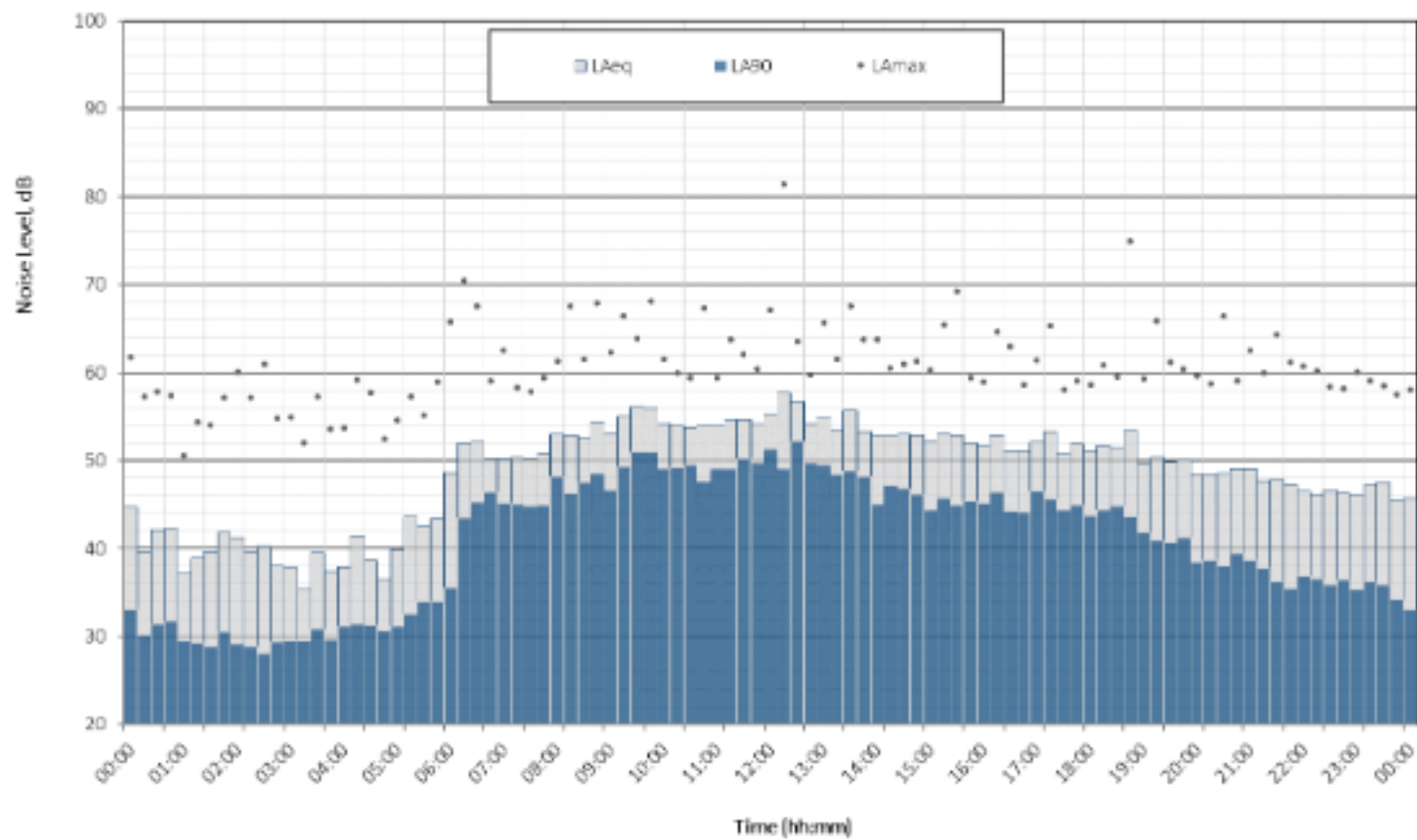
Newburn ML 2
Noise Time History Plot
Thursday 23 November 2023



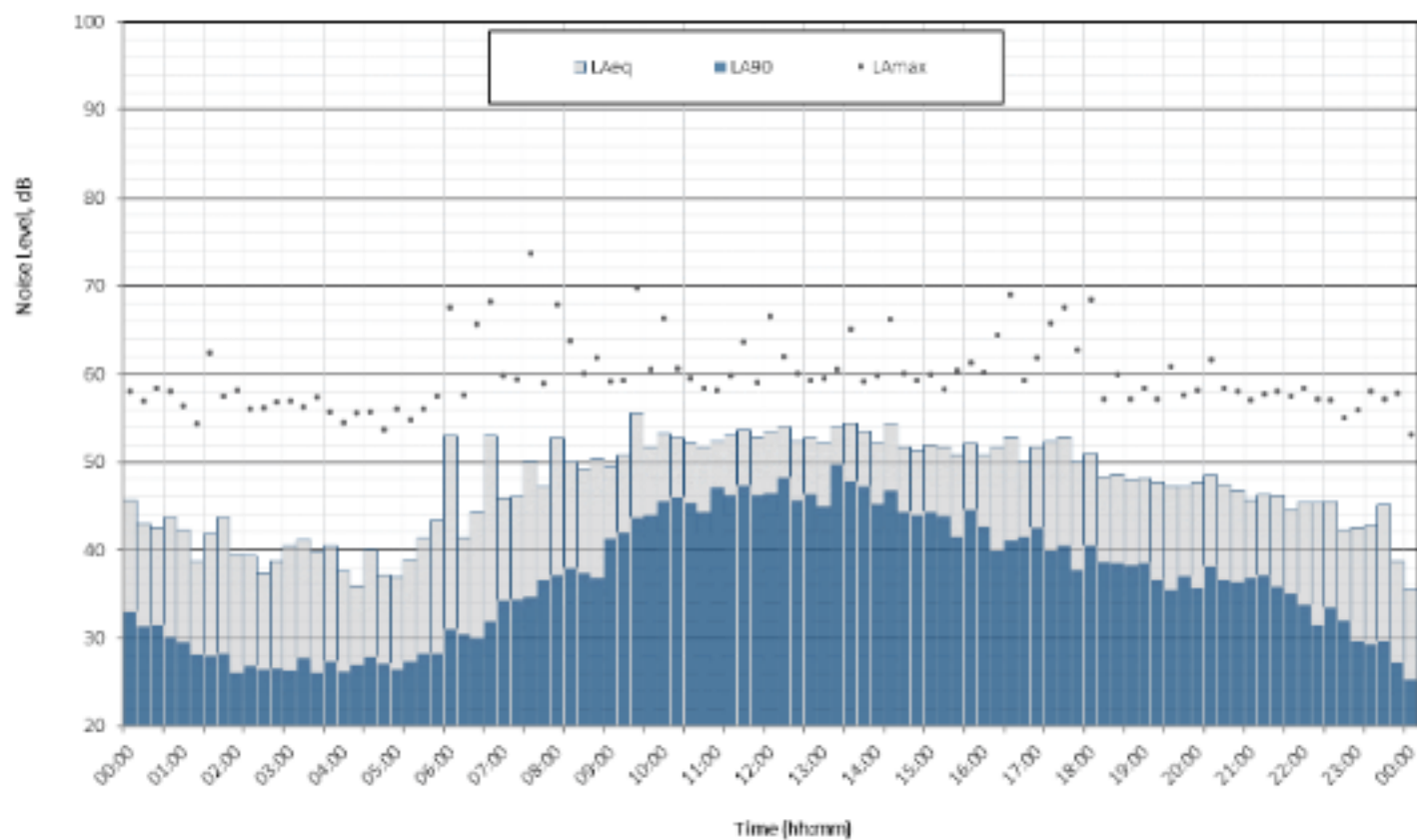
Newburn ML 2
Noise Time History Plot
Friday 24 November 2023



Newburn ML 2
Noise Time History Plot
Saturday 25 November 2023



Newburn ML 2
Noise Time History Plot
Sunday 26 November 2023



Appendix C Manufacturer Correspondent

RE: Fig Power/Hithium



Catherine Lewis

To: Stone Shi

Cc: Wei Zheng; Zoe He; Laura Garcia de Dios; Steffan Davies; Thomas Buckberry

Reply

Reply All

Forward

...

Fr 02/02/2024 15:43

Good Afternoon Stone,

I just wanted to check with you that the noise test data for the second generation container will be available in mid February? We also have a few questions for you from our noise consultants (cc'd in Steffan and Thomas) regarding the containers, please see below:

- Can you confirm that the sound power level (LwA) will be 65 dB for the new unit?
- Can you confirm that you will undertake appropriate measurements to demonstrate this?
- Can you provide some information on the changes you are making to the unit to achieve a sound power level of 65 dB LwA? This is quite a significant reduction in noise levels from the first generation unit which you recently provided us noise level data for.

Have a lovely weekend.

Kind Regards,

Catherine Lewis

Graduate Renewable Energy Consultant | Smart Energy and Sustainability

Make flexibility work: Hydrock promotes flexible working, if you get an email from me outside normal hours it is because I am sending it at a time convenient to me. I do not expect you to read or reply until normal office hours.

Dear Catherine,

Good morning, and hope you had a sweet weekend.

Regarding to your questions, please find the **reply** in your last email.

Thanks<3

Stone-Mingwei.Shi(石明伟)

Director, Sales/key projects

Mobile/Whatsapp/Wechat: +86 177 2133 5698/+44 7946 612524

E-mail: stone.shi@hithium.com

发件人: Catherine Lewis <Catherine.Lewis@hydrock.com>

发送时间: 2024年2月2日 15:43

收件人: Stone Shi <Stone.Shi@hithium.com>

抄送: Wei Zheng <Wei.Zheng@hithium.com>; Zoe He <Zoe.He@hithium.com>; Laura Garcia de Dios <LauraGarcadeDios@hydrock.com>; Steffan Davies

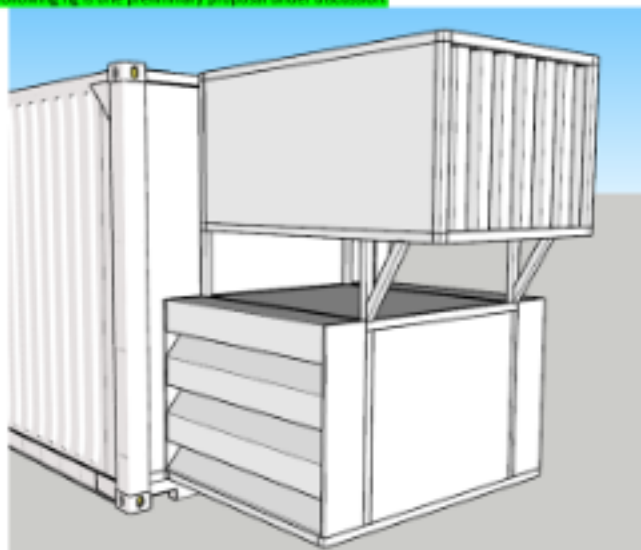
<SteffanDavies@hydrock.com>; Thomas Buckberry <ThomasBuckberry@hydrock.com>

主题: RE: Fig Power/Hithium

Good Afternoon Stone,

I just wanted to check with you that the noise test data for the second generation container will be available in mid February? **Hithium: currently, we are designing it, and the test data's schedule is not available yet.** We also have a few questions for you from our noise consultants (cc'd in Steffan and Thomas) regarding the containers, please see below:

- Can you confirm that the sound power level (LwA) will be 65 dB for the new unit? **Hithium: this is design target, and we are working on it.**
- Can you confirm that you will undertake appropriate measurements to demonstrate this? **Hithium: we will issue an evaluation report on it.**
- Can you provide some information on the changes you are making to the unit to achieve a sound power level of 65 dB LwA? This is quite a significant reduction in noise levels from the first generation unit which you recently provided us noise level data for. **Hithium: detailed plans are under discussion, like adding silencers, etc. following fig is one preliminary proposal under discussion.**



Have a lovely weekend.

Kind Regards,

Catherine Lewis

Graduate Renewable Energy Consultant | Smart Energy and Sustainability

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Appendix D HVAC Test Data



福建省计量科学研究院
FUJIAN METROLOGY INSTITUTE

报告编号: 23C3-00014
Report No.

检测结果/说明:
Results of Test and additional explanation.

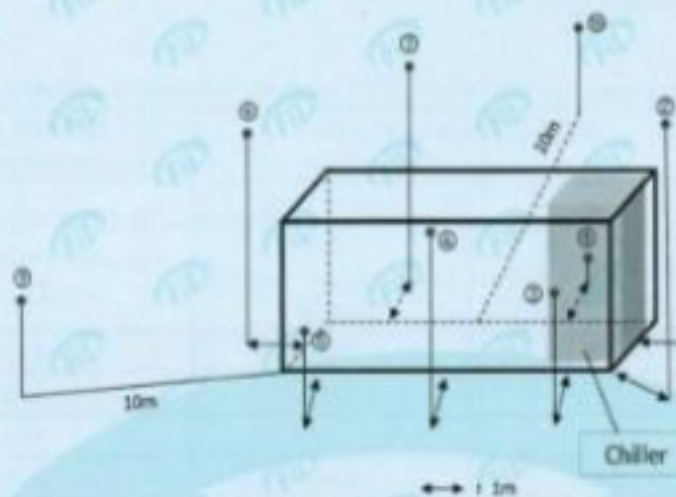


图2 液冷储能集装箱各测量点上传声器位置分布图

Fig. 2 the locations of microphones used in the SPL test of container

测点 Sampling No. i	水平距离 (m) Horizontal distance between container and microphones (Units: m)	高度 (m) The vertical distance between the floor and microphones (Units: m)	测点 Sampling No. i	水平距离 (m) Horizontal distance between container and microphones (Units: m)	高度 (m) The vertical distance between the floor and microphones (Units: m)
1	1	2	6	1	4
2	1	4	7	1	3
3	1	2	8	1	2
4	1	3	9	10	4
5	1	1	10	10	2

1.7. 测试方法 (Testing method):

- (1) 采集2min背景噪声信号数据;

The statistic analysis of background noise in 2 mins.

- (2) 在样品工作条件下, 监测采集6.5h全过程声信号数据。

The analysis of sound pressure level during 6.5h, in container operating condition.

检测报告续页专用
Continued page of test report

第 5 页/共 10 页
Page 5 of 10

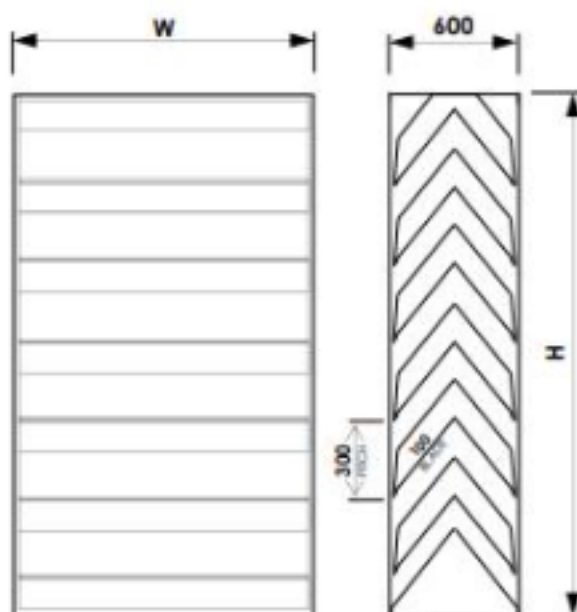
Appendix E Example Acoustic Louvre For PCS

DATA SHEET L130E ACOUSTIC LOUVRE MODEL AL3030D

THIS IS NOT A STAND ALONE DOCUMENT AND UNLESS REFERRED TO IN A DATED EQUIPMENT SCHEDULE IS SUBJECT TO REVISION WITHOUT NOTICE.



DIMENSIONS



SPECIFICATION

LOUVRES ARE CONSTRUCTED FROM FOLDED SHEET METAL AND HAVE A SERIES OF HORIZONTAL BLADES CONTAINED WITHIN A FOUR SIDED EXTERNAL FRAME.

THE MATERIAL OF CONSTRUCTION MAY BE PRE-GALVANISED STEEL (SUFFIX G) OR ALUMINIUM (SUFFIX A).

GALVANISED BRID SCREENS ARE FITTED AS STANDARD.

CASING SIDES ARE PROVIDED WITH 10mm DIA HOLES FOR FIXING ADJACENT SECTIONS TOGETHER, OR FIXING THE LOUVRE INTO THE BUILDERSWORK OPENING.

LOUVRES ARE SUPPLIED SELF FINISH AS STANDARD OR WITH AN OPTIONAL POLYESTER POWDER FINISH (SUFFIX P).

NOTES

THIS DATA SHEET IS TO BE READ IN CONJUNCTION WITH THE EQUIPMENT SCHEDULE.

WIDTH (W) AND HEIGHT (H) DIMENSIONS GIVEN ON THE EQUIPMENT SCHEDULE ARE AS MANUFACTURED. ADEQUATE CLEARANCE MUST BE ALLOWED WHEN CONSTRUCTING THE BUILDERSWORK OPENING, A MINIMUM OF 10 mm IS RECOMMENDED.

LOUVRES WILL BE SUPPLIED WITHOUT SUPPORT STEELWORK, CLEATS, BRACKETS, FIXINGS, FLASHING, MASTIC, OR OTHER SUCH ITEMS, UNLESS OTHERWISE STATED.

EXCESSIVELY LARGE OR HEAVY LOUVRES MAY BE MANUFACTURED IN MATING SECTIONS FOR EASE OF HANDLING.

LOUVRES ARE MANUFACTURED TO STANDARD SHEET METAL TOLERANCES OF ± 3 mm.

SUFFIX

THE SUFFIX DEFINES ADDITIONAL FEATURES OR SPECIAL CONSTRUCTIONAL DETAILS.

- G GALVANISED STEEL CONSTRUCTION.
- A ALUMINIUM CONSTRUCTION.
- P POLYESTER POWDER COAT.
- X SPECIAL CONSTRUCTION - REFER TO EQUIPMENT SCHEDULE FOR DETAILS.

WEIGHT

LOUVRE WEIGHTS ARE GIVEN ON THE EQUIPMENT SCHEDULE, APPROXIMATELY:

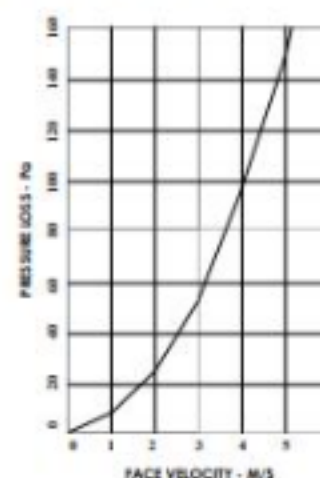
104kg/M² GALVANISED CONSTRUCTION
74kg/M² ALUMINIUM CONSTRUCTION

ACOUSTIC PERFORMANCE

SOUND REDUCTION INDEX: BS EN ISO 10140 - 2

63	125	250	500	1000	2000	4000	8000	HZ
6	9	13	15	25	29	27	24	dB

PRESSURE LOSS



STANDARD SIZES

THERE ARE NO STANDARD SIZES. ALL LOUVRES ARE MADE TO ORDER.

ALLAWAY ACOUSTICS LIMITED Old Police Station, 1 Queens Road, Hertford SG14 1EN
T | 01992 550825 E | enquiries@allawayacoustics.co.uk W | allawayacoustics.co.uk