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Extension of gym opening hours, Argo Fitness, Coach Road, Whitehaven

BS4142:2014+A1:2019 Sound Assessment Report

Doc ref: 03701-130100

16/09/2022

On behalf of
Argo Fitness Ltd

Prepared by
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CONTENTS

1.0 INTRODUCTION

1.1 Blue Tree Acoustics has been instructed by Argo Fitness Ltd to carry out an acoustic assessment relating to the proposed extension of opening hours of their existing gym premises located at Coach Road, Whitehaven.

1.2 The Argo Fitness gym exists onsite and has been operational for a number of years, with planning permission having been granted in 2017 for change of use from the formerly permitted A1 'Old Storage Building' planning class (presumed to be A1 'Retail Warehouse' planning class, as the site had warehouse storage, external storage for stone and building materials, kitchen and bathroom showrooms, tool hire, skip hire, a carpark, and a sales area during its operation as a Jewson Ltd timber yard) to the currently permitted D2 'Assembly and Leisure' planning class for use as a CrossFit gym.

1.3 Although planning conditions relating to the permitted prior A1 operation of the site are difficult to search and find, and/or are not listed, on the Copeland Borough Council planning portal website, Google Streetview confirms the above use, as well as the Jewson Ltd premises' opening hours of 0730-1700 hours Monday-Friday and 0800-1200 hours on Saturdays.

Image 1: 2015 Google Streetview photograph of Jewson Ltd premises operating

1.4 Argo Fitness' current opening hours are 0700-2000 hours Monday-Thursday, 0700-1900 hours on Fridays, and 0900-1430 hours Saturday-Sunday.

1.5 Argo Fitness' proposed opening hours are 0500-2100 hours Monday-Sunday.

1.6 The proposed additional opening hours are therefore 0500-0700 hours and 2000-2100 hours Monday-Thursday, 0500-0700 hours and 1900-2100 hours on Fridays, and 1430-2100 hours Saturday-Sunday.

1.7 Argo Fitness occupies the former shopfront building and the southern section of the warehouse building onsite, as marked by the red line on the image below. The northern section of the warehouse building is understood to be utilised by a builder for storage. The building is internally subdivided such that the builder's storage space in the northern section is separated from the gym space in the southern section. The builder's storage section of the building shares use of the carparking area and access via the entrance gate to the site, and the builder's storage section of the building also has a large roller shutter, which is not connected to the gym use.

Image 2: Outline markup of gym premises

1.8 We have been provided with the following Council wording:

> *"I believe that the Council needs to have impartial supporting technical information to be fair to all parties.*
>
> *That is, establish the background noise level of the area, establish the predicted / actual noise levels of the operation, and then show that the operation will not adversely affect the noise background.*
>
> *A BS4142 – type noise assessment will do this."*

1.9 We have also been provided with the following Council wording:

> *"• On a Sunday from commencement of proposed operating hours (05:00hrs) until mid-morning and the last 3 x hours of the proposed operational hours (eg 18.00 – 21.00) to measure existing baseline noise levels, and any operational noise from the site. This would either be at the site boundary, potentially at height to remove the façade effect of any boundary walls etc, or public realm at a location representative of the nearest/most exposed residential receptors on Woodstock Lane*
>
> - *Additional sample noise measurements inside the building to measure operational noise, including amplified music (particularly bass)*
> - *Additional sample noise measurements outside the building to measure/determine noise break-out.*
> - *Additional sample noise measurement of any fixed plant, and equipment, including ventilation.*
>
> *Assessment*
>
> - *Use the results of the surveys to assess the measured/calculated noise levels (i.e. amplified music, vehicles, fixed plant and any other potentially significant sources) in accordance with relevant guidance, including NPPF, NPSE, BS 8233, BS 4142*
> - *For amplified music, a conservative assessment would ideally be adopted, perhaps using guidance provided by Manchester City Council for amplified music (s.3.1.7.2 of this document) as additional guidance."*

1.10 It is proposed that no amplified music be played during the gym's proposed extended opening hours. The proposal would therefore satisfy the Manchester City Council amplified music assessment guidance, and by extension also the Copeland Borough Council requirements regarding amplified music.

1.11 The sound impact assessment has included:

a) Inspection of the site and surroundings.

b) Monitoring of ambient and background sound levels in the area.

c) Measurement and assessment of likely sound emissions.

d) Consideration of the impact of the proposed extended opening hours in accordance with *British Standard 4142:2014+A1:2019,* '*Methods for rating and assessing industrial and commercial sound*' (BS4142:2014).

1.12 A glossary of technical terminology and parameters used in this report is provided in Appendix 1.

2.0 EXISTING NOISE SOURCES

2.1 The following existing noise sources were noted in the course of the attended background sound survey undertaken over a period of just under 8 hours on Sunday 28/08/2022.

Road traffic

2.2 Local and distant vehicle movements are a primary source of background sound levels in the area. Background sound levels are low when there are no vehicles in close proximity.

Birdsong

2.3 Birds, particularly seagulls, can be relatively loud, and a large contribution to noise levels was made by birds, particularly in the early morning period of the survey.

Other operations

2.4 Loud music and cheering / shouting / speech noise were heard from both the direction of the Whitehaven Rugby League Football Club / Whitehaven Football Club / Whitehaven Miner's Social Club, and from the direction of the Whitehaven Cricket Club. The Whitehaven Cricket Club is situated approximately 280m northwest of measurement Location 1, and the other facilities are situated approximately 250m southeast of measurement Location 1. There was music emanating from one or both source locations at times over the afternoon / evening period of the survey between 1700-2100 hours, with a live band audible from the direction of the Whitehaven Cricket Club towards the end of that period.

3.0 SOUND SURVEY

3.1 Sound monitoring was undertaken by Blue Tree Acoustics on Sunday 28/08/2022 to determine the existing ambient noise climate at nearby dwellings in the vicinity of the gym. The measurement results are detailed in Appendix 2.

3.2 The measurements were carried out using 1no Rion NA-28 Type 1/Class 1 integrating sound level meter. The meter was within a valid period of laboratory calibration. A proprietary environmental windshield was fitted to the microphone, and the measurements were made with the microphone fitted to a tripod at around 1.5m height above local ground level. Calibration checks were carried out both before and after the measurements, with no variance observed.

3.3 Weather conditions during the survey periods were generally dry and calm, with wind speeds <5m/s. Appendix 3 presents archival data from a local weather station.

3.4 Attended logging measurements were made at a free-field location on the footpath in front of 2 Woodstock Lane (Location 1, indicated in Figure 2).

3.5 Measurements were also made at a free-field location in the carpark of the gym at the end of the survey period (Location 2, also indicated in Figure 2). Additional measurements were made at Location 2 in order to capture sound egress data directly during one of the noisier activities where weights were dropped atypically. This was undertaken at 2100 hours, when ambient noise levels were lower.

3.6 Measurements were also made within the gym once it had started trading for the day, in order to establish sound levels generated by various activities. Each measurement was made at 1m distance from each source, thus sound levels are shown to be higher than the sound level that strikes the internal face of the building envelope.

3.7 It is considered that an internal sound level of 72dB $L_{Aeq(15min)}$ is representative of the proposed gym opening hours. Sound levels in the gym are often below 60dB L_{Aeq}. A sound level of 84dB L_{Aeq} was measured at 1m distance of a 100kg lift 'fail' demonstrated for measurement purposes, during which the weights were dropped from a 2m height onto the floor. This kind of event would be atypical, and does not represent this gym's normal activities or normal use of its equipment; a weightlifter dropping 100kg from a 2m height is unsafe, and this would not ordinarily occur. Weights are usually placed on the floor, and a gym member dropping weights would ultimately be asked to leave the gym.

3.8 As can be seen in the data, typical events generate less than 70dB L_{Aeq} at 1m, and therefore 72dB L_{Aeq} at the building envelope is considered to be conservative.

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4.0 BS4142:2014+A1:2019 COMMERCIAL/INDUSTRIAL SOUND ASSESSMENT

4.1 The most relevant British Standard for assessing sound impact from commercial and industrial premises upon residential property is *British Standard 4142:2014+A1:2019* '*Methods for rating and assessing industrial and commercial sound*' (BS4142:2014). This requires the level of sound radiating from the proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature (in L_{Aeq}) to be compared with the existing Background Sound Level (L_{A90}) at any nearby residential property.

4.2 The D2 planning class the gym premises enjoy is for 'Assembly and Leisure' use, and the premises have no commercial or industrial sound sources. BS4142 therefore does not strictly apply to this scenario, as outlined in Paragraph 1.3 of the guidance quoted below. Nonetheless, as this has been requested by Copeland Borough Council, this section of the report considers and assesses the proposal in BS4142 terms.

4.3 The scope of BS4142 states:

"1.1 This British Standard describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

a) sound from industrial and manufacturing processes;

b) sound from fixed installations which comprise mechanical and electrical plant and equipment;

c) sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and

d) sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

1.2 This standard is applicable to the determination of the following levels at outdoor locations:

a) rating levels for sources of sound of an industrial and/or commercial nature;

and

b) ambient, background and residual sound levels, for the purposes of:

1) *investigating complaints;*

2) *assessing sound from existing, proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature; and*

3) *assessing sound at proposed new dwellings or premises used for residential purposes.*

1.3 The determination of noise amounting to a nuisance is beyond the scope of this British Standard.

Sound of an industrial and/or commercial nature does not include sound from the passage of vehicles on public roads and railway systems.

The standard is not intended to be applied to the rating and assessment of sound from:

a) *recreational activities, including all forms of motorsport;*

b) *music and other entertainment;*

c) *shooting grounds;*

d) *construction and demolition;*

e) *domestic animals;*

f) *people;*

g) *public address systems for speech; and*

h) *other sources falling within the scopes of other standards or guidance.*

The methodology set out in Clauses 7, 8, and 9 of this standard is not intended to be used to assess the extent of the impact at indoor locations. Internal sound levels can be taken into account as outlined in Clause 11.

The standard is not intended to be applied to the assessment of indoor sound levels.

The standard is not applicable to the assessment of low frequency noise."

4.4 The standard describes various methods for determining whether a correction or corrections should be applied to reflect the prominence of characteristic features in the industrial/commercial specific sound experienced at the assessment location. In subjective assessment, if the industrial/commercial sound has a tonal element that is just perceptible at the receptor, a 2dB penalty can be applied. If the tone is clearly perceptible, a 4dB penalty can be applied. If the tone is highly perceptible, a 6dB penalty can be applied. The standard also describes two objective methods for assessing tonal sound which may apply a penalty of up to 6dB.

4.5 Similarly, a penalty of 3dB can be applied for a sound that has impulsivity that is just perceptible. If the impulsivity is clearly perceptible, a 6dB penalty can be applied. If the impulsivity is highly perceptible, a 9dB penalty can be applied. The standard also describes an objective method for assessing impulsivity which may apply a penalty of up to 9dB.

4.6 If the sound has clearly identifiable on/off conditions during the reference period and this is readily distinctive against the residual acoustic environment during the reference period, a 3dB penalty for intermittency can be applied. No objective method is given in the standard for assessing intermittency.

4.7 Where characteristic features of the specific sound are neither tonal nor impulsive, nor intermittent, but are readily distinctive against the residual acoustic environment, a 3dB subjective penalty can be applied.

4.8 Therefore, depending on the circumstances, a total penalty of between 0 and 18dB could potentially be applied to allow for characteristic features of the industrial/commercial sound. However, BS4142:2014 does state that, if any single feature is dominant to the exclusion of others, then it may be appropriate to apply a reduced or zero correction for the minor characteristic. Also, the subjective prominence of the character of the specific sound at the noise-sensitive receptor should be considered, and the extent to which such characteristics will attract attention and/or be masked by residual sound at that location.

4.9 The level of the industrial/commercial sound measured or calculated in L_{Aeq} terms, plus any penalty as described above, provides the Rating Level.

4.10 BS4142 states that:

"The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. 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.

Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level (…) from the rating level (…).

NOTE 1. More than one assessment might be appropriate.

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.

NOTE 2. 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.

Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following.

1) The absolute level of sound. 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 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.

Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

2) The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound, to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging

time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it.

NOTE 3 Consideration ought to be given to evidence on human response to sound and, in particular, industrial and/or commercial sound where it is available. (…)

3) *The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:*

   i) *facade insulation treatment;*

   ii) *ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and*

   iii) *acoustic screening."*

4.11 BS4142:2014 lists the following information to be reported when assessing sites to the standard.

Table 1: BS4142:2014+A1:2019 – Required information

a) Statement of qualifications, competency, professional memberships and experience directly relevant to the application of this British Standard of all personnel contributing to the assessment:	
Richard Watson BEng(Hons) Electroacoustics, Chartered Engineer, Member of the Institute of Acoustics, has undertaken many BS4142 assessments previously. Blue Tree Acoustics is a member of the Association of Noise Consultants (ANC).	
b) Source being assessed as follows:	
1) description of the main sound sources and of the specific sound;	Proposed extension to opening hours of gym. Sources of sound are of non-commercial and non-industrial nature; running machines, rowing machines, weights lifted, etc. No music proposed to be played during the proposed extended opening hours (which can be conditioned). No specific classes or training sessions proposed. No opening or closing of external shutters proposed. No plant, heating / cooling / ventilation systems in the premises. Opening of a gate at the beginning of the period, and closing at the end of the period.

2) hours of operation;	Proposed opening hours of 0500-2100 hours Monday-Sunday.
3) mode of operation (e.g. continuous, twice a day, only in hot weather);	N/A
4) statement of operational rates of the main sound sources (e.g. maximum load setting, 50% max rate, low load setting); and	N/A
5) description of premises in which the main sound sources are situated (if applicable).	Site formerly used by Jewson Ltd as a retail warehouse, plant hire, skip hire, etc. premises. Premises essentially comprise 2no connected buildings, 1no being the former shopfront and 1no being a section of the former warehouse. Shop is of traditional masonry construction with windows and pitched tile roof; warehouse is of masonry wall construction up to approximately 3.2m height, then profile metal sheeting for approximately another 3.2m, with profile metal sheeting roofing.
c) Subjective impressions, including:	
1) dominance or audibility of the specific sound; and	Specific sound source will most likely be inaudible for most of the time at dwellings.
2) main sources contributing to the residual sound.	Road traffic noise, birdsong, other local operations
d) The existing context (see Clause 4 and Clause 11), including an assessment of the sensitivity of the receptor:	
The sensitive receptors are dwellings.	

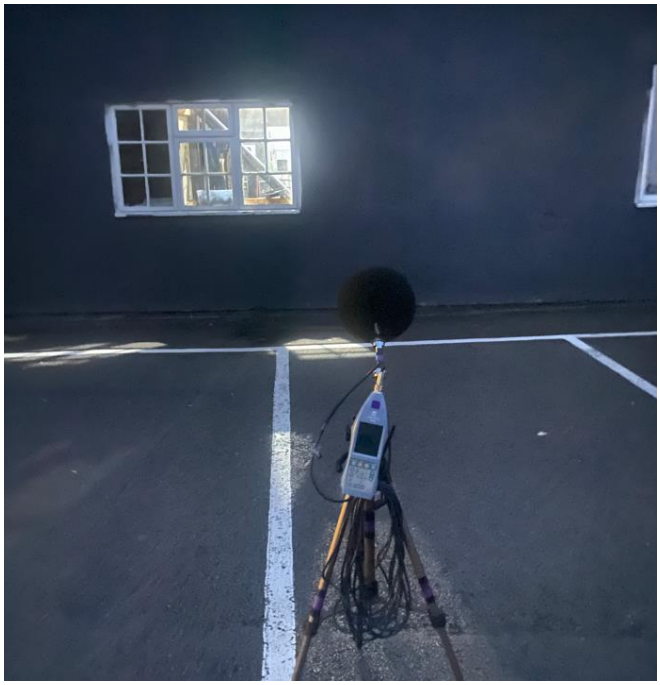
e) Measurement locations, their distance from the specific sound source, the topography of the intervening ground and any reflecting surface other than the ground, including a photograph, or a dimensioned sketch with a north marker. A justification for the choice of measurement locations should also be included.

Location 1:

As presented in Figure 2 and Appendix 2. Free-field on footpath outside 2 Woodstock Lane.

Location 2:

As presented in Figure 2 and Appendix 2. Free-field in the carpark of the gym, 5m from the windows.



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f) Sound measuring systems, including calibrator or pistonphone used:	
1) type and/or model;	Class 1 / Type 1. Rion NA-28 sound level meter.
2) manufacturer;	Rion
3) serial number (S/N); and	30552175
4) details of the latest verification test including dates.	Calibrated by CMR Ltd on 22/03/2022.
g) Operational tests:	
1) reference level(s) of calibrator, multi-function calibrator or pistonphone; and	94.0dB Cirrus CRL511E (S/N 036799), calibrated by CMR Ltd on 18/03/2022.
2) meter reading(s) before and after measurements with calibrator, multi-function calibrator or pistonphone applied.	93.8dB pre-measurement each time 93.8dB post-measurement each time
h) Weather conditions, including:	
1) wind speed(s) and direction(s);	<5m/s, as supported by local weather station data presented in Appendix 3.
2) presence of conditions likely to lead to temperature inversion (e.g. calm nights with little cloud cover);	Temperature inversion unlikely.
3) precipitation;	No precipitation, as supported by local weather station data presented in Appendix 3.
4) fog;	None
5) wet ground;	None
6) frozen ground or snow coverage;	None
7) temperature; and	Constantly varying. See Appendix 3 for local weather station data.
8) cloud cover.	Varying – typically around 10%

i) Dates and Times of Measurements	
As set out in this report	
j) Measurement time intervals:	
15 minutes for background sound levels. Shorter source sound measurements as described.	
k) Reference time interval(s).	
1 hour in the daytime; 15 minutes at night	
l) Measured sound level(s):	
1) residual sound level(s) and method of determination;	It was not possible to accurately measure sound from the gym at Location 1, as the gym is quiet relative to residual sound levels and cannot be measured in isolation. Some source sound levels of weights being dropped were measured at Location 2 in an attempt to establish the external sound level when a high activity level is generated within the gym. Residual sound levels measured are as stated in Appendix 2, taken to be 40dB L_{Aeq}.
2) ambient sound level(s) and method of determination;	Ambient sound levels are established as 43.7dB L_{Aeq} at Location 2.
3) specific sound level(s) and method of determination;	The specific sound level is taken to be 41.3dB L_{Aeq} at Location 2, which equates to around 30dB L_{Aeq} at the dwellings. This assumes weights being dropped every second of the assessment period. Sound egress calculations assuming an internal sound level of 72dB L_{Aeq} found a specific sound level of 30dB L_{Aeq} at the dwellings.
4) justification of methods; and	Both the sound egress calculations and the measurements at Location 2 with (corrections to Location 1) indicate that a specific sound level of 30dB L_{Aeq} is unlikely to be exceeded throughout the proposed additional opening hours.
5) details of any corrections applied.	Sound egress calculations apply corrections for areas of the building envelope and the distance from the material to the dwellings, etc., as shown in Appendix 2.

m) Background sound level(s) and measurement time interval(s) and, in the case of measurements taken at an equivalent location, the reasons for presuming it to be equivalent:	
15-minute measurements were made as described in this report, with the representative nighttime background sound level being 34dB L_{A90}, and the representative daytime background sound level being 40dB L_{A90} at Location 1, as shown in Appendix 2.	
n) Rating level(s):	
1) specific sound level(s);	Levels up to 30dB L_{Aeq} during the proposed extended hours.
2) any acoustic features of the specific sound; and	3dB for intermittent characteristic possibility.
3) rating level(s).	33dB
o) Excess of the rating level(s) over the measured background sound level(s) and the initial estimate of the impacts:	
-1dB at nighttime and -7dB in daytime	
p) Conclusions of the assessment after taking context into account:	
The BS4142 -1dB result is low, and indicates no impact. The BS4142 -7dB result is even lower, i.e. of lesser impact.	
q) The potential impact of uncertainty:	
Measurements have been undertaken in accordance with relevant standards and guidelines to minimise measurement uncertainty. Class 1/Type 1 instrumentation has been used for all measurements.	

4.12 The above assessment assumes no additional sound insulation measures over and above those that already exist. The required acoustic strategy is to have no music played and no classes taking place in the extended opening hours. Shutters can additionally be opened and closed outside of the extended opening hours to further reduce any impact. Naturally, it is possible to improve the sound insulation properties of the building (e.g. double glazing rather than single, lining the section of wall that used to be a doorway with 2no layers of acoustic plasterboard such as 15mm SoundBloc with mineral wool behind), but these measures are not necessary since the current sound impact is suitably low.

4.13 It is considered that a BS4142 assessment is not appropriate for a gym, as it falls outside of the scope of BS4142 – but even so, the BS4142 impact is found to be low.

4.14 Private cars driving a few meters within the carpark are also considered to fall outside of the scope of BS4142. A car driving at slow speeds typically generates around 76dB SEL at 1m. Over a 15-minute period, 4no cars would generate 23dB L_{Aeq} at the nearest dwellings, compared to the existing ambient sound level of at least 42dB L_{Aeq}. The ambient sound level when combining the existing levels with the vehicle movements would remain at 42dB L_{Aeq}. It is considered unlikely that more than 4no cars use the carpark per 15-minute period.

4.15 It is possible for the carpark entrance gate to open or close in a manner that makes noise, but equally it is possible to open and close the gate in a manner that does not make noise. It is envisaged that minor modifications can be introduced to ensure that the gate does not generate noise. The gate is not in the sole use of the gym, as this entrance leads to the adjacent warehouse also accessed via the gate and is understood to have unrestricted hours of use.

4.16 It should be noted that music was audible from at least 2no other, more distant sources during the survey. It is considered possible that any objectors to the gym's proposed extended opening hours confuse those other operators for the gym. Again, it is reiterated that music will not be played during the gym's proposed extended opening hours.

4.17 It should also be noted that the gym operation is likely to generate significantly lower sound levels than the previously permitted Jewson Ltd use of the site, given the number of activities listed (including plant hire, skip hire, timber merchants, builders' merchants, etc.) – i.e. the change of use from builders' merchants to gym is of beneficial effect in terms of sound impact in the area.

4.18 The absolute levels of sound are low in BS8233 and WHO terms, and both the external sound levels in gardens and the internal sound levels in bedrooms and living rooms of nearby residential receptors would be unaltered by the proposed extended opening hours being permitted.

4.19 The requirements of NPPF and NPSE are also satisfied when a proposal generates no adverse impact, as is the case here.

5.0 SUMMARY AND CONCLUSIONS

5.1 A sound assessment has been carried out relating to the proposed extension of opening hours of the Argo Fitness gym occupying premises at Coach Road, Whitehaven.

5.2 Copeland Borough Council has requested consideration of sound impact in terms of BS4142 and assessment of potential impact from the gym during the proposed extended opening hours.

5.3 The BS4142 Rating Level is found to be relatively low at 33dB, and BS4142 results of -1dB at night and -7dB in the day are found. This represents no adverse impact.

5.4 No amplified music is proposed to be played within the gym during the proposed extended opening hours.

5.5 There is no external mechanical services sound generation from the gym premises.

6.0 DISCLAIMER

6.1 This document is limited to addressing the specific acoustic issues contained herein, and its content is based on drawings and information provided to date by our Client/their Design Team.

6.2 All findings, comments, recommendations, etc., in this document are for acoustic purposes only; any and all other considerations and requirements, e.g. structural, airflow, thermal, fire safety, CDM compliance, determination of whether materials are dangerous, hazardous, deleterious, etc. (non-exhaustively), are the responsibility of other such suitably qualified specialists to check and advise on.

6.3 BTA's work may occasionally involve provision of acoustic performance advice and acoustic design recommendations that others may choose to regard as a "specification" under CDM 2015 (and thus others may occasionally choose to regard BTA to be a "Designer" under CDM 2015). Notwithstanding this, it is always the responsibility of others (Principal Designer) to approve/incorporate into their final design – or not – their final specification selections; although these may be based on BTA's acoustic performance advice, as BTA neither has control over how or whether BTA's acoustic advice is incorporated into the final design by others, nor any power to enforce that any such final specification selections made by others based on BTA's advice are appropriate in any regard beyond their acoustic performance qualities, it also remains the responsibility of others under CDM 2015 to ensure that any ancillary (non-acoustic) considerations in the course of selection, installation, maintenance, etc. of final specifications are advised upon by such relevantly qualified specialists (non-acoustic, and therefore non-BTA), and that any safety precautions identified in the course of their consideration by others are taken by others (the Principal Designer, Designers, Contractors, Client, etc.).

6.4 Products and materials that perform well acoustically tend to be heavier than standard products. Use of these products and materials may increase the weight of the element, and the CDM Principal Designer, Client, etc. must take care to ensure that this risk is mitigated as far as possible with appropriate changes to their design, and the Client, Principal Contractor, Contractor, Installer, Fitter, etc. must ensure that appropriate and safe lifting and installation techniques, maintenance, etc. are used to reduce any remaining risk. Wherever BTA advises that works such as acoustic barriers are desirable to attenuate noise, care must be taken by the CDM Principal Designer, Client, etc. to ensure that the risks associated with constructing and maintaining bunds, walls, fences, etc. are mitigated as far as possible with appropriate changes to their design, and the Client, Principal Contractor, Contractor, Installer, Fitter, etc. must ensure that appropriate and safe construction and installation techniques, maintenance, etc. are used to reduce any remaining risk.

6.5 This document has been prepared for the sole use, benefit, and information of our direct Client for the purposes agreed at the time of their formal instruction. The liability of BTA in respect of the information contained herein will not extend to any third party.

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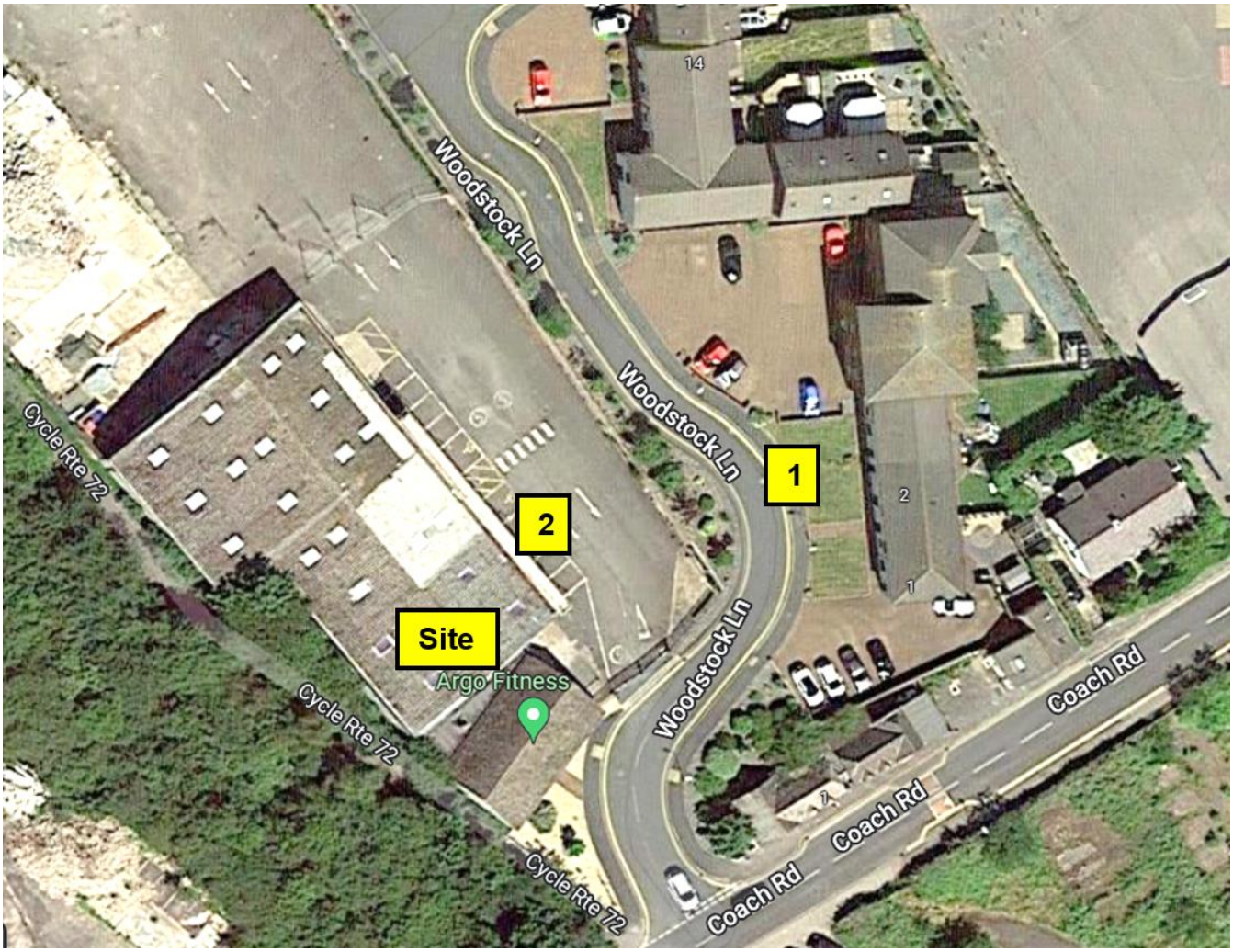
FIGURE 1 – SITE POSITION WITHIN LOCAL CONTEXT

FIGURE 2 – SITE AERIAL VIEW AND APPROXIMATE MEASUREMENT LOCATIONS



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APPENDIX 1 – TECHNICAL UNITS AND INDICES

a) Sound Pressure Level and the decibel (dB)

A sound wave is a small fluctuation of pressure in air. 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. Due to the wide range of pressure variations detectable by the ear, a logarithmic scale is used to convert the values into manageable numbers. 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 120 dB (threshold of pain).

b) Frequency and Hertz (Hz)

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 frequencies are often written as kilohertz (kHz), where 1kHz = 1000Hz.

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

As the ear hears some frequencies better than others, the A-weighting scale is used to mimic human hearing. A-weighing applies a correction to the sound level at a given frequency depending on how well the ear hears that frequency.

c) Glossary of Terms

In order to describe noise where the level is continuously varying, a number of other indices, including statistical parameters, are used. The indices used in this report are described below.

L_{Aeq} This is the A-weighted equivalent continuous sound 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.

L_{Amax} This is the maximum A-weighted sound level that was recorded during the monitoring period.

L_{A90} This is the A-weighted sound level exceeded for 90% of the time period. L_{A90} is used as a measure of background noise.

L_{A10} This is the A-weighted sound level exceeded for 10% of the time period and is often used in the assessment of road traffic noise.

SEL The SEL is the single event level (also sometimes called the sound exposure level). This is commutable with L_{Aeq} using the following formula:

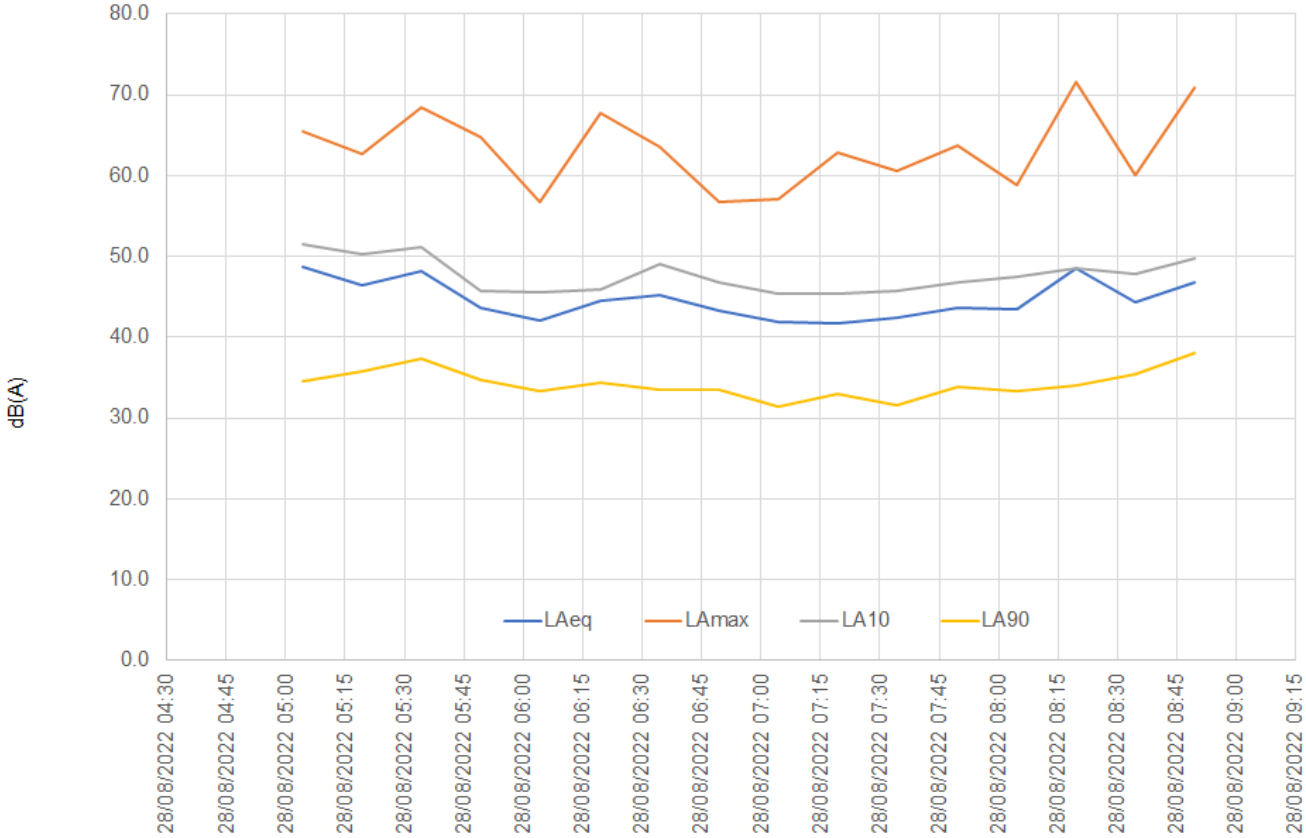
$SEL = L_{Aeq} + 10\log(t)$ where t is time in seconds.

APPENDIX 2 – SOUND SURVEY DATA

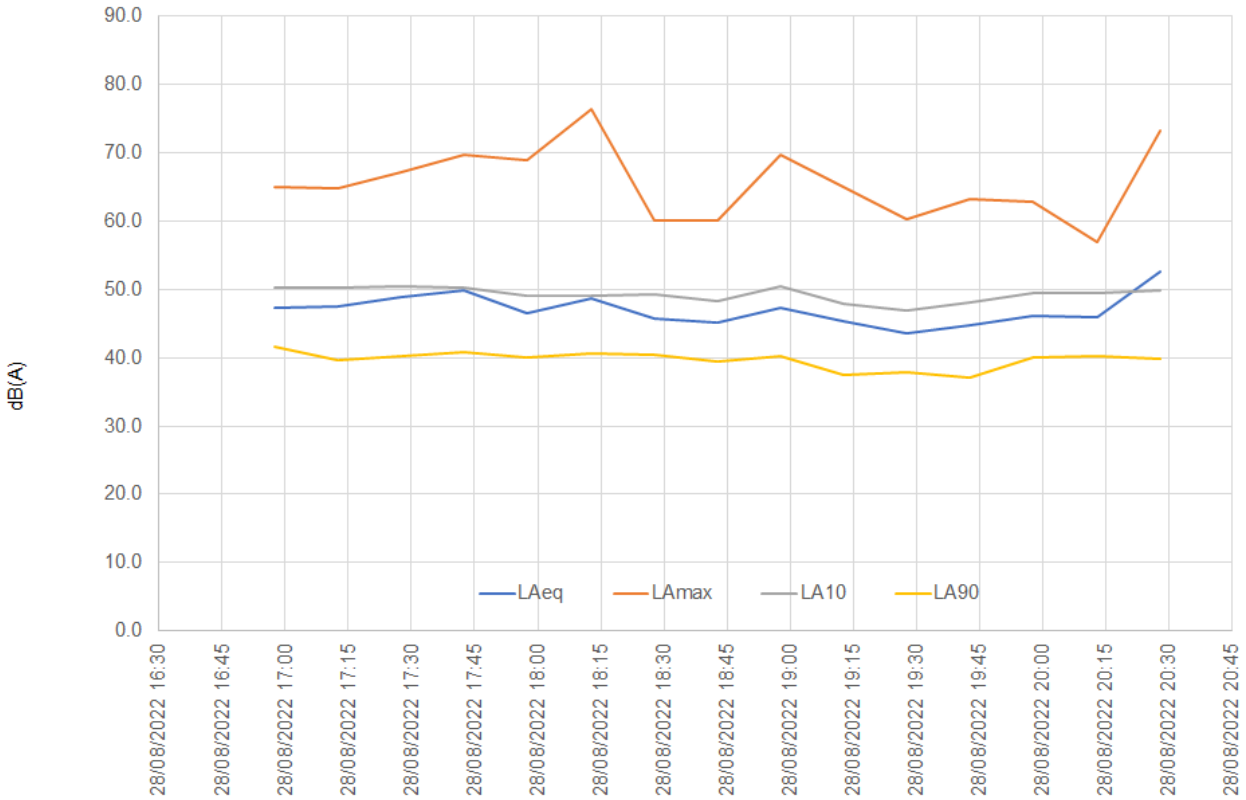
Sunday 28/08/2022

Location 1 – On footpath outside 2 Woodstock Lane, free-field
Rion NA-28 sound level meter, all values dB(A), 15-minute measurements.

Background sound level data from commencement of proposed extended opening hours until midmorning on a Sunday

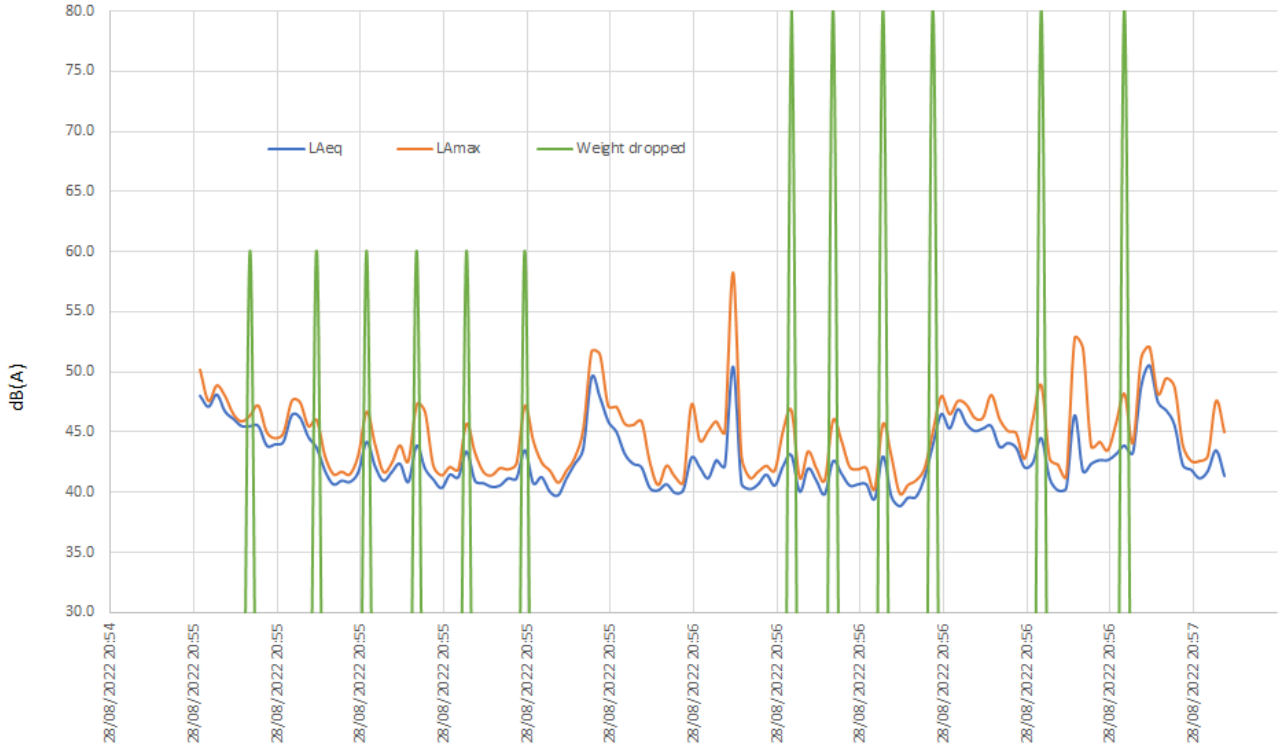


Background sound level data for last 3 hours of proposed extended opening hours on a Sunday



Location 2 – Gym carpark 5m from building, free-field
Rion NA-28 sound level meter, all values dB(A), 1 second measurements.

Source activity sound levels



AP2.1 The green markers on the chart above indicate times when weights are being dropped onto 6-inch pads or 12-inch pads. The taller green markers indicate 12-inch pads. Unmarked sections show that other noise was present, demonstrating the difficulty of isolating the source activity sound from residual sound levels generated by roads and other surrounding sound sources sufficiently that the source activity sound can be measured and compared to the residual sound levels – even at 5m distance from the building at 2100 hours on a Sunday.

AP2.2 At Location 2, the ambient sound level when weights are being dropped is found to be 43.7dB L_{Aeq}.

AP2.3 The residual sound level is taken to be 40dB L_{Aeq}, but as can be seen above, there are times when traffic noise is over 50dB L_{Aeq}. The specific sound level is therefore 41.3dB L_{Aeq} (i.e. 43.7dB-40.0dB). This is uncorrected for time – essentially, assuming a weight is dropped every second for 1 hour in the day, and every second for 15 minutes at night – and is uncorrected for distance, Location 2 being in the gym carpark 5m away from the gym windows facing the nearest dwellings.

AP2.4 Correcting for a point source would generate 24dB L_{Aeq} at the dwellings. Conservatively, correcting for a line source would generate 33dB L_{Aeq} at the dwellings. It is therefore likely that, assuming a situation where weights were constantly dropped in the gym, the resulting sound levels at the dwellings are around 30dB L_{Aeq}. Day or night, sound levels at Location 1 are found to be not less than 42dB $L_{Aeq(15min)}$ during the proposed extended opening hours of the gym.

AP2.5 Sound egress calculations indicate that with a trading sound level of 72dB L_{Aeq}, the resulting sound levels are likely to be 30dB L_{Aeq} outside the nearest dwellings – essentially, a 42dB(A) reduction from source to receiver. It is considered very unlikely that the internal sound level will exceed 72dB $L_{Aeq(15min)}$ in the proposed extended opening hours. This is considered to be a conservative assumption for the gym's trading level. It should be remembered that sound egress calculations presume that this level strikes the inside surface of all building elements (walls, windows, roof, doors, etc.), which is highly unlikely to actually occur in reality. The calculation assumes single glazing (whereas in reality, some areas are double glazed), single skin masonry walls at low level, and single skin corrugated sheeting at upper wall levels and roof level (as well as the infilled section of wall where a doorway used to be), and doors with poor sound insulation.

Sound egress calculation

		Octave Band Centre Frequency (Hz)								
		63	125	250	500	1K	2K	4K	8K	dB(A)
Internal Source Level		**70**	**71**	**70**	**71**	**68**	**35**	**63**	**59**	**72**
Glazing				4mm single glazed						
Glazing SRI	Deduct	13	20	22	28	33	34	28	28	
Area of Glazing, S = 30m sq										
+ 10*log S	Add	15	15	15	15	15	15	15	15	
Distance to receiver, r = 37 m										
- 20*log r	Deduct	31	31	31	31	31	31	31	31	
Correction	Deduct	14	14	14	14	14	14	14	14	
Receiver SPL	TOTAL	26	20	17	12	4	-30	4	0	14
Doors				Poorly sealed door						
Doors SRI	Deduct	9	12	13	14	16	18	24	26	
Area of Doors, S = 4m sq										
+ 10*log S	Add	6	6	6	6	6	6	6	6	
Distance to receiver, r = 37 m										
- 20*log r	Deduct	31	31	31	31	31	31	31	31	
Correction	Deduct	14	14	14	14	14	14	14	14	
Receiver SPL	TOTAL	22	20	18	18	13	-22	0	-6	18
Roof/Upper wall			Single skin uninsulated corrugated sheeting							
Roof/Upper wall SRI	Deduct	9	15	15	22	26	22	30	30	
rea of Roof/Upper wall, S = 250m sq										
+ 10*log S	Add	24	24	24	24	24	24	24	24	
Distance to receiver, r = 37 m										
- 20*log r	Deduct	31	31	31	31	31	31	31	31	
Correction	Deduct	14	14	14	14	14	14	14	14	
Receiver SPL	TOTAL	40	35	34	28	21	-8	12	8	29
Lower wall				Single skin masonry						
Lower wall SRI	Deduct	30	36	37	40	46	54	56	56	
Area of Lower wall, S = 50m sq										
+ 10*log S	Add	17	17	17	17	17	17	17	17	
Distance to receiver, r = 37 m										
- 20*log r	Deduct	31	31	31	31	31	31	31	31	
Correction	Deduct	14	14	14	14	14	14	14	14	
Receiver SPL	TOTAL	12	7	5	3	-6	-47	-21	-25	-170
Summed Level At Receiver		**40**	**35**	**34**	**28**	**21**	**-8**	**13**	**9**	**30**

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Gym sound sources measured internally between 1000-1200 hours
Rion NA-28 sound level meter, all values dB(A), 1m distance

Activity	dB L_{Aeq}	dB L_{Amax}	Duration (seconds)	Comments
55kg normal rubber plate, 2.3m drop onto 6-inch pads	67.8	81.9	02	Dropping is atypical use; demonstrated for measurement purposes only.
55kg normal rubber plate, 2.3m drop onto 6-inch pads	66.1	80.0	05	Dropping is atypical use; demonstrated for measurement purposes only.
75kg normal rubber plate, 2.3m drop onto 6-inch pads	73.5	89.1	05	Dropping is atypical use; demonstrated for measurement purposes only.
75kg normal rubber plate, 2.3m drop onto 6-inch pads	72.3	86.3	07	Dropping is atypical use; demonstrated for measurement purposes only.
85kg normal rubber plate, 2.3m drop onto 6-inch pads	73.3	89.8	06	Dropping is atypical use; demonstrated for measurement purposes only.
85kg normal rubber plate, 2.3m drop onto 6-inch pads	72.0	89.3	09	Dropping is atypical use; demonstrated for measurement purposes only.
100kg steel and rubber crumb plate, 0.8m hip drop onto 18mm rubber and 23mm honeycomb and 2mm impact rubber pads	81.7	91.9	13	Dropping is atypical use; demonstrated for measurement purposes only.
100kg steel and rubber crumb plate, 0.8m hip drop onto 18mm rubber and 23mm honeycomb and 2mm impact rubber pads	83.7	96.6	04	Dropping is atypical use; demonstrated for measurement purposes only.
100kg steel and rubber crumb plate, placed onto 18mm rubber and 23mm honeycomb and 2mm impact rubber pads as normal	58.9	65.0	04	Typical use
Air bike – cycling machine	72.5	74.0	09	Typical use
Biker – cycling machine, 2no people next to each other, each using	66.7	74.0	08	Typical use
Air runner – running machine	61.1	65.2	07	Typical use
Concept 2 – rowing machine	67.4	70.4	10	Typical use
Normal running machine	68.6	78.4	09	Typical use
Stepper – stair climber	63.3	72.7	18	Typical use

Gym sound sources measured internally between 1000-1200 hours
Rion NA-28 sound level meter, all values dB L_{eq}, 1m distance

Activity	Octave band centre frequency						
	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz
55kg normal rubber plate, 2.3m drop onto 6-inch pads	68.6	68.1	64.5	65.1	63.1	58.6	55.6
55kg normal rubber plate, 2.3m drop onto 6-inch pads	67.7	67.6	66.5	63.0	61.4	56.8	53.7
75kg normal rubber plate, 2.3m drop onto 6-inch pads	69.7	71.0	69.7	71.2	67.9	65.6	62.9
75kg normal rubber plate, 2.3m drop onto 6-inch pads	67.5	68.0	69.6	68.9	64.3	65.6	64.2
85kg normal rubber plate, 2.3m drop onto 6-inch pads	68.2	73.2	71.0	71.8	66.5	65.4	62.0
85kg normal rubber plate, 2.3m drop onto 6-inch pads	69.8	68.5	68.5	66.7	67.9	64.8	60.9
100kg steel and rubber crumb plate, 0.8m hip drop onto 18mm rubber and 23mm honeycomb and 2mm impact rubber pads	66.2	68.1	72.9	72.7	79.4	73.1	70.0
100kg steel and rubber crumb plate, 0.8m hip drop onto 18mm rubber and 23mm honeycomb and 2mm impact rubber pads	68.7	71.0	72.2	73.0	80.6	76.2	74.3
100kg steel and rubber crumb plate, placed onto 18mm rubber and 23mm honeycomb and 2mm impact rubber pads as normal	52.1	56.0	57.7	56.7	53.4	50.7	48.0
Air bike – cycling machine	76.3	65.9	65.8	65.6	66.3	67.6	63.4
Biker – cycling machine, 2no people next to each other, each using	52.2	57.8	62.1	64.7	61.4	58.8	55.4
Air runner – running machine	54.8	63.4	64.6	56.3	55.2	52.5	47.7
Concept 2 – rowing machine	59.0	59.2	61.4	64.8	63.0	59.2	55.6
Normal running machine	59.8	66.9	65.2	66.4	64.7	60.1	52.3
Stepper – stair climber	59.1	60.9	60.4	59.4	58.6	55.5	53.9

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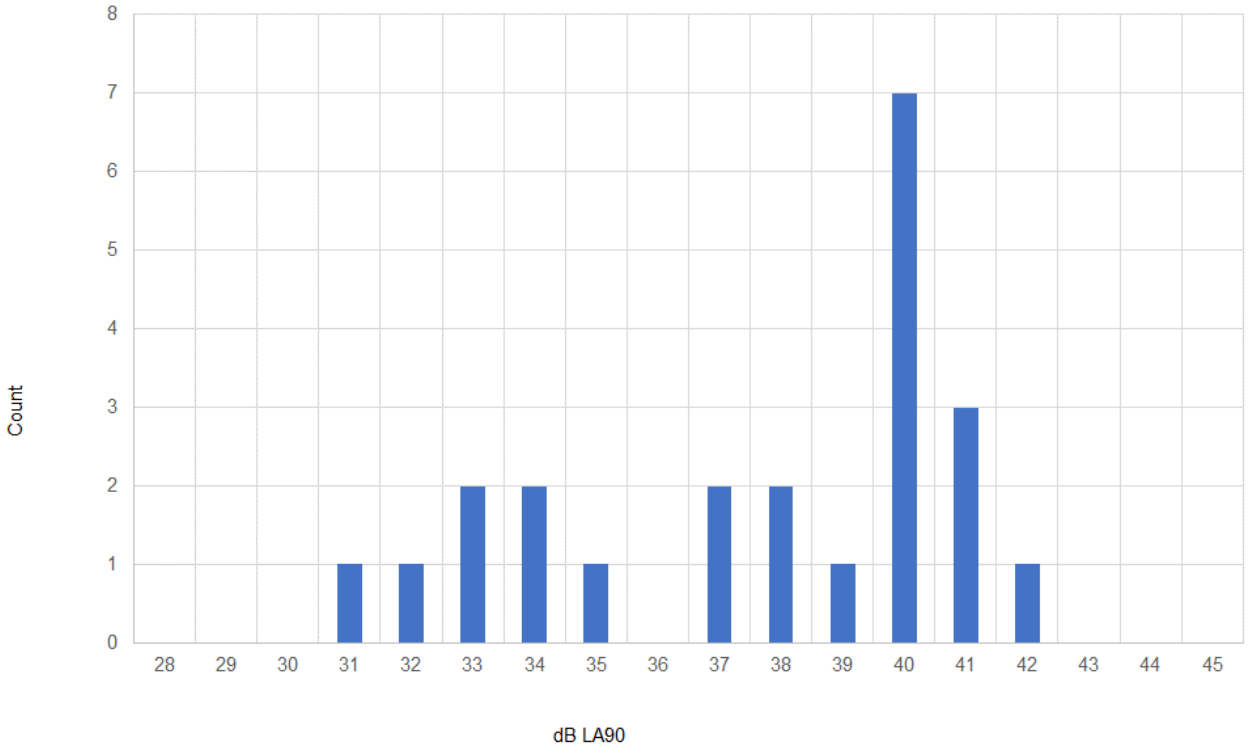
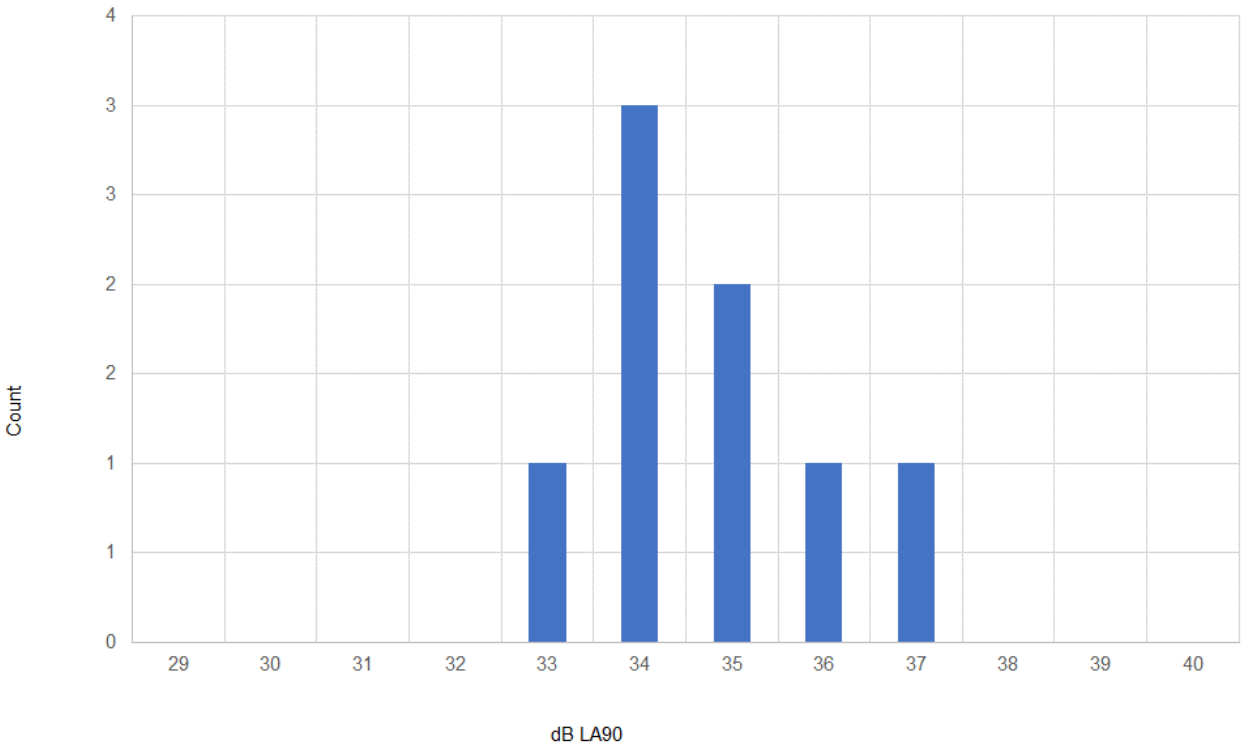
Location 1 – L_{A90} statistical count – Daytime, free-field



The typical free-field background sound level is 40dB L_{A90} in the daytime.

Location 1 – L_{A90} statistical count – Nighttime, free-field



The typical free-field background sound level is 34dB L_{A90} at nighttime.

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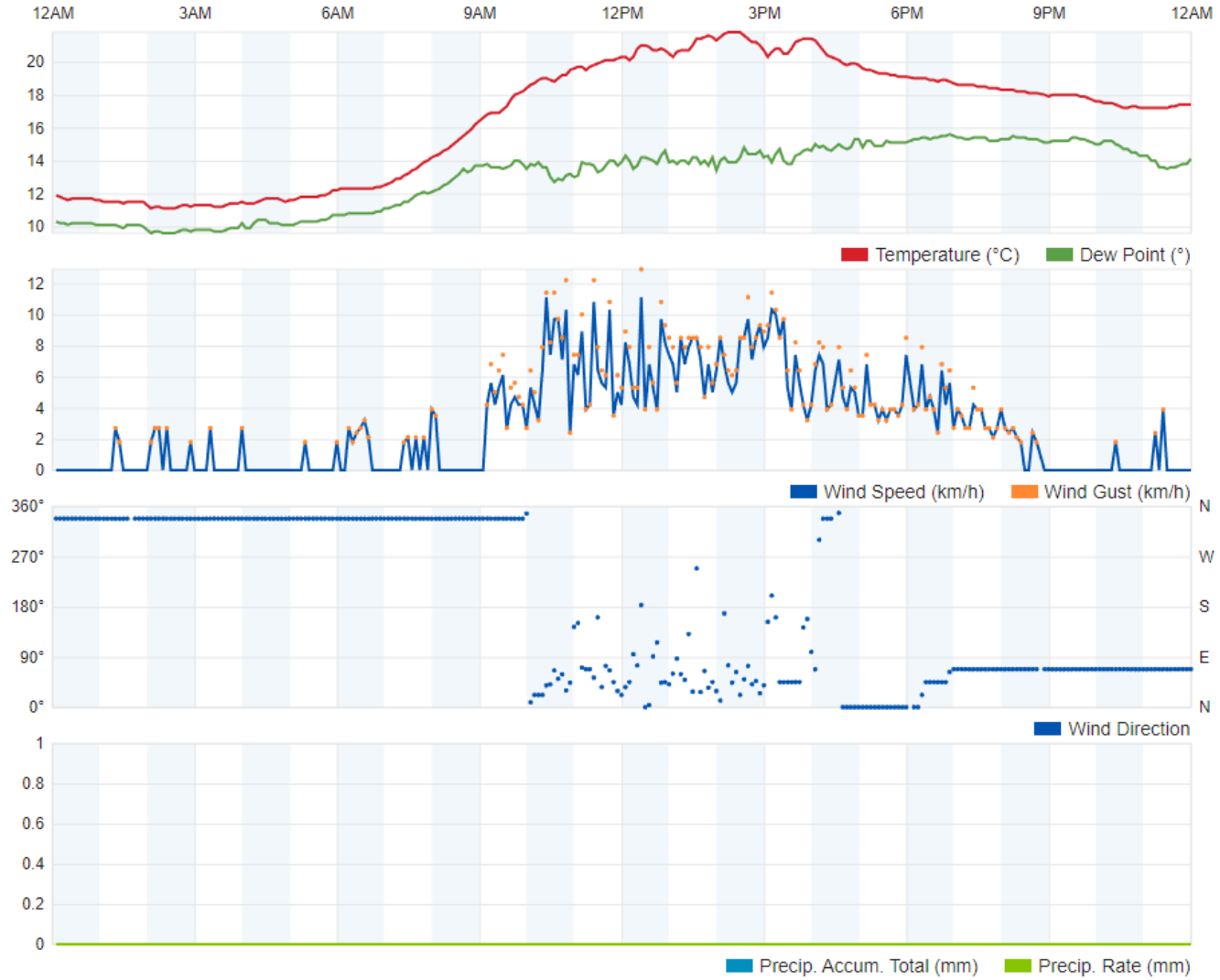
APPENDIX 3 – WEATHER DATA

Sunday 28/08/2022



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