



PREPARED: Friday, 13 September 2024

CENTRAL RETAIL PARK, HAVANT

NOISE IMPACT ASSESSMENT

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Project Ref:	ASI3692	Title:	Central Retail Park, Havant
Report Ref:	ASI3692.240903.R1 rev B	Title:	Noise Impact Assessment
Client Name:	PureGym		
Project Manager:	Ben Dymock		
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Clarke Saunders Acoustics Winchester SO22 5BE		This report has been prepared in response to the instructions of our client. It is not intended for and should not be relied upon by any other party or for any other purpose.	

1.0 INTRODUCTION

- 1.1 Clarke Saunders Acoustics (CSA) has been instructed by Pure Gym (PG) to undertake a noise impact assessment of the proposed gym unit at Central Retail Park, Havant, PO9 1HH. This assessment will be undertaken in accordance with PureGym project targets and the planning requirements of Havant Borough Council.
- 1.2 This report describes the survey and assessment undertaken, including acoustic calculations, and its findings.
- 1.3 A glossary relevant to the terminology used in this report is presented in Appendix A

2.0 DESCRIPTION OF SITE

- 2.1 Central Retail Park is located off the A27 near Havant Station and is surrounded by commercial retail with residential housing to the west. The previous Carpetright unit of the retail park is proposed for gym use.
- 2.2 There is a half-height, metal roller shutter and single escape door at the rear of the unit (west), facing onto a loading bay/service yard, where existing plant items are located. The unit frontage (east) is primarily glazed with low level height brick/blockwork cavity walls with high level lightweight metal cladding. The roof is a lightweight metal clad construction.
- 2.3 The nearest residential area to the proposed gym space is approximately 60m to the west on North Way; Havant Fire Station lies immediately behind the unit. The frontage overlooks the car park.
- 2.4 An annotated site plan is shown in the attached figure ASI3692/SP1.

3.0 APPROPRIATE CONDITIONS IN NEIGHBOURING / ADJOINING USES

- 3.1 Assumed criteria governing noise and vibration from the gym adopted for the purpose of this assessment are summarised below.

3.2 NOISE BREAKOUT

- 3.2.1 Noise breakout criteria from PureGym activity is provided in Table 3.1.

AREA	DAYTIME	NIGHT-TIME
Residential	Equal to or lower than existing background level	L _{Fmax} NR 25 inside dwellings L _{Fmax} NR 35 outside dwelling facades

Table 3.1 – Target criteria

[dB ref. 20 µPa]

3.3 PLANT NOISE EMISSIONS

- 3.3.1 Plant noise emissions will target the standard requirements of Havant Borough Council (HBC).
- 3.3.2 Based on previous experience with planning applications for plant noise emissions, we understand that HBC require:

That a BS4142:2014+A.1:2019 be submitted in order to assess the potential impacts, clearly detailing any mitigation measures that are required and with clear calculations showing the expected noise reduction.

4.0 SITE INVESTIGATION, FINDINGS & RECOMMENDATIONS

- 4.1 CSA personnel undertook various tests of the building structure during a visit to site on 16th August 2024. The findings of these tests are summarised below. Details of the adopted PG testing methodologies and equipment used throughout the survey are shown in Appendix B.

4.2 ENVIRONMENTAL NOISE SURVEY

- 4.2.1 An environmental noise survey, described in Appendix B, was conducted, the measured typical lowest noise levels of which are presented below.

PERIOD	TYPICAL LOWEST BACKGROUND ($L_{A90,5MIN}$)
Daytime	42dB
Night-time	32dB

Table 4.1 - Measured background noise levels

[dB ref. 20µPa]

4.3 AIRBORNE SOUND INSULATION

- 4.3.1 Airborne sound insulation tests were conducted of the rear wall, facing the residential receptors. The results are presented in Table 4.2.

TEST LOCATION	RESULT
Rear Wall (noise breakout primarily from roller shutter)	D_w 28 @ 7m
	D_w 39 @ 30m

Table 4.2 – Sound Insulation Test Results

[dB ref. 20µPa]

- 4.3.2 The roller shutter will be boarded over as part of the fitout. This will significantly improve the sound insulation performance of the rear façade.

- 4.3.3 The activity noise levels provided by PG in Table 4.3 have been assessed.

LOCATION	PERIOD	L_{eq}/L_{MAX}	63	125	250	500	1K	2K	4K	8K
Main Gym Floor / Free Weights	07:00h - 23:00h	L_{eq}	68	67	67	68	66	63	61	57
	23:00h - 07:00h		62	65	64	62	60	58	56	51
Functional (daytime only)	07:00h - 23:00h	L_{eq}	65	72	71	72	74	68	64	61
Studio (daytime only)	07:00h - 22:00h	L_{eq}	87	85	81	79	79	80	76	73
		L_{max}	79	79	77	79	76	71	66	65

Table 4.3 – Pure Gym Activity Noise Levels

4.4 ASSESSMENT RESULTS

4.4.1 Calculations have been undertaken to predict the external noise levels at the most affected residential receptors to the west on North Way due to gym activity. These have accounted for losses associated with screening from buildings as well as distance propagation.

4.4.2 Table 4.4 shows the predicted noise levels to the nearest dwellings based on the spectral activity noise levels (Table 4.3). The NR value is shown for the night-time activity for comparison with Table 3.1, whilst A-weighted L_{eq}/L_{max} levels are shown for consideration during the daytime period.

GYM AREA / FUNCTION	L_{eq} / L_{MAX}	NORTH WAY DWELLINGS
Main Gym Floor / Free Weights	L_{eq}	26dB(A) [07:00h -23:00h] 21dB(A) / NR17 [23:00h -07:00h]
Functional (daytime only)	L_{eq}	32dB(A)
Maximum Levels from Typical Gym Operations	L_{max}	41dB(A)
Studio (daytime only)	L_{eq}	37dB(A)
	L_{max}	51dB(A)

Table 4.4 – Environmental Noise Breakout Levels

4.4.3 The night-time criterion is expected to be achieved during typical night-time operation.

4.4.4 Once the roller shutter is over-boarded, the predicted daytime noise levels are all anticipated to be below the pre-existing background noise levels at the receptors.

4.4.5 Gym noise breakout is, therefore, expected to be suitably controlled at residential properties.

4.5 PLANT NOISE EMISSIONS

4.5.1 The background levels measured during the environmental noise survey, described in Appendix B, are presented below. As per the BS4142 assessment methodology, these form the basis of the plant noise assessment.

PERIOD	TYPICAL LOWEST BACKGROUND
Daytime	$L_{A90,5min}$ 42 dB
Night-time	$L_{A90,5min}$ 32 dB

Table 4.5 – Measured background noise levels [dB ref. 20 μ Pa]

4.5.2 It is understood that typical PG MBF sites make use of the following mechanical plant specification:

- 9 no. Mitsubishi PUHZ-ZRP250YKA3.

- 4.5.3 It is assumed that the plant will be located to the rear of the unit. Calculations have been undertaken to predict the external plant noise level at the closest residential receptors, identified as nos. 4 and 5 North Way.
- 4.5.4 The service area is bounded with a brick wall topped with a close-boarded timber fence having overall height of around 3m. It is expected that the screening afforded by the wall and fence will be capable of reducing plant noise emissions to $L_{Aeq,T}$ 29dB at the upper floor of the receptor premises and $L_{Aeq,T}$ 26dB at ground level. As these noise levels are below the pre-existing background noise level, feature corrections for tonality, impulsivity or intermittency are not required.
- 4.5.5 Table 4.6 shows the prediction noise levels against the criteria, whilst a calculation summary is provided in Appendix C.

PREDICTION	CRITERIA
1 st Floor Level: $L_{Aeq,T}$ 29 dB Ground Floor Level: $L_{Aeq,T}$ 26 dB	Daytime: $L_{Aeq,T}$ 42 dB Night-time: $L_{Aeq,T}$ 32 dB

Table 4.6 – Measured background noise levels and plant noise criteria

[dB ref. 20 μ Pa]

- 4.5.6 No specific mitigation measures are required for the control of plant noise emissions.

5.0 GYM MANAGEMENT PROTOCOL

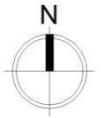
- 5.1.1 A standard gym management protocol will be required to ensure that members behave responsibly within, and when entering and leaving the premises.
- 5.1.2 Gym managers must ensure that music systems are set at the correct volume and that, during unattended periods, are secured so as to avoid unauthorised tampering.

6.0 CONCLUSIONS

- 6.1 Clarke Saunders Acoustics (CSA) has been instructed by Pure Gym (PG) to undertake a noise impact assessment of the proposed gym unit at Central Retail Park, Havant, PO9 1HH. This assessment will be undertaken in accordance with PureGym project targets and the planning requirements of Havant Borough Council.
- 6.2 An assessment of noise breakout to the residential properties has demonstrated that suitable conditions can be achieved, once the roller shutter is over-boarded.
- 6.3 Results of an environmental noise survey have established the current background noise climate at the site, which has enabled noise limits to be set for the control of plant noise emissions to the most affected noise sensitive receptors in accordance with the planning requirements of the Havant Borough Council.
- 6.4 Data for the new plant units has been used to predict the noise impact of the proposed plant emissions at the nearby receptors. Compliance with local authority requirements has been demonstrated, no further mitigation is required.

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Acoustic Terminology

The human impact of sounds is dependent upon many complex interrelated factors such as 'loudness', its frequency (or pitch) and variation in level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

Sound	Vibrations propagating through a medium (air, water, etc.) that are detectable by the auditory system.
Noise	Sound that is unwanted by or disturbing to the perceiver.
Frequency	The rate per second of vibration constituting a wave, measured in Hertz (Hz), where 1Hz = 1 vibration cycle per second. The human hearing can generally detect sound having frequencies in the range 20Hz to 20kHz. Frequency corresponds to the perception of 'pitch', with low frequencies producing low 'notes' and higher frequencies producing high 'notes'.
dB(A):	Human hearing is more susceptible to mid-frequency sounds than those at high and low frequencies. To take account of this in measurements and predictions, the 'A' weighting scale is used so that the level of sound corresponds roughly to the level as it is typically discerned by humans. The measured or calculated 'A' weighted sound level is designated as dB(A) or L_A .
L_{eq}:	A notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 8 hour, 1 hour, etc). The concept of L_{eq} (equivalent continuous sound level) has primarily been used in assessing noise from industry, although its use is becoming more widespread in defining many other types of sounds, such as from amplified music and environmental sources such as aircraft and construction. Because L_{eq} is effectively a summation of a number of events, it does not in itself limit the magnitude of any individual event, and this is frequently used in conjunction with an absolute sound limit.
L_{10} & L_{90}:	Statistical L_n indices are used to describe the level and the degree of fluctuation of non-steady sound. The term refers to the level exceeded for n% of the time. Hence, L_{10} is the level exceeded for 10% of the time and as such can be regarded as a typical maximum level. Similarly, L_{90} is the typical minimum level and is often used to describe background noise. It is common practice to use the L_{10} index to describe noise from traffic as, being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic flow.
L_{max}:	The maximum sound pressure level recorded over a given period. L_{max} is sometimes used in assessing environmental noise, where occasional loud events occur which might not be adequately represented by a time-averaged L_{eq} value.
NR	<i>Noise Rating</i> . A single figure noise level rating that takes into account the frequency content of an acoustic environment.
R	<i>Sound Reduction Index</i> . Effectively the Level Difference of a building element when measured in an accredited laboratory test suite in accordance with the procedures laid down in BS EN ISO 10140-2:2010 and corrected for its size and the reverberant characteristics of the receive room.
D	The sound insulation performance of a construction is described in terms of the difference in sound level on either side of the construction in the presence of a sound source on one side and the reverberant characteristics of the adjoining 'receive' space. D is the arithmetic Level Difference in decibels between the

source and receive sound levels when filtered into frequency bands.

D_{nT}	<i>Weighted Standardised Level Difference.</i> As defined in BS EN ISO 717-1, representing the Weighted Level Difference, when standardised for reference receiving room reverberant characteristics.
$D_{n,e}$	Normalised sound insulation of small building elements of fixed dimensions, such as vents, measured in an accredited laboratory test suite in accordance with the procedures laid down in BS EN ISO 10140-2:2010.
$D_{n,f}$	Flanking sound insulation of lightweight elements, such as curtain wall mullions, measured in an accredited laboratory test suite in accordance with the procedures laid down in ISO 10848-2:2006
R_w D_w $D_{nT,w}$ $D_{n,e,w}$ $D_{n,f,w}$	Value of parameter, determined as above, but weighted in accordance with the procedures laid down in BS EN ISO 717-1 to provide a single-figure value.
C , C_{tr}	Spectral adaptation terms to be added to a single number quantity such as $D_{nT,w}$, to take account of the sound insulation within frequency ranges of particular interest.
$L'_{nT,w}$	<i>Weighted Standardised Impact Sound Pressure Level</i> as defined in BS EN ISO 717-2, representing the level of sound pressure when measured within a space where the floor above is under excitation from a calibrated tapping machine, standardised for the receiving room reverberant characteristics.
ΔL_w	Change in impact sound pressure level when a floor is fitted with a 'soft' or resilient covering, as measured in an accredited laboratory test suite in accordance with the procedures laid down in BS EN ISO 10140-3:2010.

Octave Band Frequencies

In order to determine the way in which the energy of sound is distributed across the frequency range, the International Standards Organisation has agreed on "preferred" bands of frequency for sound measurement and analysis. The widest and most commonly used band for frequency measurement and analysis is the Octave Band.

In these bands, the upper frequency limit is twice the lower frequency limit, with the band being described by its "centre frequency" which is the average (geometric mean) of the upper and lower limits, e.g. 250 Hz octave band extends from 176 Hz to 353 Hz. The most commonly used octave bands are:

Octave Band Centre Frequency Hz	63	125	250	500	1000	2000	4000	8000
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Human Perception of Broadband Noise

Because of the logarithmic nature of the decibel scale, it should be borne in mind that sound levels in dB(A) do not have a simple linear relationship. For example, 100dB(A) sound level is not twice as loud as 50dB(A). It has been found experimentally that changes in the average level of fluctuating sound, such as from traffic, need to be of the order of 3dB before becoming definitely perceptible to the human ear. Data from other experiments have indicated that a change in sound level of 10dB is perceived by the average listener as a doubling or halving of loudness. Using this information, a

APPENDIX A

ACOUSTIC TERMINOLOGY AND HUMAN RESPONSE TO BROADBAND SOUND

guide to the subjective interpretation of changes in environmental sound level can be given.

INTERPRETATION

Change in Sound Level dB	Subjective Impression	Human Response
0 to 2	Imperceptible change in loudness	Marginal
3 to 5	Perceptible change in loudness	Noticeable
6 to 10	Up to a doubling or halving of loudness	Significant
11 to 15	More than a doubling or halving of loudness	Substantial
16 to 20	Up to a quadrupling or quartering of loudness	Substantial
21 or more	More than a quadrupling or quartering of loudness	Very Substantial

Earth Bunds and Barriers - Effective Screen Height

When considering the reduction in sound level of a source provided by a barrier, it is necessary to establish the "effective screen height". For example if a tall barrier exists between a sound source and a listener, with the barrier close to the listener, the listener will perceive the sound as being louder if he climbs up a ladder (and is closer to the top of the barrier) than if he were standing at ground level. Equally if he sat on the ground the sound would seem quieter than if he were standing. This is explained by the fact that the "effective screen height" is changing with the three cases above. In general, the greater the effective screen height, the greater the perceived reduction in sound level.

Similarly, the attenuation provided by a barrier will be greater where it is aligned close to either the source or the listener than where the barrier is midway between the two.

SITE INVESTIGATIONS

The equipment listed in the following Table was used during the survey.

EQUIPMENT	MANUFACTURER & TYPE	SERIAL NUMBER	LAST CALIBRATION	CERTIFICATE NUMBER
Sound Level Analyser	Norsonic 118	31511	Feb 2023	TCRT23/1138
	Pre-amp Norsonic 1206	30553		
	Microphone GRAS 40AF	81838		
Sound Level Analyser	Rion NL-52	710445	Nov 2023	TCRT23/1793
	Pre-amp Rion NH 25	10988		
	Microphone Rion UC-59	19707		

Calibration of all instrumentation was verified at the commencement and conclusion of the surveys, with no significant drift in equipment sensitivity being detected.

TEST METHODOLOGY

ENVIRONMENTAL NOISE SURVEY

A survey of the existing ambient sound levels was undertaken circa 2m above local ground level at the locations shown in the site plan.

The sound level meter was set to record measurements of consecutive 5 - minute L_{Aeq} , L_{Amax} , L_{A90} and L_{A10} sound pressure levels.

The calibration of the sound level meters was verified before and after use. No significant calibration drift was detected. All CSA equipment has current traceable laboratory calibration. Certification is available upon request.

The weather was generally dry with light to moderate winds during the survey, which are appropriate conditions for the measurement of environmental sound.

Environmental sound survey measurements were made following procedures in BS4142 and BS 7445:1991 (ISO1996-2:1987) *Description and measurement of environmental noise Part 2- Acquisition of data pertinent to land use*.

AIRBORNE SOUND INSULATION

Measurements of airborne sound insulation were conducted following procedures defined in BS EN ISO 16283-1:2014 *Acoustics - Field measurement of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation*.

High volume 'pink' noise was generated from cabinet loudspeakers, positioned so as to obtain a diffuse sound field within the space.

A spatial average of the resulting one-third octave band source noise levels was obtained in the source space using a moving microphone technique.

Measurements of breakout noise were made at a number of static positions around the building.

Background noise levels were measured in the external spaces in order to correct the received noise measurements for the influence of the prevailing noise climate, as prescribed within the Standard.

Measured results are weighted as per the procedure described in BS EN ISO 717-1: 2020 *Acoustics – Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation*.

APPENDIX C
AS13692 PureGym Havant
PLANT SOUND CALCULATIONS

Plant sound to First Floor		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
PUHZ-ZRP250YKA3	Lp @ 1m	66	63	61	60	58	53	48	42	62
Number of	9no	10	10	10	10	10	10	10	10	
Attenuation Loss	None	0	0	0	0	0	0	0	0	
Screening Loss	To 4 / 5 M	-5	-5	-6	-7	-8	-10	-12	-15	
Distance Loss	58m	-35	-35	-35	-35	-35	-35	-35	-35	
Specific sound level at receptor $L_{eq 1hr}$		35	32	29	28	24	17	10	1	29

Plant sound to Ground Floor		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
PUHZ-ZRP250YKA3	Lp @ 1m	66	63	61	60	58	53	48	42	62
Number of	9no	10	10	10	10	10	10	10	10	
Attenuation Loss	None	0	0	0	0	0	0	0	0	
Screening Loss	To 4 / 5 M	-6	-6	-8	-9	-12	-14	-17	-18	
Distance Loss	25m	-28	-28	-28	-28	-28	-28	-28	-28	
Specific sound level at receptor $L_{eq 1hr}$		35	31	28	25	21	13	5	-2	26