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Planning Addendum – Gym Noise/Vibration

1 Introduction

1.1 In addition to the Noise & Vibration Chapter of the Environmental Impact Assessment submitted to Manchester City Council (MCC) regarding the proposed Plot C development of the wider Sister masterplan, MCC have requested an addendum regarding the potential use of the basement level flexible space as a gym.

2 Project Proposals

2.1 The Plot C proposals constitute a phased development comprising: Phase A - demolition of existing buildings and structures, erection of a basement (C1 Building and C2 Building) and a podium across lower ground and upper ground floors comprising flexible commercial space (Class E and/or Sui Generis drinking establishment), erection of a building (C1 Building) to form offices (Class E), landscaping works, highways, access, servicing, infrastructure and other associated works; Phase B: erection of a podium across lower ground and upper ground floors and a new building (C2 Building) to form offices (Class E) and flexible commercial and community uses (Class E, F2 and/ or Sui Generis drinking establishment), alterations to the existing Sculptural Wall (Hollaway Wall), relocation of existing art work, landscaping works, highways, access, servicing, infrastructure and other associated works; Phase C - change of use and associated works to railway Viaduct arches to form flexible commercial units (Class E, and/ or Sui Generis - drinking establishment) including highways, access and servicing arrangements, and other associated works.

2.2 The details of the wider project proposals for Plot C in the context of noise and vibration are set out in Chapter 16 of the submitted Environmental Impact Assessment (ref 143024/FO/2025). Included in the proposals for Plot C are several flexible use spaces, intended to be tenanted, at basement, lower ground, and upper ground floors.

2.3 At this stage it is the basement flexible use space that is being considered for usage as a gym, the prospective tenant is unknown, however it is anticipated that the prospective tenant is likely to be a boutique/independent operator as opposed to a larger scale commercial operator.

2.4 Figure 1 illustrates the basement flexible use unit being considered for gym usage, and Figure 2 shows the flexible use, plant, and back of house areas at lower ground floor located above.

2.5 As can be seen from Figure 1 and Figure 2, the flexible use space at basement level is subterranean and therefore has no external façade, and is vertically adjacent (below) to plant space, Estate and Building Staff Welfare space, two other tenanted flexible use spaces and the Sister Square Lobby, all located at lower ground floor level.

2.6 The proposed intermediate slab between the basement and lower ground floor spaces is to comprise 350mm RC concrete.

2.7 The use of any of the proposed flexible use spaces as a gym will have the potential to generate noise and vibration which could disrupt other uses in the building, as such the basement flexible use space has been identified as the preferred option for gym usage and flexible use spaces at lower and upper ground floor have been discounted for use as a gym.

2.8 Due to the basement space being subterranean it is considered that noise breakout to external receptors should not be a concern and therefore no assessment of noise breakout has been undertaken.

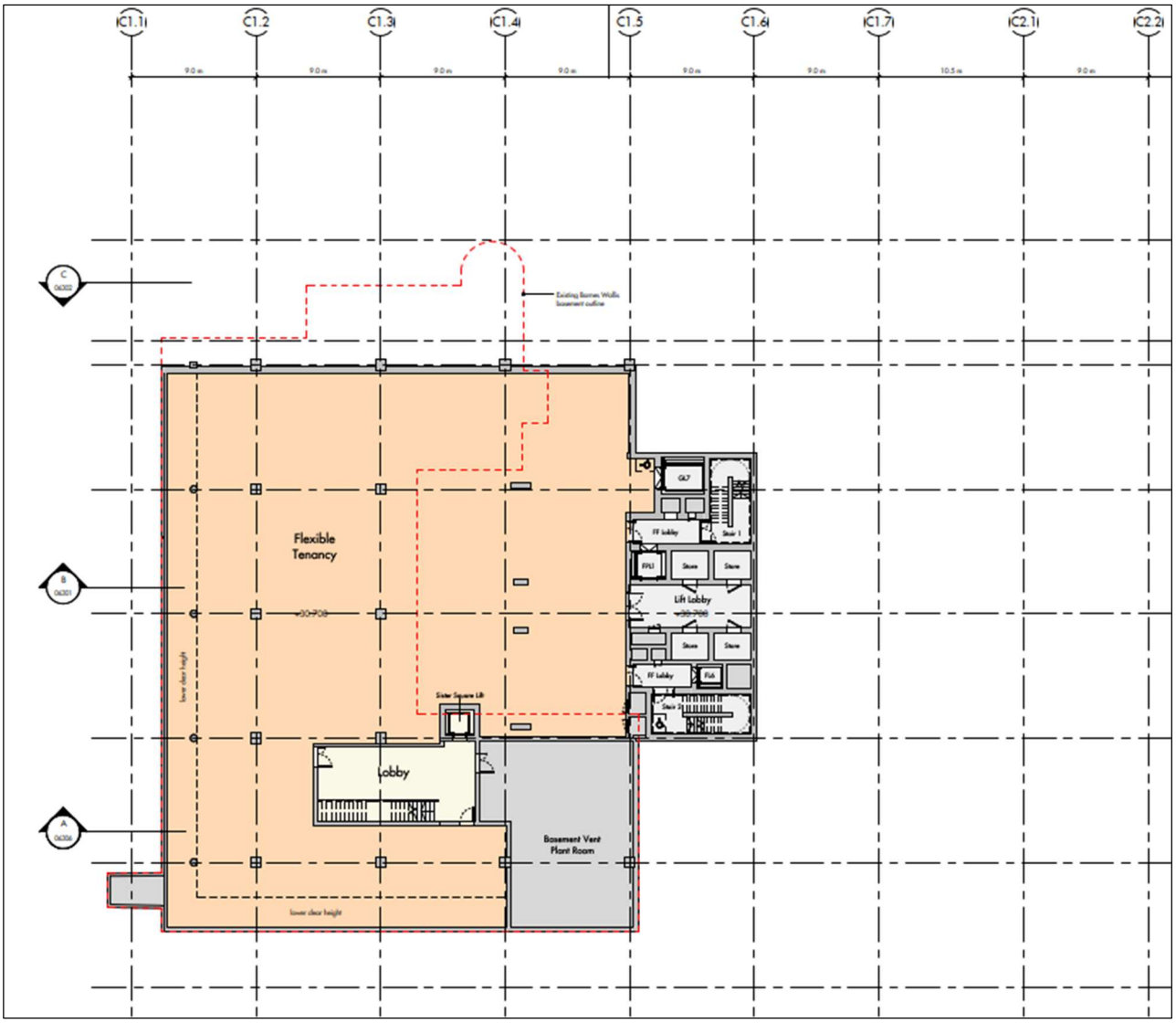

Figure 1: Basement Level GA Plan (c/o AAM)

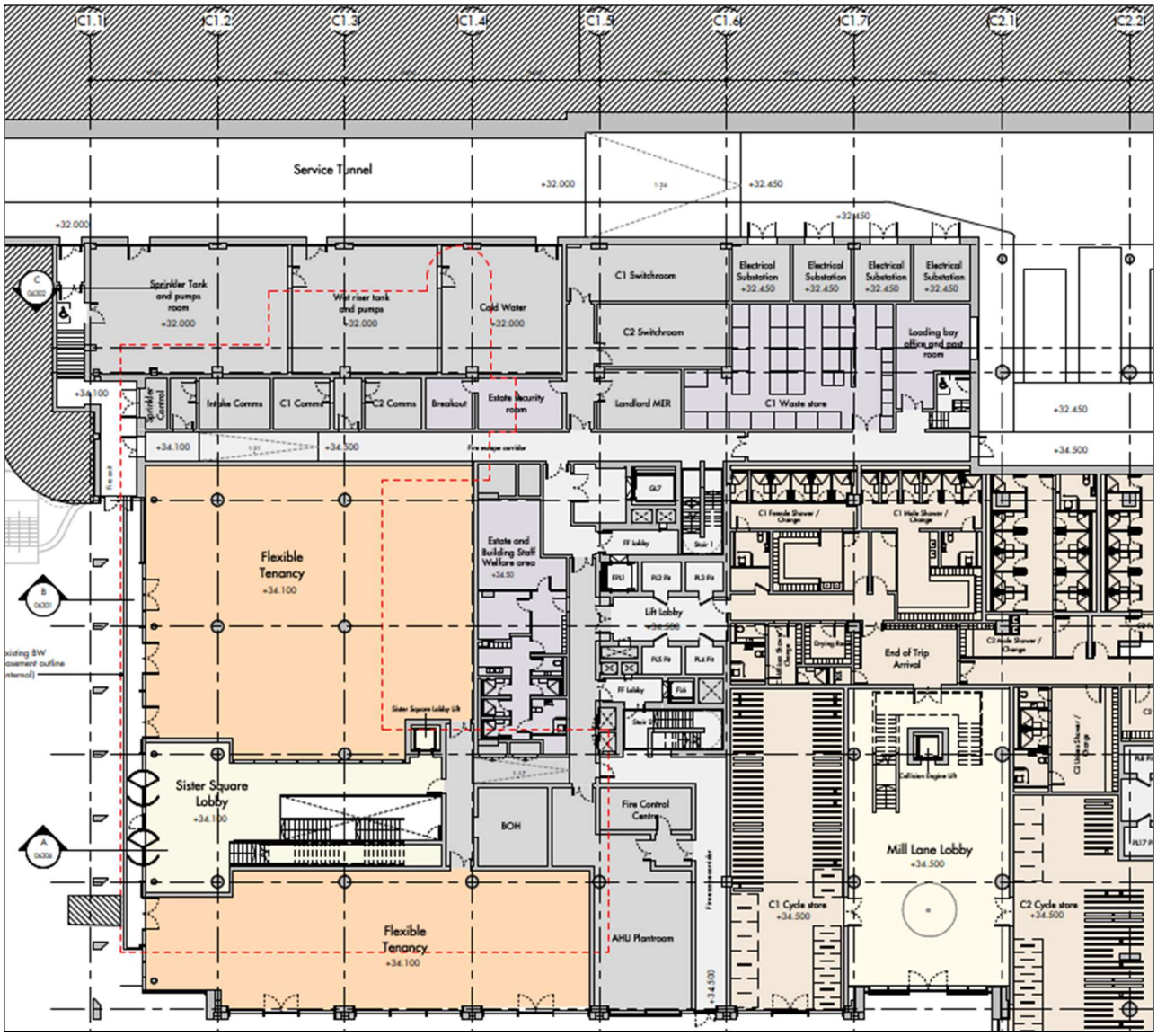

Figure 2: Lower Ground Floor GA Plan (c/o AAM)

3 Relevant Standards and Guidance

3.1 Manchester City Council

3.1.1 Manchester City Council's *'Planning and Noise Technical Guidance'* document published in October 2022 provides guidance on the assessment of noise and vibration impacts associated with various types of development within Manchester.

3.1.2 With regards to noise from commercial development it states:

> *"...The development should be designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location..."*

3.1.3 With regards to noise from fixed building services plant it states:

> *"...Externally mounted ancillary plant, equipment and services shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location..."*

3.1.4 With regards to noise from entertainment sources it states:

> *"Entertainment noise ($L_{Aeq,5min}$) should be controlled to 5dB below the typical background noise level (L_{A90}) in each octave band at the nearest noise sensitive location'.*

3.1.5 As the proposed basement space is subterranean it is considered that commercial or entertainment (music) noise breakout to external receptors should not be a concern. However, the use of the proposed basement flexible use as a gym will have the potential to give rise to noise and vibration transfer to other parts of the building, in particular, the adjacent spaces at lower ground floor level.

3.1.6 Based on recent experience working with Manchester City Council it is understood that noise and vibration associated with the proposed gym unit should be assessed and designed with reference to the ProPG: Gym Acoustic Guidance.

3.2 ProPG: Gym Acoustics Guidance (GAG)

3.2.1 The ProPG: Gym Acoustic Guidance (GAG) was published in March 2023 by the Association of Noise Consultants, Institute of Acoustics, and Chartered Institute of Environmental Health.

3.2.2 The GAG provides various good practice guidance and suggested criteria for the assessment and design of gym and fitness spaces.

3.2.3 Figure 3 shows the recommended criteria for noise transfer from gym activity to other internal areas set out in the GAG.

3.2.4 Figure 4 shows the recommended criteria for vibration transfer from gym activity to other internal areas set out in the GAG.

Table 2: Guidance Internal Sound Target Criteria for Gym Activity – Residential & Other Areas

Receptor type	**Guide Criteria** (for third octave band values plots against the stated G curve - see Figure 2)	
	Airborne Sound (e.g., music) $L_{eq,T}$ (31.5Hz to 8kHz)	Heavy Impact Sound $L_{max,F}$ (31.5Hz to 8kHz)
Commercial Offices	G25-G35	G35-G45
Retail Areas	G30-G45	G35-G50
Residential Areas	G15-G25 (day) G10-G20 (night)	G20-G25 (day) G15-G20 (night)

Table 2 Notes:

1. *The Working Group generally found in their experience that levels below the upper values tended to avoid significantly adverse impacts (SOAEL) occurring and higher levels than these should generally be avoided, but this is highly dependent on context. The background and ambient noise levels at any given site can fluctuate (e.g., a building in an urban setting adjacent to busy infrastructure versus a building shielded from external adverse noise intrusions and/or quieter location). This variation will also cause a subjective variance in relation to the perceived noise impact, both during the design phase and the completed development and the SQA should be cognisant of which target criteria would be most appropriate to their Gym scheme.*
2. *In rooms with low background noise levels (below ~20 dB $L_{A90,5minutes}$), the criteria should be carefully considered and fully justified. It has been noted that the subjective impression of low frequency noise could still cause issues of disturbance, despite meeting the above target ranges. Therefore, it is recommended that resulting heavy impact noise levels at frequencies 80Hz and below, do not exceed a level of 20dB above the existing background noise dB $L_{A90,5minutes}$ within commercial and retail adjacencies (without source/Gym related activities). Where good sound insulation and closed windows results in very low background sound levels this can result in the loss of masking sound making intruding low frequency sound from Gyms more prominent and so potentially more likely to cause disturbance*
3. *For heavy impact noise at least 1/3 octave bands analysis is desirable over the audible range from 31.5Hz, although measuring down to 20Hz is desirable to cover the audible range and may assist in identifying outlying peaks of energy.*
4. *For music noise, particular care should be given to controlling noise in the low frequency region, in the range 31.5Hz to 200Hz and $L_{max,F}$, L_1, L_{10} may also be used as parameters as a substitution for $L_{eq,T}$.*

Figure 3: ProPG GAG Suggested Noise Criteria

Table 3: Guidance Internal Vibration Target Criteria for Gym Activity – Residential & Other Areas

Receptor type	Guide Criteria (see Figure 3) Tactile Vibration (point of entry to the body) Acceleration (mm/s²)		
Commercial Offices	rms 20mm/s² W_g	Peak 40mm/s² W_g	base curve multiplier of 4 (ref. BS 6472:1992)
Retail Areas	rms 20mm/s² W_b	Peak 60mm/s² W_b	base curve multiplier of 4 (ref. BS 6472:1992)
Residential Areas	rms 7mm/s² W_b	Peak 21mm/s² W_b	base curve multiplier of 1.4 (ref. BS 6472:1992)

Table 3 Notes:

1. *When measuring vibration, a similar approach down to at least 6Hz is recommended;*
2. *For facilities that are particularly sensitive (like scientific facilities) a specific methodology might be appropriate*

Figure 4: ProPG GAG Suggested Vibration Criteria

3.2.5 Based on the above guidance it is proposed to target the gym activity noise and vibration criteria as set out in Table 1 below.

Adjacent Space	Gym Activity Noise Criteria	Gym Activity Vibration Criteria
Flexible Use	≤ G35 $L_{eq,T}$ ≤ G45 $L_{max,F}$	rms 20mm/s² W_g Peak 40mm/s² W_g base curve multiplier of 4 (ref BS 6472:1992)
Staff Welfare	≤ G35 $L_{eq,T}$ ≤ G45 $L_{max,F}$	rms 20mm/s² W_g Peak 40mm/s² W_g base curve multiplier of 4 (ref BS 6472:1992)
Sister Square Lobby	≤ G45 $L_{eq,T}$ ≤ G50 $L_{max,F}$	rms 20mm/s² W_b Peak 60mm/s² W_b base curve multiplier of 4 (ref BS 6472:1992)
Plant	N/A	N/A

Table 1: Summary of Proposed Gym Activity Noise and Vibration Criteria

4 Assessment of Proposed Gym Usage

4.1 Noise Breakout

4.2 As stated above as the proposed basement space is subterranean it is considered that commercial or entertainment (music) noise breakout to external receptors should not be a concern and as such no assessment of noise breakout has been undertaken at this stage.

4.2 Noise Transfer

4.2.1 The intermediate slab separating the basement and lower ground floor spaces is proposed to comprise a minimum 350mm reinforced concrete.

4.2.2 Table 2 below sets out the conservative sound reduction indices predicted for the 350mm reinforced concrete slab assuming a minimum density of 2,400kg/m^3.

Predicted Sound Reduction Index *R* at Octave Band Centre Frequency (Hz)						
63	**125**	**250**	**500**	**1000**	**2000**	**4000**
40	45	50	60	65	65	70

Table 2: Predicted Sound Reduction Indices – 350mm RC Slab

4.2.3 Table 3 sets out the calculated maximum internal noise levels calculated based on the most onerous requirements set out in Table 1

Description	Maximum Reverberant Internal Noise Level (dB) at Octave Band Centre Frequency (Hz)							dBA
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**	
$L_{Aeq,5min}$	98	92	90	94	96	93	94	101
$L_{Amax,f}$	106	101	99	104	106	103	105	111

Table 3: Calculated Maximum Internal Noise Limits within Gym

4.2.4 These limits should be written into the prospective tenant's rental agreement or handbook, and, although unlikely, if the prospective tenant expects gym activity noise levels to exceed the calculated limits, it should be made clear that the tenant would be responsible for enhancement of the unit shell such that the limits set out in Table 1 are not exceeded in the lower ground floor spaces above the gym.

4.2.5 These limits are expected to be suitable to permit reasonable levels of amplified background music or music used during a coordinated group activity or class with little restriction.

4.3 Vibration Transfer

4.3.1 In order to mitigate the potential for vibration transfer from gym activity in the basement to vertically adjacent units it will be necessary to install a specialist flooring system capable of dampening the impact from impulsive stimuli such as dropping of weights.

4.3.2 In accordance with the GAG, the exact flooring build-up within the gym will be subject to in-situ sample testing undertaken during construction in line with either HIR Method 1 (using reference weight drops) or HIR Method 2 (using real non-standardised weight drops if known/available for testing).

4.3.3 At this stage, it is envisaged that an allowance for up to 200mm of varying thicknesses of specialist rubber matting flooring systems dependant on equipment usage and floor areas will be sufficient but final details of the proposed mitigation will be determined by the final fit-out, specification of equipment, and layout which can be agreed in principle with a suitably worded pre-occupation condition and subsequent validation testing.

5 Summary

5.1 Airborne noise and vibration transfer limits within the proposed sensitive spaces vertically adjacent to the proposed basement have been established in accordance with the ProPG GAG.

5.2 These limits can be secured with a suitably worded pre-occupation condition of planning requiring specific details of the mitigation strategy (specialist gym floor build-up) and in-situ validation testing (in line with the ProPG GAG) to be submitted to Manchester City Council for discharge.

5.3 The limits have been reviewed in tandem with the proposed slab build-up to calculate approximate limiting internal operational noise levels within the proposed gym unit. These operational limiting noise levels are considered to be suitable to permit reasonable levels of amplified background music commensurate with the intended usage being considered.

5.4 Although final specification of the specialist gym flooring will require in-situ validation testing in line with the ProPG GAG, a preliminary allowance for a zone of up to 200mm of specialist rubber mattings has been advised and is expected to be suitable to control impact excitation from weight drops in line with the proposed transfer limits in sensitive vertically adjacent spaces.