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PROJECT TECHNICAL MEMORANDUM

JOB TITLE : 330 Grays Inn Road

REF : HT: 26609/PTM1

DATE : 23 March 2021

FROM : Luke Rendell

ISSUED TO : nmorris@groveworld.co.uk
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RE: Noise/Vibration Transfer from The Water Rats

We understand that Camden and the GLA have requested details of the 330 Grays Inn Road proposals with respect to the principal of 'agent of change' regarding the adjacent UCL Ear Institute. Our planning stage assessment with regards to this principal is as follows:-

1.0 Introduction

Hann Tucker Associates attended 330 Grays Inn Road on 19 February 2021 to undertake measurements of noise and vibration, due to music and plant noise transfer from The Water Rats Public House.

2.0 Legislation & Guidance

2.1 NPPF

Paragraph 182 of the National Planning Policy Framework states:

*"Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or '**agent of change**') should be required to provide suitable mitigation before the development has been completed."*

2.2 The London Plan 2021

Policy D13 (Agent of Change) in The London Plan 2021 (March 2021) states:

Policy D13 Agent of Change

A The Agent of Change principle places the responsibility for mitigating impacts from existing noise and other nuisance-generating activities or uses on the proposed new noise-sensitive development. Boroughs should ensure that Development Plans and planning decisions reflect the Agent of Change principle and take account of existing noise and other nuisance-generating uses in a sensitive manner when new development is proposed nearby.

B Development should be designed to ensure that established noise and other nuisance-generating uses remain viable and can continue or grow without unreasonable restrictions being placed on them.

C New noise and other nuisance-generating development proposed close to residential and other noise-sensitive uses should put in place measures to mitigate and manage any noise impacts for neighbouring residents and businesses.

D Development proposals should manage noise and other potential nuisances by:

1) ensuring good design mitigates and minimises existing and potential nuisances generated by existing uses and activities located in the area
2) exploring mitigation measures early in the design stage, with necessary and appropriate provisions including ongoing and future management of mitigation measures secured through planning obligations
3) separating new noise-sensitive development where possible from existing noise-generating businesses and uses through distance, screening, internal layout, sound-proofing, insulation and other acoustic design measures.

E Boroughs should not normally permit development proposals that have not clearly demonstrated how noise and other nuisances will be mitigated and managed.

3.13.1 For a long time, the responsibility for managing and **mitigating the impact of noise** and other nuisances on neighbouring residents and businesses has been placed on the business or activity making the noise or other nuisance, regardless of how long the business or activity has been operating in the area. In many cases, this has led to newly-arrived residents complaining about noise and other nuisances from existing businesses or activities, sometimes forcing the businesses or other activities to close.

3.13.2 The **Agent of Change principle** places the responsibility for mitigating the impact of noise and other nuisances firmly on the new development. This means that where new developments are proposed close to existing noise-generating uses, for example, applicants will need to design them in a more sensitive way to protect the new occupiers, such as residents, businesses, schools and religious institutions, from noise and other impacts. This could include paying for soundproofing for an existing use, such as a music venue. The Agent of Change principle works both ways. For example, if a new noise-generating use is proposed close to existing noise-sensitive uses, such as residential development or businesses, the onus is on the new use to ensure its building or activity is designed to protect existing users or residents from noise impacts.

3.13.3 The Agent of Change principle is included in the National Planning Policy Framework, and **Planning Practice Guidance** provides further information on how to mitigate the adverse impacts of noise and other impacts such as air and light pollution.[36]

3.13.4 The Agent of Change principle predominantly concerns the impacts of noise-generating uses and activities but **other nuisances** should be considered under this policy. Other nuisances include dust, odour, light and vibrations (see Policy SI 1 Improving air quality and Policy T7 Deliveries, servicing and construction). This is particularly important for development proposed for co-location with industrial uses and the intensification of industrial estates (see Part D4 of Policy E7 Industrial intensification, co-location and substitution). When considering co-location and intensification of industrial areas, boroughs should ensure that existing businesses and uses do not have unreasonable restrictions placed on them because of the new development.

3.13.5 Noise-generating **cultural venues** such as theatres, concert halls, pubs, night-clubs and other venues that host live or electronic music should be protected (see Policy HC5 Supporting London's culture and creative industries). This requires a sensitive approach to managing change in the surrounding area. Adjacent development and land uses should be brought forward and designed in ways which ensure established cultural venues remain viable and can continue in their present form without the prospect of licensing restrictions or the threat of closure due to noise complaints from neighbours.

3.13.6 As well as cultural venues, the **Agent of Change principle should be applied to all noise-generating uses and activities** including schools, places of worship, sporting venues, offices, shops, industrial sites, waste sites, safeguarded wharves, rail and other transport infrastructure.

3.13.7 Housing and other **noise-sensitive development** proposed near to an existing noise-generating use should include necessary acoustic design measures, for example, site layout, building orientation, uses and materials. This will ensure new development has effective measures in place to mitigate and minimise potential noise impacts or neighbour amenity issues. Mitigation measures should be explored at an early stage in the design process, with necessary and appropriate provisions secured through planning obligations.

3.13.8 Ongoing and longer-term management of mitigation measures should be considered, for example through a **noise management plan**. Policy T7 Deliveries, servicing and construction provides guidance on managing the impacts of freight, servicing and deliveries.

3.13.9 Some **permitted development**, including change of use from office to residential, requires noise impacts to be taken into consideration by the Local Planning Authority as part of the prior approval process. Boroughs must take account of national planning policy and guidance on noise, and therefore the Agent of Change principle would apply to these applications.

3.13.10 **Noise and other impact assessments** accompanying planning applications should be carefully tailored to local circumstances and be fit for purpose. That way, the particular characteristics of existing uses can be properly captured and assessed. For example, some businesses and activities can have peaks of noise at different times of the day and night and on different days of the week, and boroughs should require a noise impact assessment to take this into consideration. Boroughs should pay close attention to the assumptions made and methods used in impact assessments to ensure a full and accurate assessment.

3.13.11 Reference should be made to Policy D14 Noise which considers the impacts of noise-generating activities on a wider scale and Policy SI 1 Improving air quality which considers the impacts of existing air pollution. **Further guidance** on managing and mitigating noise in development is also provided in the Mayor's London Environment Strategy.

2.3 BS4142:2014

When assessing noise impact from existing plant, reference is commonly made to BS 4142: 2014 "*Methods for rating and assessing industrial and commercial sound".*

The procedure contained in BS 4142:2014 provides an assessment of the likely effects of sound on people when comparing the specific noise levels from the source with representative background noise levels. Where the noise contains "a tone, impulse or other characteristic" then various corrections can be added to the specific (source) noise level to obtain the "rating level".

BS 4142 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 estimation of the impact of the specific noise can be obtained by the difference of the rating noise level and the background noise level and considering the following:

• "Typically, the greater this difference, the greater the magnitude of the impact."

• "A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context."

• "A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context."

• "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 determination of the "rating level" and the "background level" are both open to interpretation, depending on the context.

In summary it is not possible to set plant noise emission criteria purely on the basis of BS 4142:2014. It is reasonable to infer from the above, however, that a difference of around -5dB

corresponds to “No Observed Effect Level” as defined in the Noise Policy Statement for England. It is also reasonable to infer from the above that if the plant noise rating level does not exceed the existing background noise level outside any noise sensitive residential window then the plant noise is of “low impact”.

2.4 Music Noise Intrusion

Whilst regular music noise intrusion is generally expected to be inaudible inside residential properties, a hotel is a business rather than a permanent residence, and given the central London location next to a pub/music venue, some low level of music noise intrusion may be expected/acceptable in some rooms, depending on the operator.

Nevertheless we would suggest that the design intent for structureborne music noise should be for it to be approaching inaudibility, given that it may affect a large area of the hotel.

However, it is difficult to use inaudibility as a design criterion because hearing thresholds vary from person to person, especially at low frequencies, and because it depends on the future level of background noise present in the rooms. Different hotel operators may also have different definitions by which to assess inaudibility. Therefore it is important to clearly set out a definition of inaudibility for design purposes (see Section 2.4.1 below).

Airborne noise intrusion through the façade should be controlled via the use of masonry constructions and high spec acoustic windows with secondary glazing, but we would suggest that absolute inaudibility during music events in the rooms on the loudest facades should *not* be sought at the expense of natural light (i.e. no windows). There is already a precedent set in the immediate vicinity, since the neighbouring hotel on the other side of The Water Rats has windows to the rear. The closest of these are only slightly further from the music room than the proposed windows of this scheme and whilst the type of glazing is unknown, based on the measurements presented herein, music noise is unlikely to be completely inaudible inside those rooms.

Airborne noise intrusion through the party wall should be controlled by space planning i.e. no guestrooms to be located directly against the party wall with The Water Rats music room on the ground floor.

2.4.1 Definition of Inaudibility – Structureborne Noise

It is generally agreed that a sound is unlikely to be audible if it is 10dB or more below the background. Background noise levels within hotel guestrooms are typically dominated by building services, usually fan coil units. Hann Tucker Associates have commissioned many fan

coil units in hotel guestrooms. The table below presents what we consider to be typical L_{eq} octave band background sound pressure levels in hotel guestrooms, together with the corresponding Noise Rating (NR) and dBA level.

Measured Sound Pressure Level (dB L_{eq}) at Octave Band Centre Frequency (Hz)								NR	dBA
63	125	250	500	1k	2k	4k	8k		
41	37	35	29	25	19	20	18	25	32

However, it may not be appropriate to use the above at very low frequencies close to the threshold of hearing. The University of Salford document 'Procedure for the assessment of low frequency noise disturbance', contract no. NANR45, hereby referred to simply as 'NANR45' which deals with low frequency noise complaints, sets out an L_{eq} criterion curve for assessing whether a measured levels of low frequency sound may be audible. This corresponds to 47dB and 41dB in the 63Hz and 125Hz octave bands respectively. The document also states that sound may still be audible at up to 5dB below the criterion curve (42dB and 36dB in the 63Hz and 125Hz octave bands respectively).

In addition, we would suggest that the proposed audibility criteria should also not be below the threshold of hearing defined in ISO226, and therefore the 8kHz value has been refined upwards slightly.

Based on the above for the purposes of this document we have defined inaudibility to be:

- L_{Aeq} 5dB below the criterion curve given in the University of Salford document 'Procedure for the assessment of low frequency noise disturbance', contract no. NANR45, hereby referred to simply as 'NANR45', in the 63Hz and 125Hz octave bands.
- L_{Aeq} 10dB below the assumed guestroom background building services noise levels given above in the 250Hz-4kHz octave bands.
- L_{Aeq} equal to the threshold of hearing defined in ISO226 in the 8kHz octave band.

The above corresponds to the following octave band sound pressure levels:

Proposed Audibility Criteria (dB L_{eq}) in Hotel Guestrooms at Octave Band Centre Frequency (Hz)							
63	125	250	500	1k	2k	4k	8k
42	36	25	19	15	9	10	13

3.0 Methodology

3.1 Equipment

The equipment used, as detailed below, was calibrated prior to and on completion of the survey. No significant calibration drift occurred.

Equipment	Model	Serial Number	Latest Calibration	Annual Lab Calibration
Type 1 Data Logging Sound Level Meter	Bruel & Kjaer	2250	3025204	Calibration on 29/09/2020
Type 1 ½" Condenser Microphone	Bruel & Kjaer	4189	3148322	Calibration on 29/09/2020
Preamp	Bruel & Kjaer	ZC0032	27881	Calibration on 29/09/2020
Type 1 Data Logging Sound Level Meter	Svantek	971	74415	Calibration on 13/09/2019
Type 1 ½" Condenser Microphone	ACO Pacific	7052E	75073	Calibration on 19/07/2019
Preamp	Svantek	SV18	82324	Calibration on 19/07/2019
Type 1 Calibrator	Bruel & Kjaer	4231	2610161	Calibration on 21/09/2020

In addition to the sound level measurements, manned vibration measurements were also undertaken using a Svantek SV948 vibration meter, and associated SV207A tri-axial accelerometer.

3.2 Music Noise

The Water Rats arranged for a drummer and sound engineer to be present in order to replicate typical sound levels during their loudest type of events. The piece of music chosen was 'Highway to Hell' by AC/DC which was played on loop with the drummer playing along to the record, both of which were played through the Water Rats PA system.

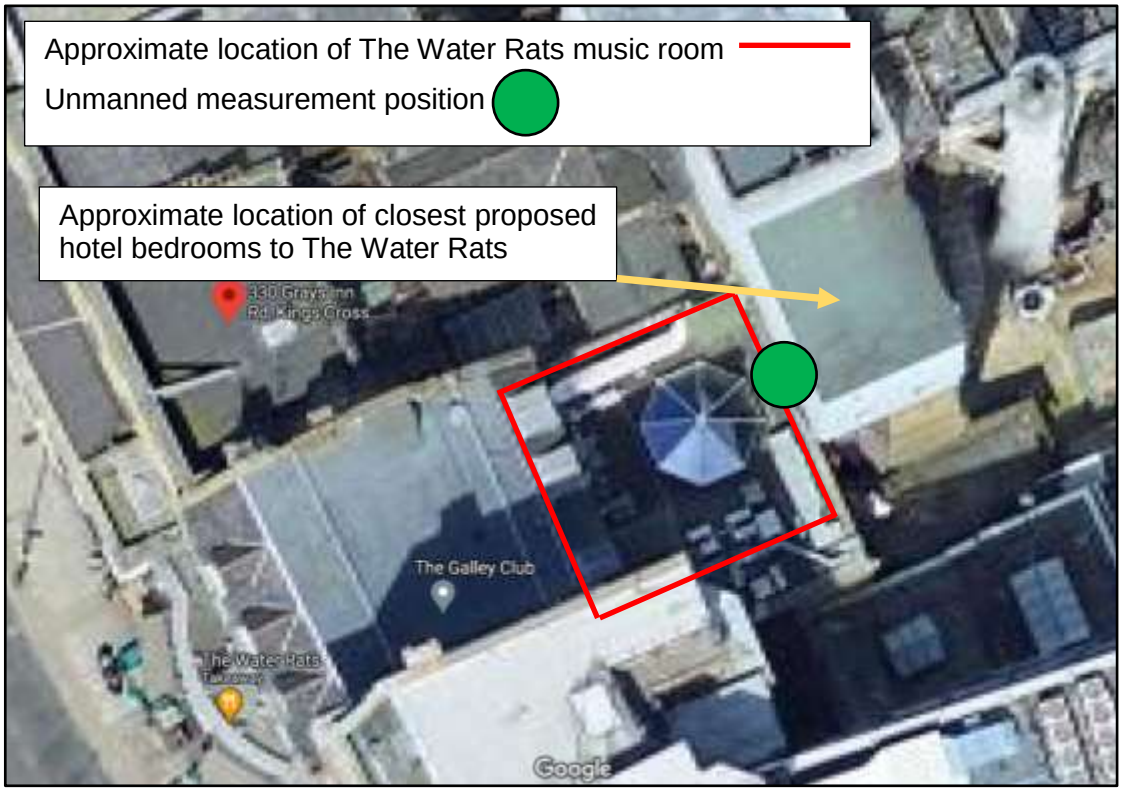
From communication with The Water Rats management we understand the sound levels achieved to be representative of one of their louder bands, with sound levels only occasionally rising slightly above this level during the very loudest events. We were also informed that The Water Rats caters for a variety of different styles of music, the sound levels associated with many of which are lower than generated during this test. We were not permitted to measure sound levels inside The Water Rats during the test.

3.3 Plant Noise

Prior to starting the music The Water Rats separately switched on their roof plant so that noise levels from that could also be taken into account.

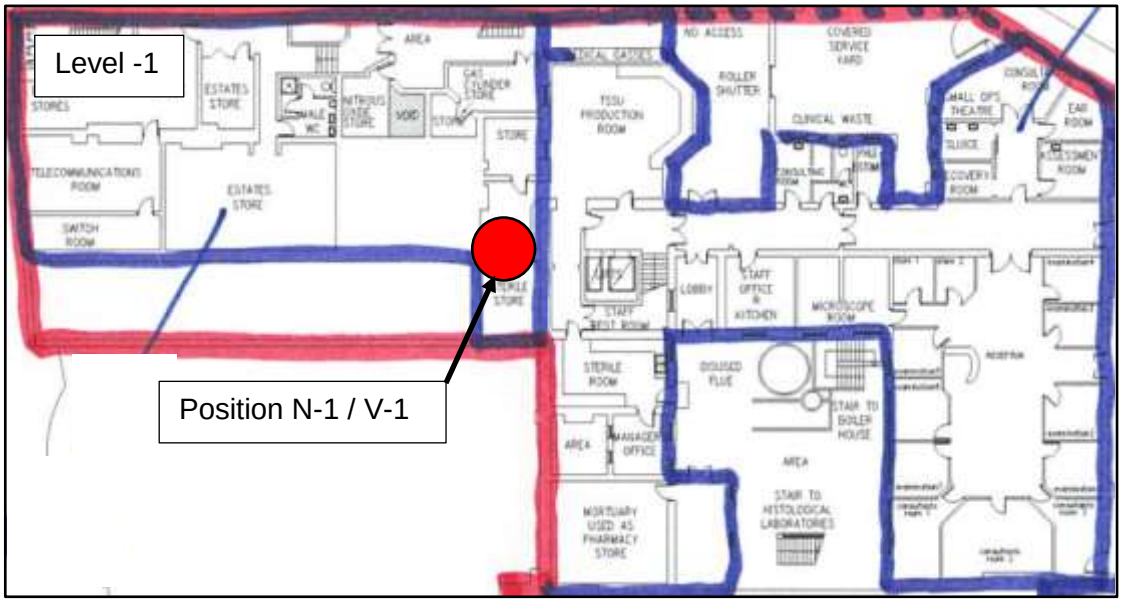
3.4 Measurement Positions

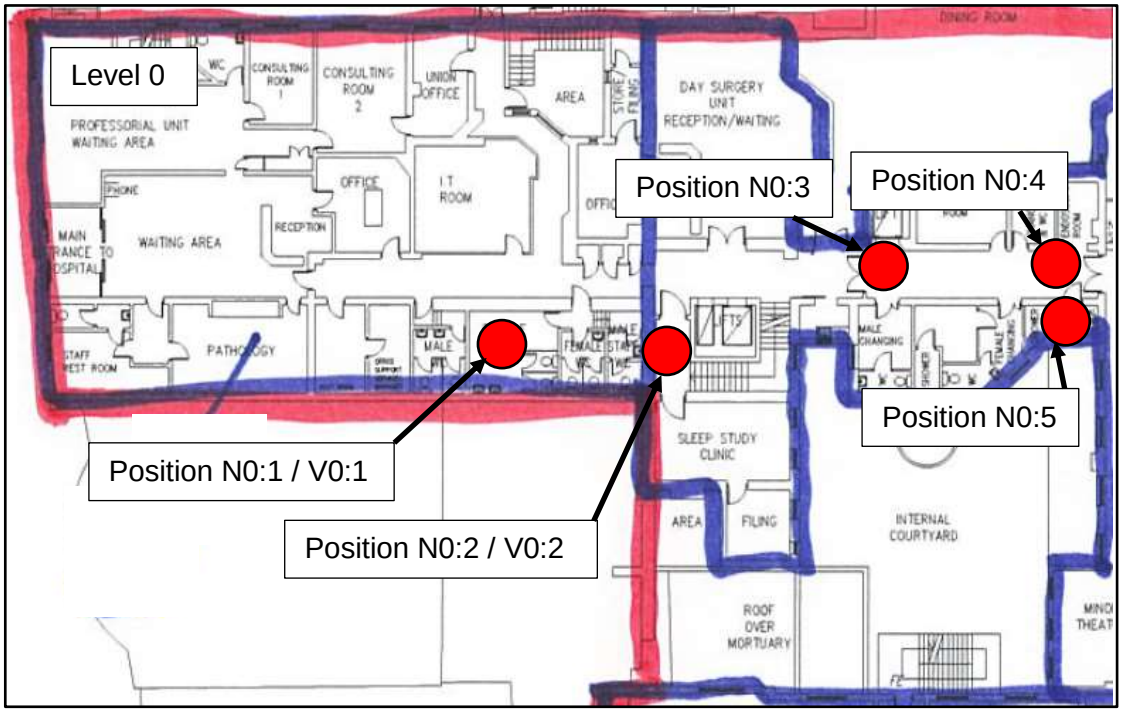
In order to measure external noise levels, an unmanned sound level meter was set up in the third floor bedroom (location of closest proposed 3rd floor guestroom to The Water Rats) with a microphone mounted to a pole and located at 1m from the façade externally, as shown below.

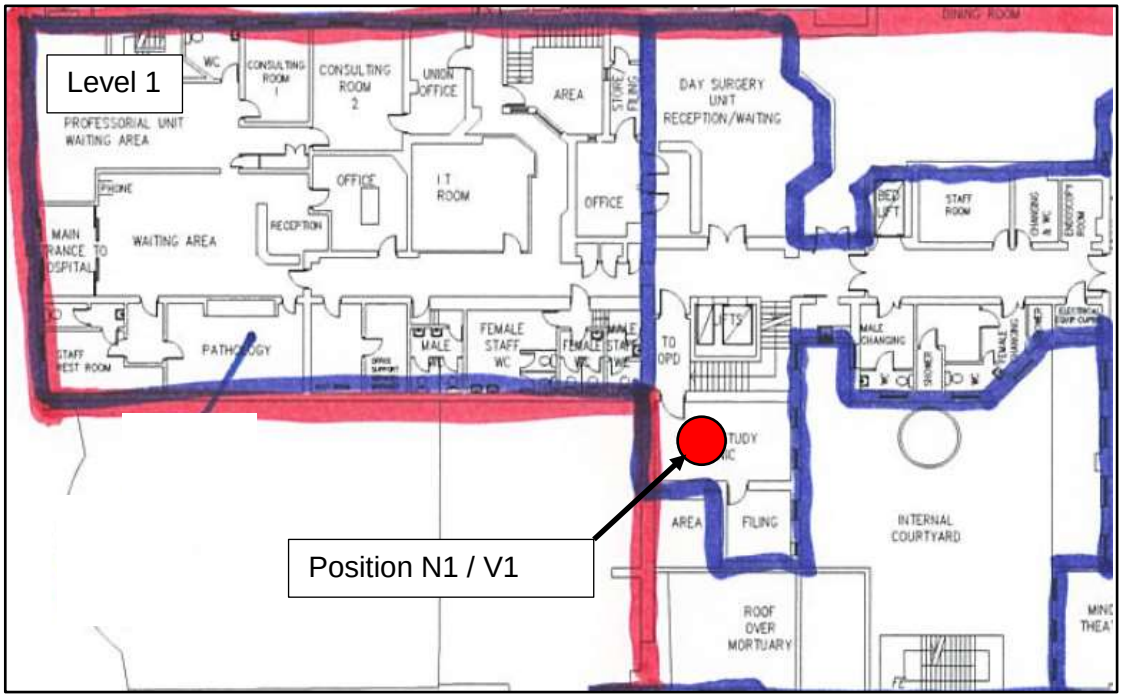


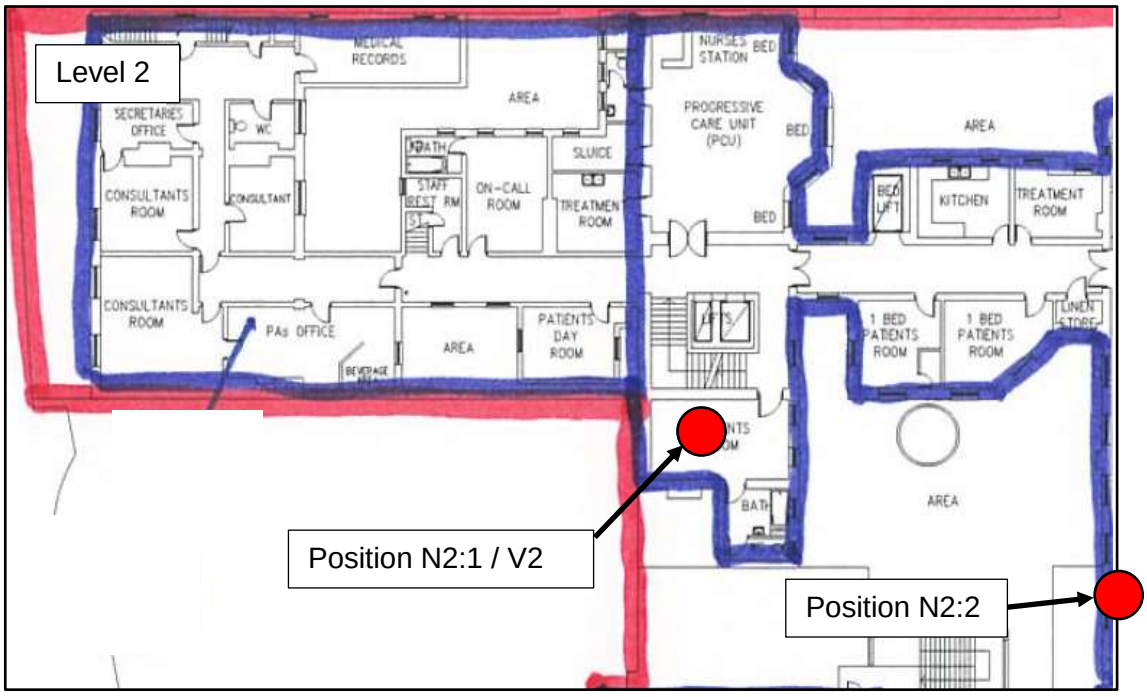
Site Plan © Google 2021

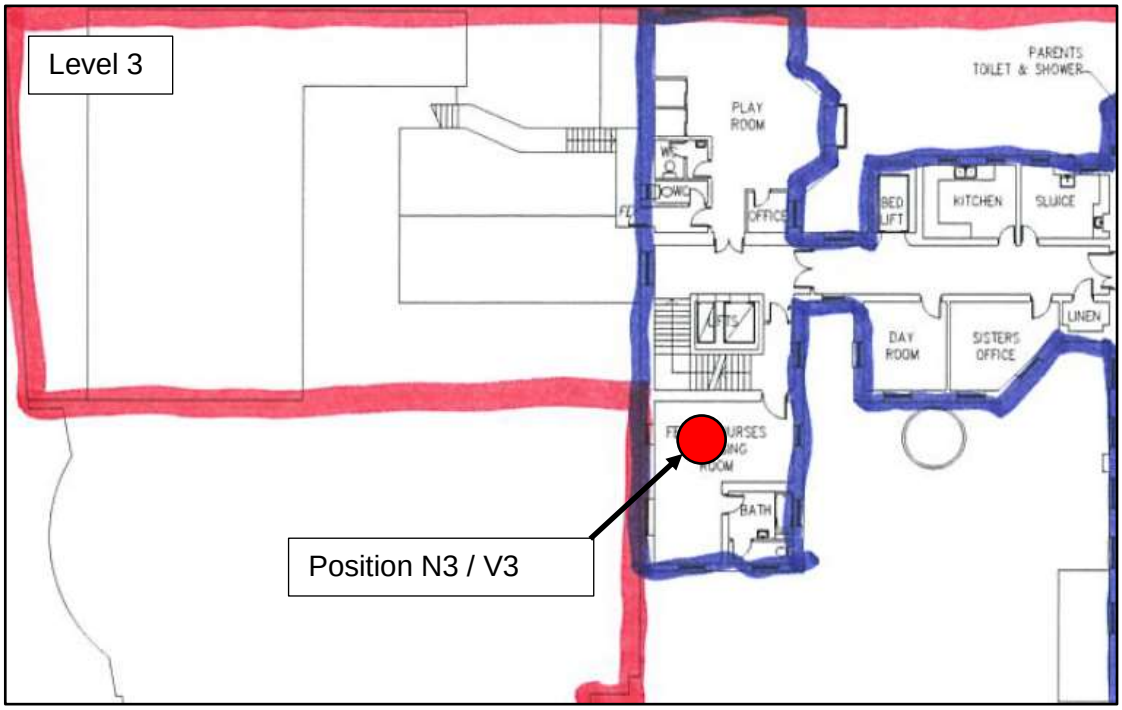
In addition, internal noise and vibration levels were measured at various locations on each floor between the basement and 4th floor level, as shown on the plans below.

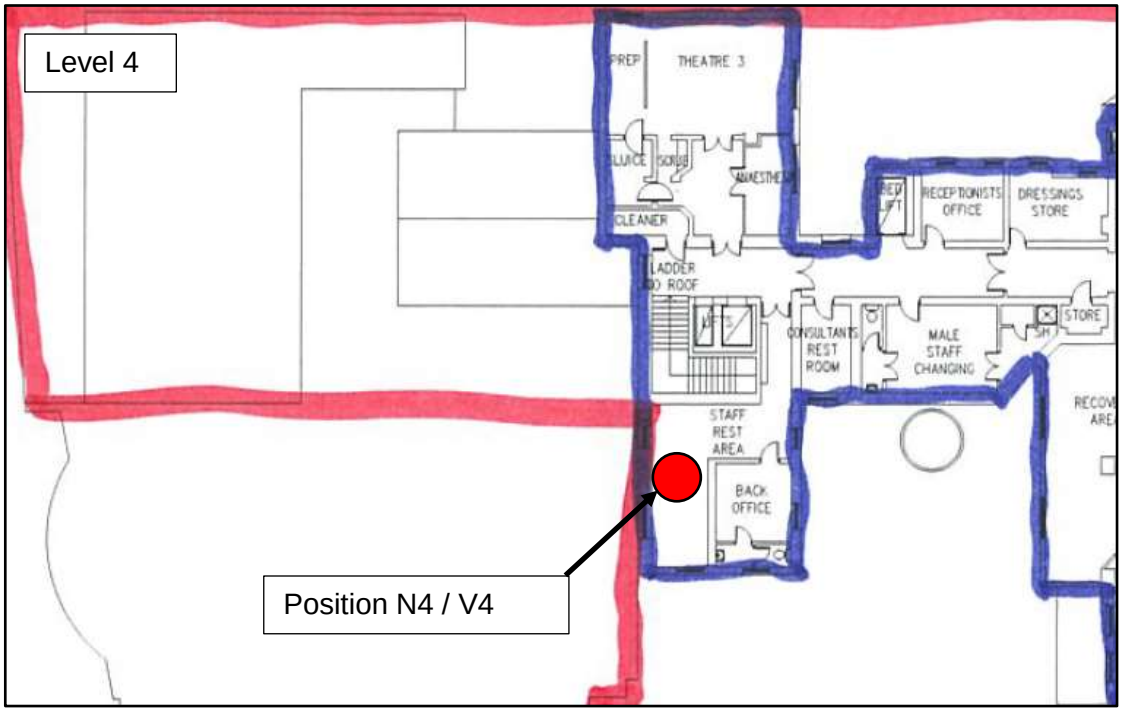

Level -1
Position N-1 / V-1


Level 0
Position N0:3
Position N0:4
Position N0:5
Position N0:1 / V0:1
Position N0:2 / V0:2


Level 1
Position N1 / V1
PROFESSORIAL UNIT WAITING AREA
CONSULTING ROOM 1
CONSULTING ROOM 2
UNION OFFICE
AREA
DAY SURGERY UNIT RECEPTION/WAITING
OFFICE
I T ROOM
OFFICE
PHONE
RECEPTION
WAITING AREA
MAIN ENTRANCE TO HOSPITAL
STAFF REST ROOM
PATHOLOGY
MALE
FEMALE STAFF WC
TO OPD
STAFF ROOM
MALE CHANGING
AREA
FILING
INTERNAL COURTYARD
ROOF OVER MORTUARY


Level 2
Position N2:1 / V2
Position N2:2
MEDICAL RECORDS
AREA
NURSES STATION
SECRETARIES OFFICE
WC
PROGRESSIVE CARE UNIT (PCU)
BED
AREA
CONSULTANTS ROOM
CONSULTANT
STAFF REST RM
ON-CALL ROOM
SLUICE
TREATMENT ROOM
KITCHEN
TREATMENT ROOM
CONSULTANTS ROOM
PAs OFFICE
AREA
PATIENTS DAY ROOM
1 BED PATIENTS ROOM
1 BED PATIENTS ROOM
AREA





For the noise measurements L_{Aeq}, L_{Afmax}, L_{A90} noise levels were measured along with octave band L_{eq} and L_{fmax} noise levels in the frequency range 63Hz-8kHz. For the vibration measurements Vibration Dose Value (VDV), and peak weighted acceleration were measured along with rms acceleration in 1/3rd octave bands from 1Hz-800Hz.

4.0 Results

4.1 Noise

4.1.1 Unmanned External Noise Measurements

The results of the unmanned external noise monitoring are presented in the attached time history graphs 26609/TH1-26609TH2 presenting the L_{Aeq}, L_{max}, and L_{90} noise levels and also the L_{eq} noise levels in the 63Hz, 125Hz, and 250Hz octave bands.

The lowest measured external background L_{90} noise level during the survey was 50dBA.

The measured external L_{eq} noise level due to The Water Rats roof plant (corrected for background) was 66dBA.

The highest measured $L_{eq,30s}$ music noise level (corrected for background) was 53dBA, comprising 78dB and 62dB in the 63Hz and 125Hz octave bands respectively. The other frequency bands were not measurable above the background.

4.1.2 Manned Noise Measurements

The results of the manned music noise measurements are presented in the table below:

Ref.	Position	Position Detail	Description	L_{eq} Sound Pressure Level (dB re2*10^{-5}Pa) at Octave Band Centre Frequency (Hz)								dBA
				63	125	250	500	1k	2k	4k	8k	
8	N3	Outside window	Background	64	58	53	51	50	49	43	31	55
25			Music	73	60	54	49	47	41	34	23	53
9	N3	Windows open	Background	50	46	41	38	36	30	22	13	41
26			Music	60	46	41	37	36	30	21	13	41
10	N3	Windows open, standing further back	Background	46	40	34	31	28	26	17	12	34
27			Music	53	42	35	29	26	22	15	12	33
5	N4	Windows closed	Background	49	39	35	32	31	25	20	17	35
28			Music	57	44	38	34	33	24	15	13	38
7	N4	Outside window	Background	64	59	56	52	51	47	38	25	55
29			Music	73	62	56	52	51	47	39	25	56
6	N4	Windows open	Background	51	53	57	47	43	38	30	20	50
30			Music	55	50	46	41	42	36	25	14	45
11	N2:1	No windows facing The Water Rats	Background	45	36	31	24	19	15	12	11	27
31			Music	63	50	38	30	25	21	16	13	38
12	N1	No windows facing The Water Rats	Background	43	38	30	25	23	18	14	13	29
34			Music	66	54	38	27	27	19	15	12	42
13	N0:2	No windows	Background	42	54	37	33	27	29	19	15	39
35			Music	69	58	43	30	36	34	26	18	46
41	N0:1	No windows	Background	42	37	27	24	18	16	13	12	27
38			Music	85	71	54	44	41	39	29	17	58

Ref.	Position	Position Detail	Description	L_{eq} Sound Pressure Level (dB re2*10^{-5}Pa) at Octave Band Centre Frequency (Hz)								dBA
				63	125	250	500	1k	2k	4k	8k	
14	N-1	No windows	Background	47	40	33	31	23	19	16	19	32
39			Music	63	49	38	28	23	20	17	18	38
51	N0:3	No windows	Background	39	38	42	33	26	25	15	11	37
42			Music	49	45	39	31	25	24	15	12	35
52	N0:4	No windows	Background	42	42	40	32	30	27	18	11	37
43			Music	43	41	40	31	32	26	18	12	37
53	N0:5	No windows	Background	43	39	37	30	25	22	13	11	33
44			Music	46	43	37	33	26	24	17	13	35

The results of the manned plant noise measurements are presented in the table below:

Ref.	Position	Position Detail	Description	L_{eq} Sound Pressure Level (dB re2*10^{-5}Pa) at Octave Band Centre Frequency (Hz)								dBA
				63	125	250	500	1k	2k	4k	8k	
2	N2:2	Outside window	Background	60	56	52	49	47	41	33	20	51
18			Plant	63	60	64	54	55	50	48	41	60
3	N2:2	Windows closed	Background	48	43	43	36	32	29	21	13	39
17			Plant	50	47	46	38	38	36	31	20	44
7	N4	Outside window	Background	64	59	56	52	51	47	38	25	55
19			Plant	66	65	68	58	60	57	54	49	65
6	N4	Windows open	Background	51	53	57	47	43	38	30	20	50
20			Plant	49	50	54	48	50	45	43	37	54
5	N4	Windows closed	Background	49	39	35	32	31	25	20	17	35
21			Plant	48	42	42	37	37	29	25	17	40
8	N3	Outside window	Background	64	58	53	51	50	49	43	31	55
22			Plant	68	69	67	59	63	58	57	53	67
9	N3	Windows open	Background	50	46	41	38	36	30	22	13	41
23			Plant	53	54	51	46	48	42	41	35	52
10	N3	Windows open, standing further back	Background	46	40	34	31	28	26	17	12	34
24			Plant	50	46	44	39	38	34	31	25	43

4.2 Vibration

The measured vertical 1/3rd octave band rms acceleration is presented in the attached graphs 26609/WR/VG1 - 26609/WR/VG4.

The measured vibration dose values (VDV) and vertical peak Wb weighted acceleration are presented in the tables below for positions that correspond to the closest proposed future hotel rooms on levels 1-4:

Floor Level	Measured VDV ($mm/s^{1.75}$)	
	Background (Music Off)	Music On
1	0.004	0.016
2	0.005	0.023
3	0.003	0.008
4	0.004	0.010

Floor Level	Maximum measured Peak Wb (mm/s^2)	
	Background (Music Off)	Music On
1	0.007	0.016
2	0.007	0.029
3	0.008	0.01
4	0.005	0.012

5.0 Assessment & Discussion

5.1 Plant Noise

We have undertaken a BS4142 assessment of the noise impact of the roof plant associated with The Water Rats, which we understand comprises a kitchen extract fan, another fan and some condenser units. The results of the assessment are presented in the table below:

Description	Sound Level (dBA)
Roof plant, measured at 1m from a 3rd floor window of 330 Grays Inn Road (proposed future hotel room location)	66
Tonality Correction	6
Rating Level	72
Background LA90	50
Excess of Rating Level over Background	22
Outcome of Assessment	Significant Adverse Impact

The assessed noise impact of the existing roof plant is ‘significant adverse impact’ and mitigation measures are therefore required.

However, the developer is willing to offer to install the necessary mitigation measures to the plant as part of the scheme in order to reduce the noise impact both to the scheme itself and also to the surrounding area.

In order to reduce the assessed outcome from ‘Significant Adverse Impact’ to ‘low impact’ at the guestroom windows noise emissions from the existing plant would need to be reduced by at least 22dBA. By comparison, were this to be a new item of plant seeking planning permission,

we understand Camden's planning requirement would be for noise levels to be 15dBA below background if tonal. In order for the existing plant to also meet this at the proposed hotel windows, noise levels would need to be reduced by around 31dBA. We would therefore recommend that mitigation measures aim to reduce noise levels from the plant by 31dBA if practicably possible. If this is not possible due to the existing nature of the plant then mitigation should achieve the greatest reduction possible, not less than 22dBA.

Potential options for mitigation include ensuring the plant is in a good state of repair and operating at the correct duty, and installation of suitably specified attenuation measures such as acoustic enclosures, acoustic lagging, and in-duct acoustic attenuators.

5.2 Music Noise

Graph 26609/TH2 shows that music noise was present externally at low frequencies, especially in the 63Hz octave band. However high levels of music noise intrusion were also measured in rooms which had no exposed facade overlooking the water rats, and the measured level of music noise at 63Hz on level 4 did not decrease when the windows were closed. In addition graphs 26609/WR/VG1-26609/WR/VG4 show elevated levels of vibration centred around the 50Hz and 63Hz 1/3rd octave bands, even for rooms not next to the party wall. Together these results indicate that as well as external noise ingress through the windows/façade and through the party wall there is likely to be a considerable component of structureborne transmission i.e. vibration travelling through the structure before being re-radiated inside the rooms as noise.

5.2.1 Airborne Noise Intrusion through the Facade

The maximum external measured $L_{eq,30s}$ music noise levels at 63Hz and 125Hz, corrected for background where necessary are as follows (external music noise was not measurable above background in the other frequency bands):

Measured External Music Noise Levels (dB re $2x10^{-5}$Pa at Octave Band Centre Frequency	
63Hz	**125Hz**
78	62

The maximum practicable mitigation proposed by the scheme is as follows:

- 350mm thick masonry façade providing a sound reduction index (SRI) of at least 37dB in the 63Hz octave band.

- Windows to comprise no more than approximately 42% of the façade area.

- Windows to be high spec acoustic laminated secondary glazing providing an SRI of at least 29dB in the 63Hz octave band. This is likely to be at the very limit of what can be achieved with secondary glazing.

Based on the above, calculated internal airborne noise levels using our in-house external building fabric software, assuming typical absorption coefficients for a bedroom (0.1 at 63Hz), are as follows:

Approximate Worst Case Internal Airborne Music Noise (dB re $2x10^{-5}$ Pa) at Octave Band Centre Frequency	
63Hz	125Hz
52	26

However, the calculations indicate that internal noise levels at low frequencies may be reduced by up to 5dB if a significant quantity of sound absorption is included as part of the guestroom finishes, for example a highly absorbent acoustic ceiling comprising a 100mm thick mineral wool backing. Revised calculations based an average absorption coefficient of 0.3 at 63Hz, are as follows:

Approximate Worst Case Internal Airborne Music Noise (dB re $2x10^{-5}$ Pa) at Octave Band Centre Frequency	
63Hz	125Hz
47	24

The above noise levels are 5dB above and 12dB below the definition of inaudibility set out in Section 2.4.1 at 63Hz and 125Hz respectively. However on the basis that this level at 63Hz corresponds to the value of the NANR45 criterion curve (converted to octave bands at 63Hz), and that it corresponds to a Noise Rating/Noise Criterion of NR/NC15, this is likely to represent levels of low frequency sound which, if audible, should be perceived to be very low in level and may therefore be acceptable given the context.

By comparison, the above predicted level (NC15) is far below the typical requirements of hotel operators for environmental noise intrusion. A recent hotel scheme we have worked on had the following requirement:

"In locations with noisy environments windows should limit noise transmission to NC30 inside the room."

Given the onerous level of mitigation described above, proposals to investigate the possibility of reducing the noise at source are discussed in Section 6.2. Further work will therefore be undertaken during the design stage.

5.2.2 Structureborne Noise

The measured internal music noise levels, corrected for background are presented in the table below. Windows where present were closed, and although there is likely to be some contribution from airborne noise, especially adjacent to the party wall (Position N0:1) it is likely that a considerable component to these levels is structureborne. Note that music noise at positions N0:4 and N0:5 was not considered to be reliably measurable over the existing background.

Position	Music Noise L_{eq} Sound Pressure Level (dB re $2x10^{-5}$Pa) at Octave Band Centre Frequency (Hz) (Corrected for Background)								dBA	NR
	63	125	250	500	1k	2k	4k	8k		
N4	57	43	35	-	-	-	-	-	33	27
N2:1	63	50	37	29	23	19	14	-	39	36
N1	66	54	37	-	24	-	-	-	42	39
N0:2	69	55	41	-	35	32	25	16	45	42
N0:1	85	71	54	44	41	39	29	15	60	62
N-1	63	49	36	-	-	-	-	-	38	34
N0:3	49	44	-	-	-	-	-	-	29	25
N0:4	-	-	-	-	-	-	-	-	-	-
N0:5	-	-	-	-	-	-	-	-	-	-

- Not reliably measurable over the existing background noise climate

The following table shows the exceedances of the above levels over the proposed audibility criterion curve presented in Section 2.1.1.

Position	Exceedance over Proposed Criterion Curve (dB) at Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Criterion Curve	42	36	25	19	15	9	10	13
N4	15	7	10	-	-	-	-	-
N2:1	21	14	12	10	8	10	4	-
N1	24	18	12	-	9	-	-	-
N0:2	27	19	16		20	23	15	3
N0:1	43	35	29	25	26	30	19	2
N-1	21	13	11	-	-	-	-	-
N0:3	7	8		-	-	-	-	-

Based on our understanding of the scheme and the above, the worst case future proposed hotel guestroom location corresponds to Position N1 at first floor level. Positions N0:1 and N0:2

correspond to a future corridor, but are a similar distance from the party wall to the proposed restaurant.

The proposed inaudibility criterion curve presented in Section 2.1.1 applies to guestrooms where hotel guests relax and sleep, but not to the restaurant where low levels of noise intrusion may be acceptable, depending on the requirements of the operator; for example this could be masked by background music played in the restaurant itself.

Therefore, we would recommend that as a minimum the design incorporates mitigation measures capable of reducing structureborne noise transfer between The Water Rats and 330 Grays Inn Road by at least 24dB in the 63Hz octave band. Mitigation measures are discussed in Section 6.1.

5.3 Vibration

The vibration results show that vibration is measurable above the background inside 330 Grays Inn Road when music is playing in The Water Rats. The maximum measured peak Wb weighted acceleration suggests that some tactile vibration may just be perceivable in some of the rooms in the absence of mitigation measures.

However, based on the measured VDVs at each position representative of the future worst case hotel room locations, and the pessimistic assumption of music events playing continuously at the measured levels for 4No. hours during the daytime (07:00-23:00hours) and 4No. hours during the night-time (23:00-07:00hours), the following VDVs have been calculated:

Floor Level	Calculated VDV ($mm/s^{1.75}$)	
	Daytime (07:00-23:00 hours)	Night-time (23:00-07:00 hours)
1	0.05	0.05
2	0.08	0.08
3	0.03	0.03
4	0.03	0.03

Even in the absence of mitigation measures, the above VDVs are below the range associated with ‘low probability of adverse comment’. Therefore whilst low levels of vibration may just be perceptible, tactile vibration is unlikely to be cause for concern.

6.0 Mitigation Measures

6.1 Structureborne Noise

The majority of 330 Grays Inn Road is to be demolished, with only the front of the building (which is not proposed to contain hotel rooms) to be retained. This enables mitigation measures in the form of structural separation and isolation (if required) to be incorporated into the scheme in order to achieve the reduction stated in Section 5.2.1 above.

The levels of structureborne noise and vibration presented herein were measured in the existing building at 330 Grays Inn Road. The level of structural connection between this existing building and The Water Rats is currently unknown and the extent of the works required to achieve this reduction will need to be determined at the design stage. However as a worst case the proposals have allowed for a new building which is structurally separate from both the water rats and the retained portion of 330 Grays Inn Road, and is isolated from the ground and surrounding buildings with suitably specified resilient bearings. Isolation may be omitted if further work determines it not to be required.

It may also be possible to partially reduce the structureborne transfer at source by providing suitably specified resilient mountings for the Water Rats sound system, specifically the Sub-woofers (large loudspeakers which generate the low frequencies). These are currently supported directly on the floor of the venue, and it may be possible to provide some level of reduction in structure borne noise transmission if they are isolated.

6.2 Airborne Noise Intrusion Through Facade

The indicative requirements for the façade overlooking The Water Rats based on the measured levels of music noise are presented in Section 5.2.1. These are onerous and it would be prudent to investigate if there is a way to reduce the levels of music noise incident upon the façade.

The dominant airborne noise transfer path out of The Water Rats music venue to atmosphere is not currently known. There is a large rooflight in the building above the first floor which could potentially be a weak point although the music venue is on the ground floor and the dominant transfer path is therefore not immediately obvious.

The developer would therefore like to offer an acoustic survey to The Water Rats with a view to providing it with improved external sound insulation if it is determined that a significant reduction in music noise emissions can be practicably achieved. This could potentially also benefit other nearby noise sensitive uses.

If external music noise levels can be reduced in this way, then the sound insulation requirements of the hotel façade may be reduced accordingly. The façade design will therefore be refined during the detailed design stage.

6.3 Airborne Noise Intrusion Through Party Wall

The structural decoupling discussed in Section 6.1 also provides an opportunity to redesign the party wall of the new portion of the building and associated flanking constructions to maximise the sound insulation performance. We would recommend that opening up works be undertaken on a section of the party wall to investigate the current construction of the 330 Grays Inn Road side of the wall in order to inform the design.

It is likely that increased sound insulation performance may be possible between The Water Rats and the new portion of the building (containing the guestrooms) by decoupling the two sides of the wall, by introducing an insulation filled cavity as large as is practicable, and by building the new 330 Grays Inn Road side of the party wall with a greater mass and thickness to that currently present, possibly with the introduction of further cavities.

7.0 Planning Conditions

The indicative planning stage mitigation proposals for dealing with music noise and vibration transfer from The Water Rats have been discussed herein in order to demonstrate that the site can be suitable for use as a hotel without affecting the operation of the The Water Rats. As discussed herein further work shall be undertaken during the design stage to develop these mitigation measures and Camden may expect to be provided with details of the final sound insulation and isolation treatments when available in order to protect the existing and historic use of The Water Rats as a live music venue. Therefore in granting consent it would be appropriate for a planning condition to be imposed along the following lines (based on the example condition 1 drawn from PPG24):

“Construction work shall not begin until a scheme for protecting the proposed hotel from both structureborne and airborne music noise from the Water Rats has been submitted to and approved by the local planning authority; all works which form part of the scheme shall be completed before any part of the Hotel is occupied.”

8.0 Conclusions

Hann Tucker visited site on 19 February 2021 in order to undertake noise and vibration measurements of existing noise and vibration transfer from The Water Rats public house.

Music was played through the PA system inside The Water Rats music venue including a live drummer playing to recorded music, in order to simulate the sound levels present during a typical event. Noise measurements were made externally overlooking the rear of The Water Rats, and noise and vibration measurements were made inside 330 Grays Inn Road to determine the current levels of music noise/vibration intrusion.

Assessments of structureborne music noise intrusion have been undertaken based on the measured noise levels and it has been determined that significant mitigation measures are required to achieve suitable noise levels inside guestrooms during music performances. The indicative proposals for such mitigation measures are described herein.

Assessments of external airborne music noise intrusion through the facade have been undertaken based on the measured noise levels and it has been determined that significant mitigation measures are required to achieve suitable noise levels inside guestrooms during music performances. The developer proposes to offer an acoustic survey of The Water Rats with a view to providing improved sound insulation if it is determined that a significant reduction in music noise emissions can be practicably achieved. The final requirements for the façade will depend on the outcome of this but worst case indicative façade proposals are described herein.

The results of the vibration assessment indicate that whilst vibration may just be perceptible in some areas, tactile vibration is unlikely to be cause for concern. In addition, the proposed work to reduce structureborne noise should reduce levels of tactile vibration further.

The roof plant associated with The Water Rats was also measured and an assessment has been undertaken. The results of the assessment show that mitigation measures to the plant are required, which the developer proposes to provide.

The Local Authority will likely wish to impose planning conditions to protect The Water Rats. A suggested condition for discussion with the Local Authority is included herein.

Yours sincerely

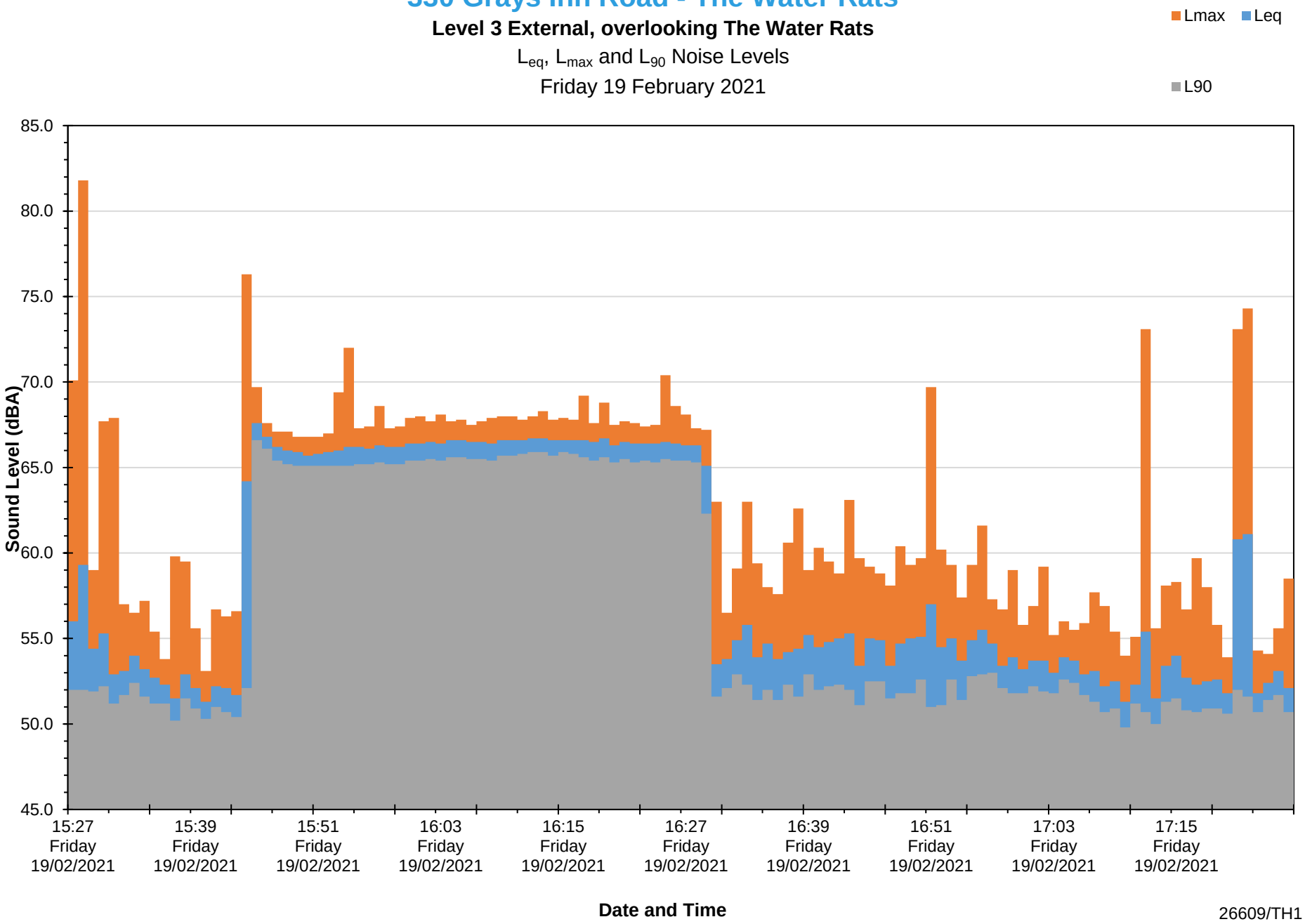
Luke Rendell
for HANN TUCKER ASSOCIATES

330 Grays Inn Road - The Water Rats

Level 3 External, overlooking The Water Rats

L_{eq}, L_{max} and L_{90} Noise Levels

Friday 19 February 2021



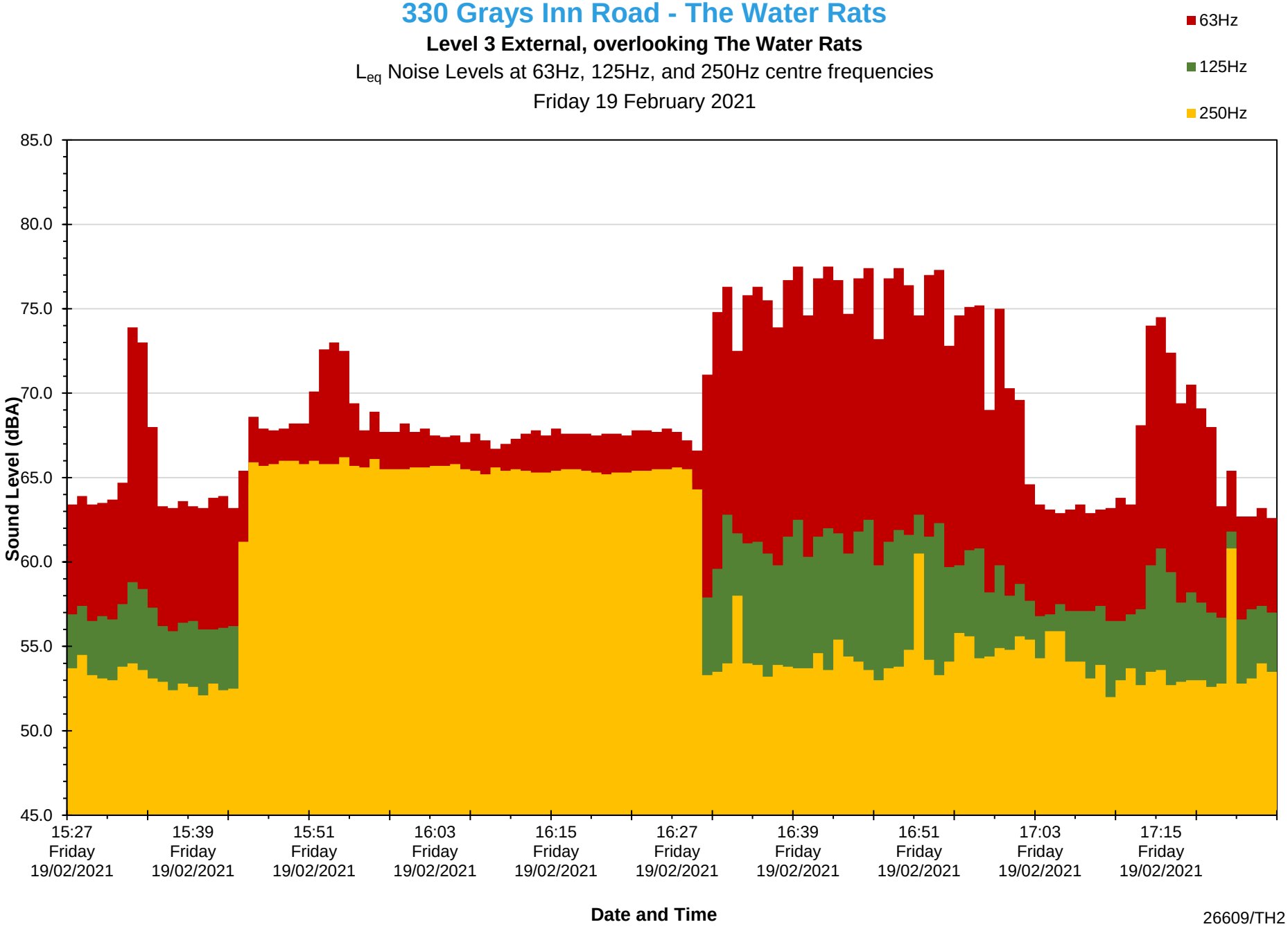
26609/TH1

330 Grays Inn Road - The Water Rats

Level 3 External, overlooking The Water Rats

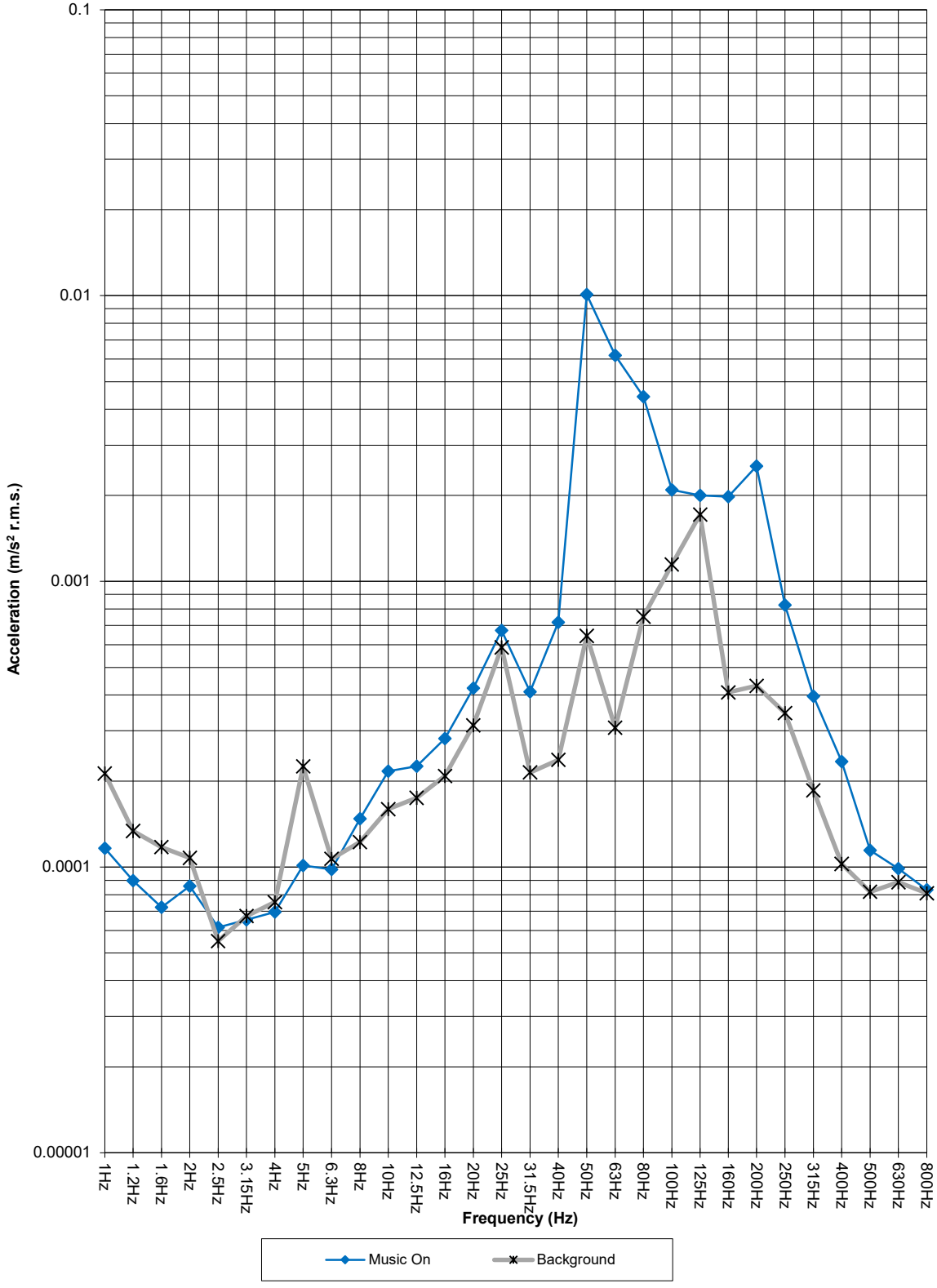
L_{eq} Noise Levels at 63Hz, 125Hz, and 250Hz centre frequencies

Friday 19 February 2021

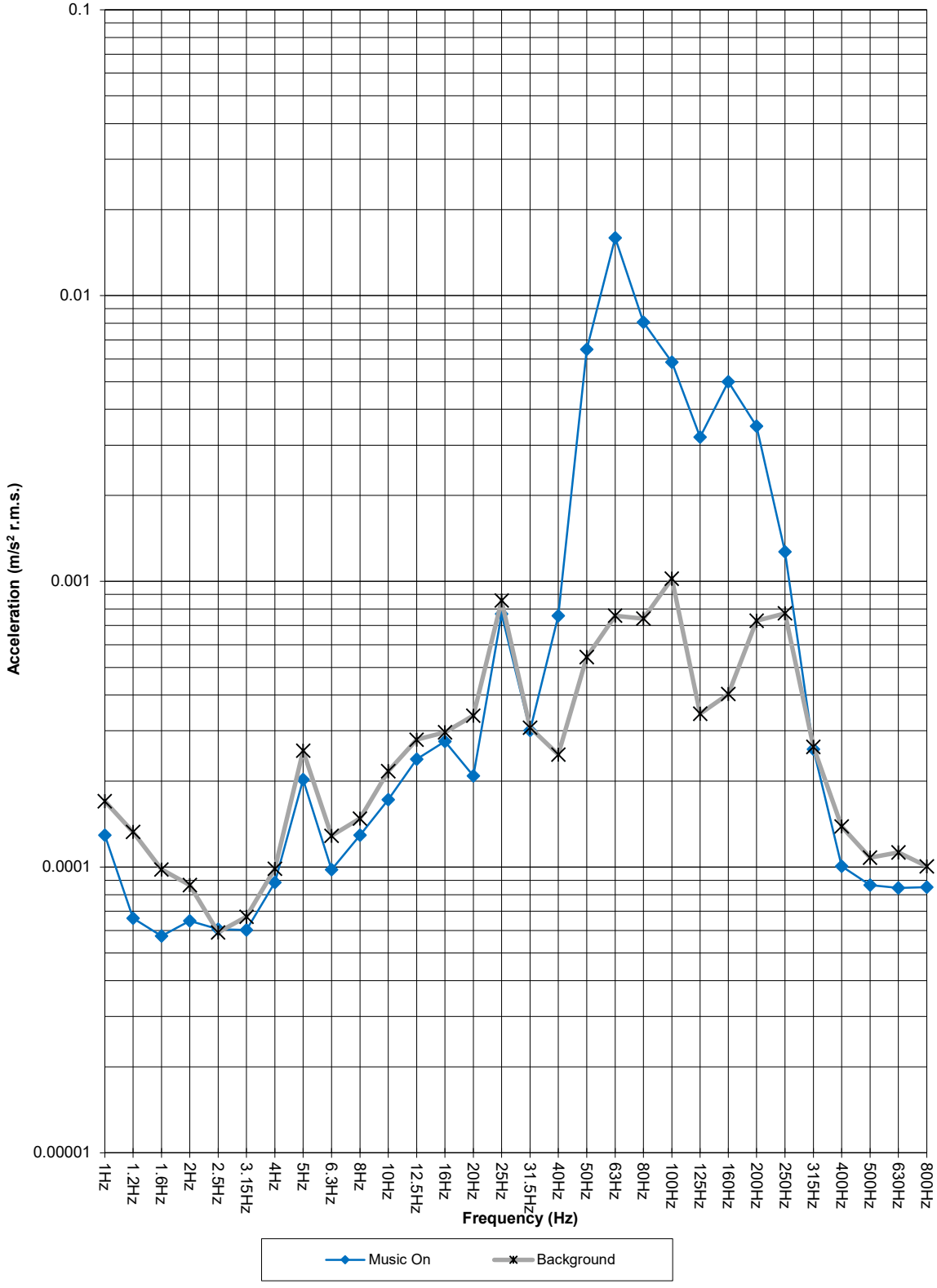


26609/TH2

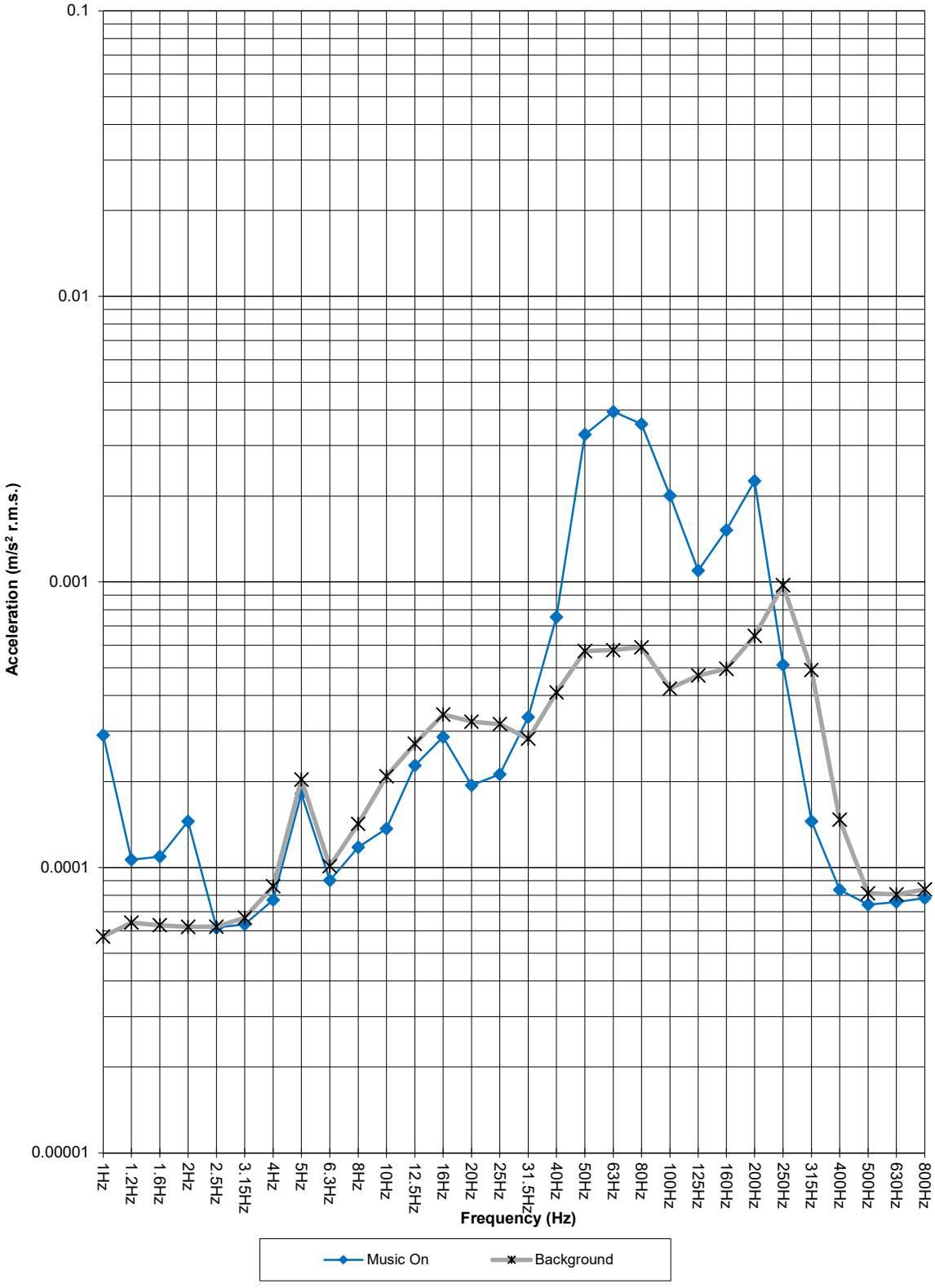
330 Grays Inn Road
Vibration Measurements (Vertical)
Level 1
19 February 2021



330 Grays Inn Road
Vibration Measurements (Vertical)
Level 2
19 February 2021



330 Grays Inn Road
Vibration Measurements (Vertical)
Level 3
19 February 2021



330 Grays Inn Road
Vibration Measurements (Vertical)
Level 4
19 February 2021