Noise Impact Assessment for Francis Crick Institute L2 and L5 Terraces, London

For Francis Crick Institute

Quality Management

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Date of Issue	04/01/2022	**Report Number**	JAJ02432–REPT–01–R1

Revision History

Rev	Date	Status	Reason for revision	Comments
0	04/11/2021	Draft	-	Draft for comment
1	04/01/2022	Issue	Update according to comments	

QA of Data processing, Calculations and/or Models

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1 Introduction

1.1 RPS Acoustics Team (RPS) has been commissioned to undertake a noise impact assessment to support the planning application for the creation of an amenity area at Level 5, of the Francis Crick Institute (FCI), Midland Road, London, NW1 1DF. The proposals relate to the flat roof area located at Level 5 in the north-eastern quarter of the Francis Crick building, fronting Midland Road. The development is located within the administrative area of the London Borough of Camden (LBC).

1.2 Level 2 in the south-western quarter of the FCI building, above the rear entrance to the FCI, was laid out as part of the original application as a potential amenity area. This noise impact assessment also considers any potential impacts associated with the use of this area.

1.3 A desktop study has been undertaken to identify the nearest noise sensitive receptors (NSRs) at the proposed development.

1.4 Consultation has been undertaken with LBC to agree the baseline sound level monitoring and assessment methodology for the proposed amenity area.

1.5 An environmental baseline sound survey was undertaken at locations representative of the NSRs at the vicinity of the proposed amenity area to establish the baseline conditions on and around the site and the representative background noise levels at the NSRs.

1.6 A 3D noise model was built to predict noise emissions from the proposed amenity area to the NSRs.

1.7 The predicted noise emission levels at the NSRs were assessed against the relevant criteria for entertainment noise as given in the Camden Local Plan.

1.8 This report presents the identified nearest NSRs as agreed with LBC, the results of the baseline environmental noise survey and the outcome of the entertainment noise assessment.

1.9 The assessment has been undertaken based upon appropriate information on the proposed development provided by the project team. RPS is a member of the Association of Noise Consultants (ANC), the representative body for acoustics consultancies, having demonstrated the necessary professional and technical competence. The assessment has been undertaken with integrity, objectivity and honesty in accordance with the Code of Conduct of the Institute of Acoustics (IOA) and ethically, professionally and lawfully in accordance with the Code of Ethics of the ANC.

1.10 The technical content of this assessment has been provided by RPS personnel, all of whom are corporate (MIOA) or non-corporate, associate members (AMIOA) of the IOA (the UK's professional body for those working in acoustics, noise and vibration). This report has been peer

reviewed within the RPS team to ensure that it is technically robust and meets the requirements of our Quality Management System.

2 Assessment Methodology, Policy, Standards and Guidance

National Planning Policy

National Planning Policy Framework

2.1 The National Planning Policy Framework (NPPF) [1] sets out the Government's planning policies for England and how these are expected to be applied. The emphasis of the Framework is to allow development to proceed where it can be demonstrated to be sustainable. In relation to noise, Paragraph 185 of the Framework states:

"Planning policies and decisions should ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from the development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and

c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.'

2.2 The point 'a)' refers to 'significant adverse impacts' which relates to the 'significant observed adverse effect level' (SOAEL) in the Noise Policy Statement for England (NPSE), although the term 'effect' is used instead of the term 'impact'. However, these have been deemed to be interchangeable in this context. Therefore, given the comments above on the NPSE with regard to assessment methods and criteria, the current content of the NPPF does not require any change in previously adopted approaches.

Noise Policy Statement for England

2.3 The Noise Policy Statement for England (NPSE) [2], published in March 2010 by Defra, aims to provide clarity regarding current policies and practices to enable noise management decisions to be made within the wider context, at the most appropriate level, in a cost-effective manner and in a timely fashion.

2.4 Paragraph 1.6 of the NPSE sets out the long-term vision and aims of Government noise policy:

"Noise Policy Vision

Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development."

"Noise Policy Aims

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life."*

2.5 The aims require that all reasonable steps should be taken to avoid, mitigate and minimise adverse effects on health and quality of life whilst also taking into account the guiding principles of sustainable development, which include social, economic, environmental and health considerations.

2.6 With regard to the terms 'significant adverse' and 'adverse' included in the 'Noise Policy Aims', these are explained further in the 'Explanatory Note' as relating to established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation which are:

'NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on human health and quality of life due to noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.'

2.7 Defra has then extended these concepts for the purpose of the NPSE to introduce the concept of:

'SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.'

2.8 The accompanying explanation states:

'It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL

values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available'.

2.9 With regard to 'further evidence', Defra has commissioned research to try and identify the levels at which the above effects occur. However, this research has been largely inconclusive and varies with source. On this basis, and until further guidance becomes available, and given that there is no specific guidance in the NPPF on noise, there is no justification to vary assessment methods and criteria from those previously adopted from British Standards etc.

Planning Practice Guidance - Noise (PPGN)

2.10 The Government has published Planning Practice Guidance on a range of subjects including noise [3]. The guidance forms part of the NPPF and provides advice on how to deliver its policies. The PPGN reiterates general guidance on noise policy and assessment methods provided in the NPPF, NPSE and British Standards (BSs) and contains examples of acoustic environments commensurate with various effect levels. Paragraph 006 of the PPGN explains that:

'The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation.'

2.11 The PPGN provides a relationship between various perceptions of noise, effect level and required action in accordance with the NPPF. This is reproduced in Table 2.1 below.

Table 2.1 Noise Exposure Hierarchy Based on the Likely Average Response

Response	Examples of outcomes	Increasing effect level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum

Response	Examples of outcomes	Increasing effect level	Action
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

2.12 The PPGN describes sound that is not noticeable to be at levels below the NOEL. It describes exposures that are noticeable but not to the extent there is a perceived change in quality of life as below the LOAEL and need no mitigation. With reference to the definition of noise in the NPSE, such immissions are ‘sound’ and not ‘noise’. On this basis, the audibility of sound from a development is not, in itself, a criterion to judge noise effects that is commensurate with national planning policy.

2.13 The PPGN suggests that noise exposures above the LOAEL cause small changes in behaviour. Examples of noise exposures above the LOAEL provided in the PPGN is having to turn up the volume on the television; needing to speak more loudly to be heard; where there is no alternative ventilation, closing windows for some of the time because of the noise; or, a potential for some reported sleep disturbance. In line with the NPPF and NPSE, the PPGN states that consideration needs to be given to mitigating and minimising effects above the LOAEL but taking account of the economic and social benefits being derived from the activity causing the noise.

2.14 The PPGN suggests that noise exposures above the SOAEL cause material changes in behaviour. Examples of noise exposures above the SOAEL provided in the PPGN are, where there is no alternative ventilation, keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present; and/or there is a potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. In line with the NPPF and NPSE, the PPGN states that effects above the SOAEL should be avoided and that whilst the economic and social benefits being derived from the activity causing the noise must be taken into account, such exposures are undesirable.

2.15 The PPGN suggests that a noise impact may be partially offset if the residents of affected dwellings have access to a relatively quiet part of their dwelling, private external amenity area and/or external public or private amenity space nearby.

Guidelines for Pub Noise and Assessment Method

2.16 Currently there are no formal or national guidelines or standards for assessing or controlling entertainment noise from pubs and clubs. However, guidance on assessing entertainment noise from pubs and clubs is provided in the following documents:

- Institute of Acoustics (IoA), "Good Practice Guide on the Control of Noise from Pubs and Clubs", March 2003
- Department for Environment, Food and Rural Affairs (DEFRA), "Noise from Pubs and Clubs – Phase 1", DEFRA contract no. NANR 92, 2005
- Department for Environment, Food and Rural Affairs (DEFRA), "Noise from Pubs and Clubs – Phase 2" DEFRA contract on. NANR 163, 2006
- Department for Environment, Food and Rural Affairs (DEFRA), "A Review of Published Research on Low Frequency Noise and its Effects", DEFRA contract no. EPG 1/2/50 2003
- Department for Environment, Food and Rural Affairs (DEFRA), "Proposed criteria for the assessment of low frequency noise disturbance", DEFRA contract no. NANR 45, 2011

2.17 A summary for the guidance listed above is presented below.

DEFRA – Noise from Pub and Clubs

2.18 The Institute of Acoustics (IOA) published a guide [4] in 2003 providing some general guidelines and advice on measurements, assessment and control of pub noise.

2.19 There have been several national studies investigating the relationship between noise and subjective perception in relation to noise from pubs and clubs, including entertainment noise. This is summarised in two reports from the Department for Environment, Food and Rural Affairs (Ref. Phase I [5] & Phase II [6]) which form the basis for most current assessments of entertainment noise from pub and clubs with recommendations as to which measure to use for assessments of entertainment noise.

2.20 The DEFRA Phase I report provides expected levels from internal pub noise as summarised in Table 2.2 below. It also refers to the most commonly used assessment methods being BS 4142:1997 [7] and Noise Rating Curves (NR curves), which are not originally intended for assessing entertainment noise.

Table 2.2 Typical Noise Levels

Type	Reported Noise Levels
Crowd, quiet (no music)	65 to 70 dB L_{Aeq}
Crowd, busy (no music)	up to 88 dB L_{Aeq}
Crowd, music	90 to 95 dB L_{Aeq}
Clubs, dance floor	105 dB L_{Aeq}
Amplified music (dance floor)	Up to 115 dB L_{eq} at 63 Hz Up to 110 dB L_{eq} at 125 Hz
Typical difference between L_{eq} and L_{max}	5 – 15 dB (also for A-weighted)

2.21 The DEFRA Phase I report mentions in its paragraph 2.3.1.3 how some other European countries, in addition to a noise criterion, have specified the required sound insulation in terms of a weighted airborne criteria, $D_{nT,W}$ with or without C_{tr}. It is further stated:

"*In France (Decret 98-113), D_{nT} is also specified in octave bands, with stringent targets of 66 or 75 dB in the 125 or 250 Hz bands for an emission level of 99 dB in those bands.*"

2.22 The DEFRA Phase I report suggests a schedule of parameter against which a criterion for entertainment noise can be evaluated. This is summarised in Table 2.3 below.

Table 2.3 Schedule of proposed criteria for validation

Name	Parameter	Type
IOA working group annex	L_{Aeq} vs L_{A90} plus L_{10} vs L_{90} in 40 – 160 Hz 1/3 octave bands	Relative
BS 4142 / Noise Act 1996	L_{Aeq} vs background (L_{A90}, L_{A99}, etc.)	Relative
Noise Rating curve	1/3 octave (L_{eq}, L_{10}, or L_{max}) vs NR curve	Absolute
Absolute L_{Aeq}	L_{Aeq}	Absolute
DIN 45680 / Moorhouse	10 – 160 Hz 1/3 octave L_{eq} vs reference curve	Absolute
Inaudibility	Subjective	Relative

2.23 The DEFRA Phase II report considers which assessment method and parameter would be the most useful in relation to entertainment noise. The conclusions or recommendations were:

"*D. The noise metric that provided the best overall prediction of subjective ratings of all the entertainment noise types tested by ordinary members of the public was the Absolute L_{Aeq}.*"

E. However, during the field testing it was apparent that the "highest performers" from the laboratory testing all had clear disadvantages in use under real world conditions, so there is no clear best option for recommendation which combines optimum correlation with subjective response with ease and rapidity of use."

2.24 It then goes on to recommend using the parameters as follows:

"***Absolute L_{Aeq}*** *– That is an $L_{Aeq, 5min}$ noise level value set at a single action level. However, an intrusive entertainment noise criteria base on Absolute $L_{Aeq,}$ would be difficult to use where the existing ambient noise level without the entertainment noise was close to, equal to or above the action level. Therefore, we would recommend an action level Absolute L_{Aeq}, with an additional subjective requirement that the entertainment noise itself has a clearly audible (to an ontologically normal listener) contribution to the overall noise e.g. the songs/tracks would be recognisable to a listener familiar with the music and any words intelligible*.

L_{A90} - L_{A90} (no music) *– That is the difference between $L_{A90, 5min}$ noise level with the intrusive entertainment noise and the equivalent $L_{A90, 5min}$ with no intrusive entertainment noise. This allows consideration of the background level but requires a measurement without intrusive entertainment noise that may not be possible on the night of a complaint. This in itself may be problem enough to make the metric unusable for "on-off" events or as a quick response to a problem.*

L_{Aeq} – $L_{A99.95}$ *or existing Noise Act methodology (L_{Aeq} – $L_{A99.8}$). These metrics include some considerations of the underlying noise level at the same time as any offending noise level is measured, without requiring a separate "no music" measurement to be made. The former is slightly more effective in prediction of subjective response than the latter but not substantially so, and using the latter has logistical advantages. The performance of both these noise metrics was less good than the previous two options, but they also avoid the practical disadvantages highlighted above.*"

2.25 The DEFRA Phase II report thus provide several parameters that can be used when assessing entertainment noise, but not one single criterion that can be generally applied.

Low Frequency Considerations

2.26 Due to the nature of entertainment noise, i.e. the sound source being music, live or amplified, the noise will have a substantial low frequency component. While the majority of the low frequency studies and development of criteria are intended for assessing industrial low frequency and infra sound noise sources, the reasoning should still be considered when addressing entertainment noise and its low frequency content.

2.27 DEFRA has published a proposed assessment method of low frequency disturbance including criteria [8]. In summary the criteria are as follows:

"*If the L_{eq}, taken over a time when the noise is said to be present, exceeds the values in Table 9 it may indicate a source LFN (Low Frequency Noise) that could cause disturbance. The character of the sound should be checked if possibly by playing back an audio recording at amplified level.*

If the noise occurs only during the day then 5 dB relaxation may be applied to all third octave bands.

If the noise is steady then a 5 dB relaxation may be applied to all third octave bands. A noise is considered steady if either of the conditions a. or b. below is met:

a. $L_{10} - L_{90} < 5dB$

b. *The rate of change of sound pressure level (Fast time weighting) is less than 10 dB per second*

where the parameters are evaluated in the third octave band which exceeds the reference curve values (Table 9) by the greatest margin.

Table 9 Proposed reference curve

Hz	*10*	*12.5*	*16*	*20*	*25*	*31.5*	*40*	*50*	*63*	*80*	*100*	*125*	*160*
dB, Leq	*92*	*87*	*83*	*74*	*64*	*56*	*79*	*43*	*42*	*40*	*38*	*36*	*34*

2.28 A previous study on low frequency noise also published by DEFRA [9] provides the following points:

- *"In setting criterion limits it is implicit that these are at levels which protect a certain percentage of the population. Noise levels at which protection is offered typically leave 10 – 20 % of the population annoyed by a noise, since the desire to improve the environment is moderated by technical and economic factors."*
- *"Two spectra of (Figure 18 are plotted), showing how spectra with different subjective effects may have a similar NR number, in this case a little more than NR 35"*
- Annoyance is the response to a source taking into account the listeners social and personal characteristics, and thus a more complex parameter than the normally used objective parameters used for measuring and evaluating noise

2.29 World Health Organisation (WHO) has in its publication Community Noise (2000) [10] provided some references to low frequency noise, such as:

- *"For noise with a large proportion of low frequency sounds a still lower guideline (than 30 dBA) is recommended"*
- *"When prominent low frequency components are present, noise measures based on A-weighting are inappropriate"*

Camden Local Plan

2.30 It should be noted that the Camden Local Plan [11], Appendix 3 states that:

"*Assessments for noise from entertainment and leisure premises must include consideration to amplified and unamplified music, human voices, footfall and vehicle movements and other general activity. Appropriate metrics must be used to measure and assess the noise impact including L_{Aeq} and L_{Amax} metrics and appropriate frequency spectrum. Planning permission will not be granted in instances where it is not possible to achieve suitable and sufficient internal noise levels with reference to the most up to date and appropriate guidance within proposed noise sensitive receptors despite appropriate mitigation proposals due to the totality of noise from existing entertainment venues.*"

2.31 The Local Plan also provides the following table on noise levels applicable to proposed entertainment premises (customer noise):

Table 2.4 Noise levels applicable to proposed entertainment premises (customer noise)

Noise sensitive receptor	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAEL (Red)
Dwellings	Garden used for amenity (free field)	Day	The higher of 55dB $L_{Aeq,5min}$ Or 10dB below existing $L_{Aeq,5min}$ Without entertainment noise	56dB to 60dB $L_{Aeq,5min}$ Or 9dB to 3dB below existing $L_{Aeq,5min}$ Without entertainment noise	The higher of 61dB $L_{Aeq,5min}$ Or 2dB below existing $L_{Aeq,5min}$ Without entertainment noise
Dwellings	Garden used for amenity (free field)	Evening	The higher of 50dB $L_{Aeq,5min}$ Or 10dB below existing $L_{Aeq,5min}$ Without entertainment noise	51dB to 55dB $L_{Aeq,5min}$ Or 9dB to 3dB below existing $L_{Aeq,5min}$ Without entertainment noise	The higher of 56dB $L_{Aeq,5min}$ Or 2dB below existing $L_{Aeq,5min}$ Without entertainment noise
Dwellings	Garden used for amenity (free field)	Night	The higher of 45dB $L_{Aeq,5min}$ Or 10dB below existing $L_{Aeq,5min}$ Without entertainment noise	46dB to 50dB $L_{Aeq,5min}$ Or 9dB to 3dB below existing $L_{Aeq,5min}$ Without entertainment noise	The higher of 51dB $L_{Aeq,5min}$ Or 2dB below existing $L_{Aeq,5min}$ Without entertainment noise

Proposed Assessment Method

2.32 Based on the above considerations, it was proposed to consider a combination of the presented general guidelines and the Camden Local Plan requirements for this assessment. Following consultation with David Fowler, Deputy Team Leader at LBCC, it was confirmed that the following method to assess the noise impact of customer noise from the proposed amenity area on the external noise levels of the gardens or balconies of the nearest NSRs, is satisfactory:

- the LOAEL and SOAEL levels as indicated in the table above will be considered.

- Undertake an environmental baseline noise survey to determine the existing baseline noise levels at the nearest NSRs. The measurements will be undertaken in 5-minute intervals and at locations representative of the nearest NSRs.
- Considering the proposed operational hours of the amenity, undertake noise measurements during evening hours (20:00 to 22:00 hours) and base the assessment on these levels as a worst-case approach.
- Customer (patron) noise levels will be predicted at the nearest NSRs by using a 3D noise model and the predicted noise levels will be assessed against the external LOAEL and SOAEL levels for entertainment noise as given in the Camden Local Plan. In case the predicted noise levels are above the criteria, outline mitigation measures will be recommended to ensure that no adverse effects occur at the nearest NSRs.
- Amplified music/ speech/ talks noise levels will be predicted as an absolute L_{Aeq} noise level at the nearest NSRs by using a 3D noise model. Then it is proposed that the predicted noise levels from music/speech breakout should not be increasing the existing external background noise levels.

3 Site Description

3.1 The Francis Crick Institute (FCI) is located at Midland Road, London, NW1 1DF. St Pancras International station is located at approximately 40 m to the east of the FCI. Residential areas are located to the north, west and southwest of the FCI. The British Library and the Alan Turing Institute are located at approximately 50 m to the south of the FCI.

Noise Sensitive Receptors

3.2 The identified nearest noise sensitive receptors (NSRs) at the vicinity of the proposed development, as agreed with LBC, are:

- **NSR A**: the residential receptors along Neville Close and Cooper's Lane which lie approximately 22 m north of the Francis Crick Institute building.
- **NSR B**: the future residential receptors of the Brill Place Tower, which is currently under construction.
- **NSR C**: the residential receptors at Phoenix Court, which are located approximately 15 m northwest of the Francis Crick Institute building
- **NSR D**: the residential receptors along Ossulston Street and Phoenix Road, which are 28 to 33 m west of the Francis Crick Institute building.

3.3 The approximate site location and the identified NSRs can be seen in Figure 3.1.

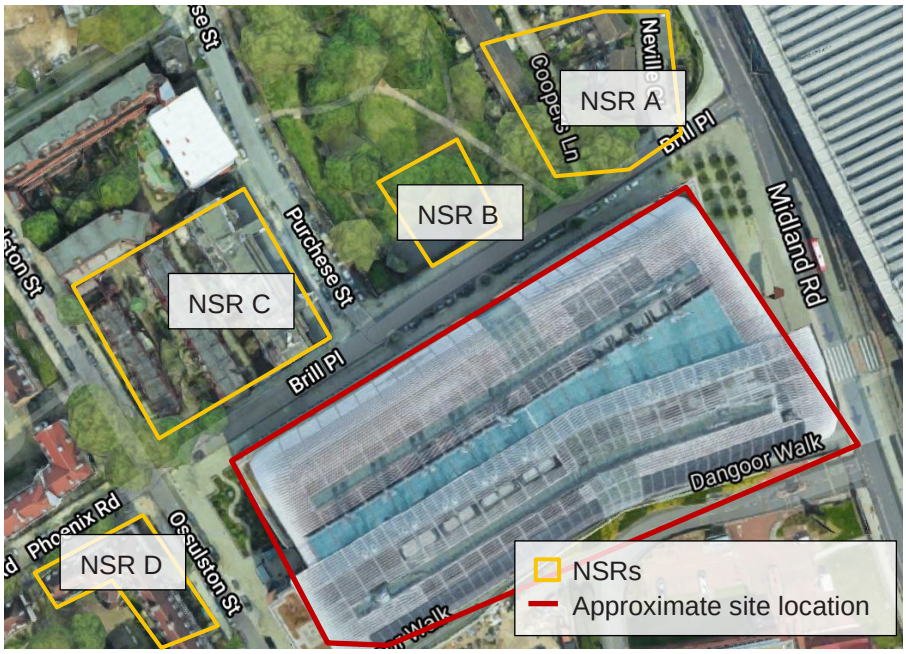


Figure 3.1 Noise Sensitive Receptors

Proposed Development Description and

3.4 An amenity area is proposed at the flat roof area located at Level 5 in the north-eastern quarter of the Francis Crick building, fronting Midland Road. The L5 terrace area can be seen in Figure 3.2.

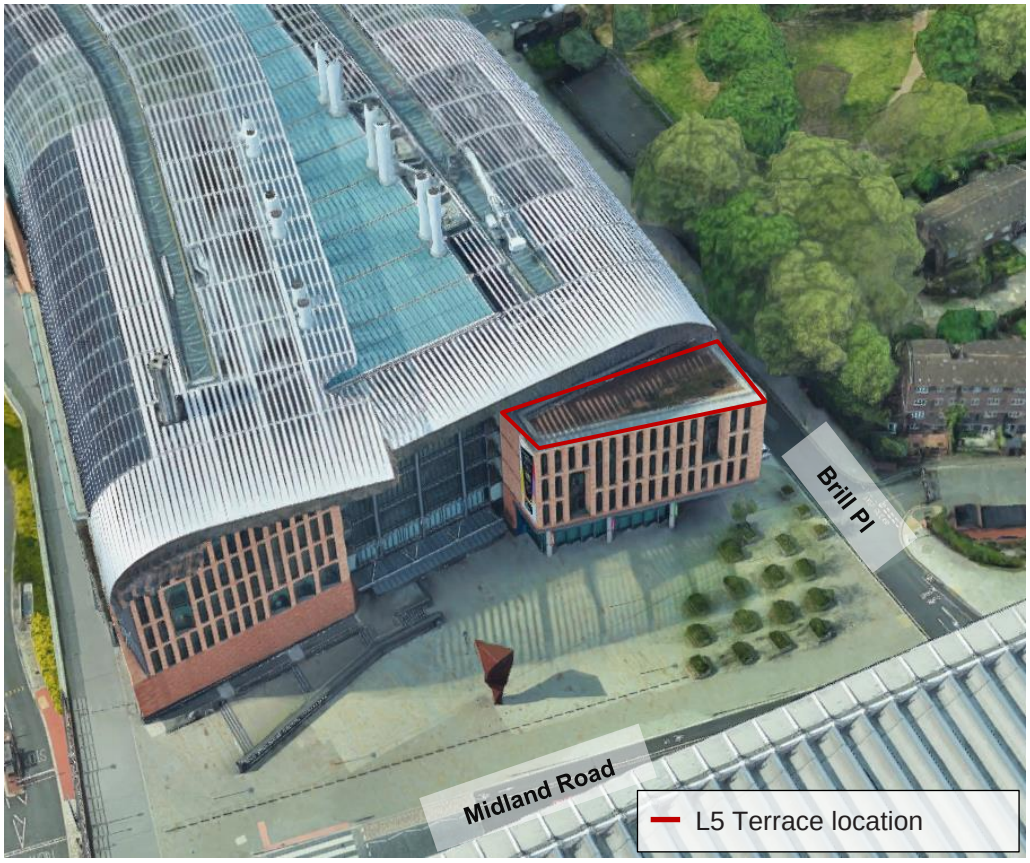


Figure 3.2 L5 Terrace location – View from the east

3.5 Level 2 in the south-western quarter of the FCI building, above the rear entrance to the FCI, was laid out as part of the original application as a potential amenity area. The L2 terrace area can be seen in Figure 3.3. The L2 terrace surface is laid with paving and there is a large door that provides access/egress from the main building, the outside of which is an internal amenity/collaboration space.

Figure 3.3 L2 Terrace location – View from the east

Operational Hours

3.6 The proposed amenity area at L5 terrace is intended to be used between 08:00 – 22:00 hours from Monday to Friday and between 09:00 – 20:00 hours at weekends and bank holidays. Some ambient background music and the occasional use of PA system for potential talks /speeches /announcements is currently being considered for the proposed amenity area. Beyond this amplified music is not proposed and any talks/speeches would occur earlier in the evening due to the nature of how this space would operate.

3.7 The amenity area at L2 terrace is intended to be used between 08:00 – 22:00 hours from Monday to Friday and between 09:00 – 20:00 hours at weekends and bank holidays. This terrace only includes a sitting area and there is no music or PA system use proposed within this area.

4 Baseline Environmental Noise Survey

Noise Sensitive Receptors

4.1 An environmental baseline sound survey was undertaken to establish the baseline conditions of the FCI surrounding area. Unattended environmental noise monitoring was undertaken at locations ST1 and ST2 on Thursday 7th October 2021. The noise monitoring locations, which were agreed with LBC, are shown in Figure 4.1.

Figure 4.1 Noise Measurement Locations

Monitoring Locations

4.2 Survey location ST1 was located near the dwellings along Coopers Lane, along Brill Place at a distance of approximately 40 m from Midland Road. The microphone was set up 1.5 m above ground level (AGL).

4.3 Survey location ST2 was located on the northwest corner of the FCI building at a distance of approximately 10 m from Ossulston Street and 8.5 m from Brill Place. The microphone was set up 1.5 m above ground level (AGL).

4.4 At both locations, the microphone was located at least 3.5 m from any reflective surface. Therefore, the sound levels measured at each location were free-field.

Instrumentation

4.5 Details of the instrumentation used during the survey are provided in Table 4.1 below. Calibration certificates of the equipment are available upon request. Calibration of the equipment was carried out before and after measurements with no significant drift (0 dB) observed.

Table 4.1 Baseline Sound Survey Instrumentation

Measurement Location	Make/Model	Serial Number	Calibration Ref/ Calibration Start/ Calibration End	Last Calibration Date
ST1, ST2	Rion NL52	#168 / 998569	94.0 / 94.1 / 94.0 dB	16/03/2020
Calibrator	Rion NC72	#014 / 00110118	n/a	19/11/2020

Procedure

4.6 The measurement equipment for the short-term measurements was configured to determine the following parameters over 5-minute intervals:

- dB $L_{Aeq,5\ min}$: Equivalent continuous A-weighted sound pressure level, and
- dB $L_{A90,\ 5min}$: 90th percentile A-weighted sound pressure level (background sound level).

Observations

4.7 At location ST1 the main noise source was railway noise from idling trains at St Pancras International coming from the open area of the platforms at a heigh of approximately 17 m above ground. Other audible sounds included road traffic on Midland Road, which was in general limited during the evening, some distant ambulances, whistling noises from St Pancras International platforms, two passing-by trains from St Pancras International platform which sounded tonal, taxis dropping off people along Brill Place, in general limited traffic on Brill Place and pedestrians' noise.

4.8 A location ST2 the main noise source was distant road traffic. The sound environment at this location was quieter than the sound environment at location ST1 and noise from St Pancras International was inaudible at this location. Other audible noise sources included a limited number of cars/ motorcycles passing by Ossulston Street, some idling cars at Brill Place, a car alarm that went off for a few seconds and pedestrians' noise.

Weather Conditions

4.9 The weather conditions were quantified based on historic weather data from Weather Underground (https://www.wunderground.com/) and particularly from weather station WeatherStation1 - ILONDO287 which is located 2.8 km away from the site. Overall, the wind

speeds were up to 1.2 m/s which was not strong enough to affect the results, so no data has been removed due to wind speeds.

4.10 There were no periods of rain during the measurements therefore no data has been removed due to rainy periods.

4.11 Further information on the wind speeds and precipitation during the sound measurements are given in Appendix A.

Noise Measurements Results

4.12 The results from the short-term noise monitoring are summarized in Table 4.2.

Table 4.2 Short-Term Noise Measurement Results

Measurement Location	Measurement Duration	Date / Time	Equivalent continuous A-weighted sound pressure level $L_{Aeq,5\ min}$ (dB)	Background Sound Levels $L_{A90,\ 5min}$ (dB)
ST1	30 minutes	07/10/2021 20:00	58	54
ST1	30 minutes	07/10/2021 21:08	56	52
ST2	30 minutes	07/10/2021 20:35	53	44
ST2	25 minutes	07/10/2021 21:40	51	45
Notes: All values have been rounded to the nearest whole number, where 0.5 it is rounded up.				

Representative Ambient and Background Sound Levels

4.13 The $L_{Aeq,5\ min}$ and $L_{A90,\ 5min}$ measured sound levels for each position, shown in Table 4.2, were arithmetically averaged to get a single $L_{Aeq,5\ min}$ and $L_{A90,\ 5min}$ values, representative of the sound levels over the time period between 20:00 and 22:00 hours at the identified NSRs.

4.14 These representative ambient and background sound levels at the identified NSRs are presented in Table 4.3 below.

Table 4.3 Summary of Background and Ambient Sound Levels (free-field)

Noise sensitive receptor	Representative location	Ambient sound level, dB $L_{Aeq,\ T}$ Evening (20:00 – 22:00 hours)	Background sound levels, dB $L_{A90,\ T}$ Evening (20:00 – 22:00 hours)
NSR A, NSR B	ST1	57	53
NSR C, NSR D	ST2	52	45

5 3D Noise Model

5.1 Based on the assessment methodology presented in Section 2, a noise model was built to predict:

- Unamplified speech (Customer of L5 terrace and people speaking on L2 Terrace) L_{Aeq} sound levels (customer noise levels) at the NSRs;
- Amplified music L_{Aeq} and L_{AFmax} sound levels at the NSRs, and
- Speech/ talks' L_{Aeq} sound levels at the NSRs.

Noise source data & noise model methodology

5.2 In order to determine the sound levels resulting from customers, amplified music and speech/talks, a 3D noise model has been built using SoundPlan v8.2 noise modelling software. The model predicts noise levels under light down-wind conditions based on hemispherical propagation, atmospheric absorption, ground effects, screening and directivity based on the procedure detailed in ISO 9613-2:1996 (International Organisation for Standardisation (ISO), 1996).

Description of sound sources

5.3 The modelling of the sound from customers, amplified music and speech/talks was based on information received by the design team until 25/10/2021. The input acoustic data for these activities were based on the RPS sound source database. Table 5.1 below summarises the modelling inputs used.

Table 5.1 Summary of Background and Ambient Sound Levels (free-field)

Noise Source	Description
Customer noise (patron noise)	Modelled as point sources with a SWL of **75 dBA L_w** with a spectrum based on the RPS database (raised voice spectrum), at a height of 1.2 m above local ground (assuming seated speakers). As a worst-case approach, 76 speakers were modelled at L5 Terrace and 20 speakers were modelled at L2 Terrace. The location of each speaker was based on the layouts considered for each area.

Noise Source	Description
Loudspeakers (music)	Modelled as point sources at 1.5 metre above local ground with an SWL of **72 dBA L_w** and a maximum level of **98.5 dB $L_{w,max}$**, a spectrum and a directivity based on the SoundPlan database (discotheque music spectrum, professional loudspeaker JBL – AWL266-LS cardioid directivity). To consider the impact from low frequency noise from music, a different spectrum has been used, i.e., the music spectrum from IEC 60268, with an SWL of **72 dBA L_w.** At this stage the loudspeaker layout is not known. A total number of 8 loudspeakers was considered for the L5 terrace at an assumed layout that is considered appropriate for the L5 Terrace. No loudspeakers will be used on L2 Terrace.
Loudspeakers (speech)	Modelled as point sources at 1.5 metre above local ground with an SWL of **75 dBA L_w** , a spectrum based on the RPS database (raised voice spectrum) and a directivity based on the SoundPlan database (professional loudspeaker JBL – AWL266-LS cardioid directivity). It is considered reasonable that a loudspeaker used to amplify a speaker's voice will emit similar noise levels as a raised human voice. For this reason, the same SWL as a raised voice has been applied to all 8 loudspeakers. At this stage the loudspeakers layout is not known. A total number of 8 loudspeakers was considered for L5 terrace at an assumed layout that is considered appropriate for the L5 Terrace. No loudspeakers will be used on L2 Terrace.

5.4 Details on the sound power levels for various plant items used within the noise model are presented in Table 5.2 to Table 5.4.

Table 5.2 Noise Model Inputs for Customer Noise – Octave Bands

Source	Number	Height above ground (m)	Overall sound power level (dBA)	Linear octave band sound power levels (dB)							
				63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Customers (raised voice spectrum)	96	1.2 m	75 dBA	38	48	61	72	71	64	57	53
Speech/Talk event (raised voice spectrum)	8	1.5 m	75 dBA	38	48	61	72	71	64	57	53

Table 5.3 Noise Model Inputs for Music – 1/3 Octave Bands

Source	Number	Height above ground (m)	Overall sound power level (dBA)	Maximum sound power level (dBA)	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz
Loudspeakers (discotheque)	8	1.5 m	72	98.5	64	66	71	75	73	76	78	81	84	83	79	78	78	72	69	68	66	59	43	41	41

Table 5.4 Noise Model Inputs for Music – 1/3 Octave Bands - LF

Source	Number	Height above ground (m)	Overall sound power level (dBA)	31Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz	12.5kHz	16kHz	20kHz
Loudspeakers (music from IEC 60268)	8	1.5 m	72	54	57	58	60	61	61	62	62	62	62	62	62	62	62	62	62	62	61	61	60	60	58	57	55	53	50	48	44	41

5.5 In addition, the following generic assumptions have been incorporated into the noise model:

- the topography of the site and the surrounding area has been obtained from Ordnance Survey (OS) open data (Terrain 50);
- depending on the selected parapet specification for the L5 Terrace, some attenuation to the L5 Terrace noise levels might be provided. However, to assess a worst-case scenario, the L5 Terrace parapet has not been incorporated in the noise model;
- the effect of screening from solid structures (buildings) has been incorporated into the modelling process by importing OS Open Data 'Buildings' shape file data into the model and including existing buildings; and
- the ground type in the model has been generally set to hard (G=0).

5.6 A 3D view of the proposed model can be seen in Figure 5.1 to Figure 5.2.

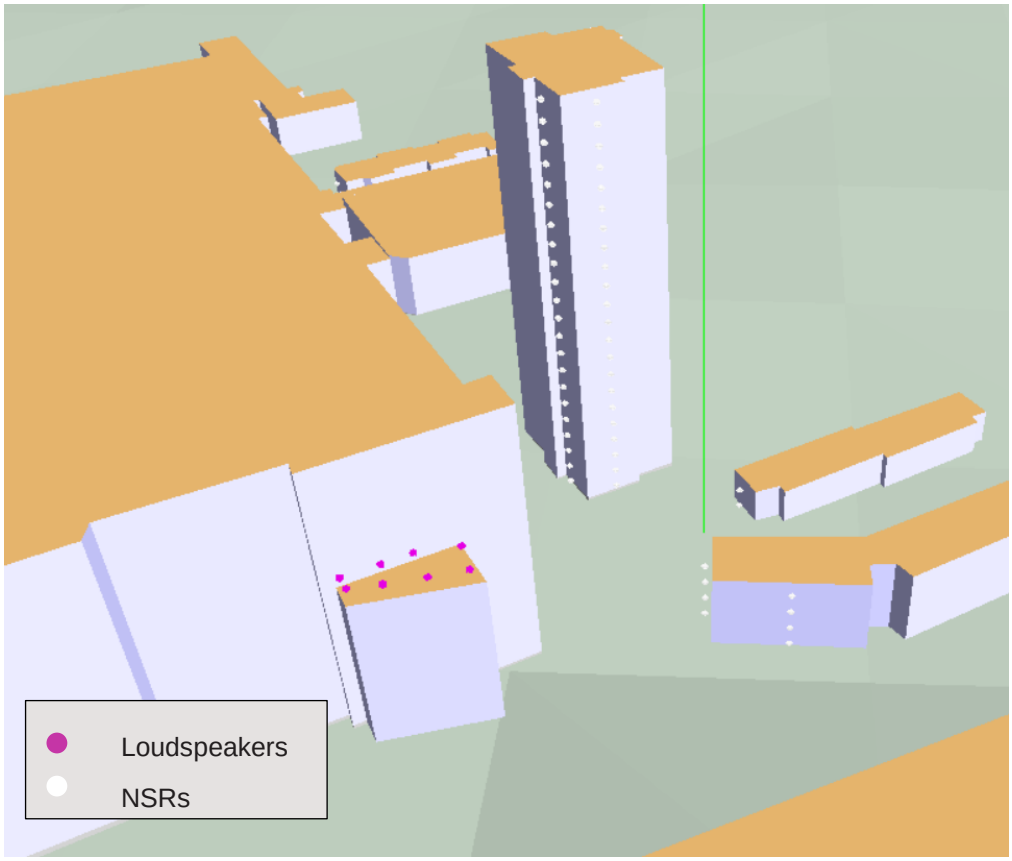


Figure 5.1 Noise Model – 3D View – East – Loudspeakers Locations at L5 Terrace

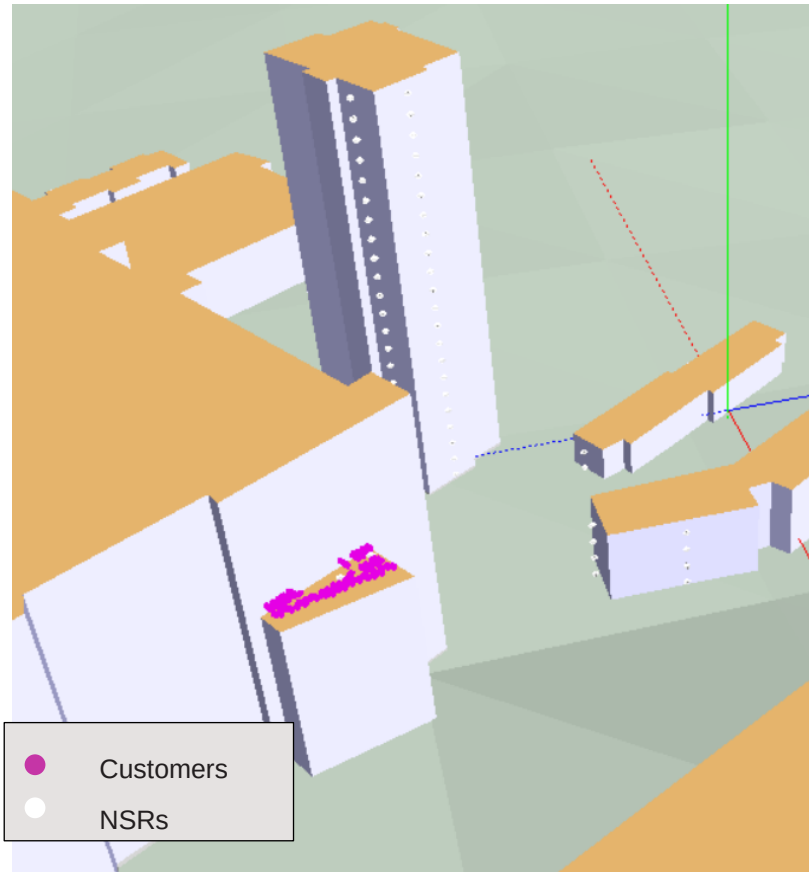


Figure 5.2 Noise Model – 3D View – East – Customers Locations at L5 Terrace

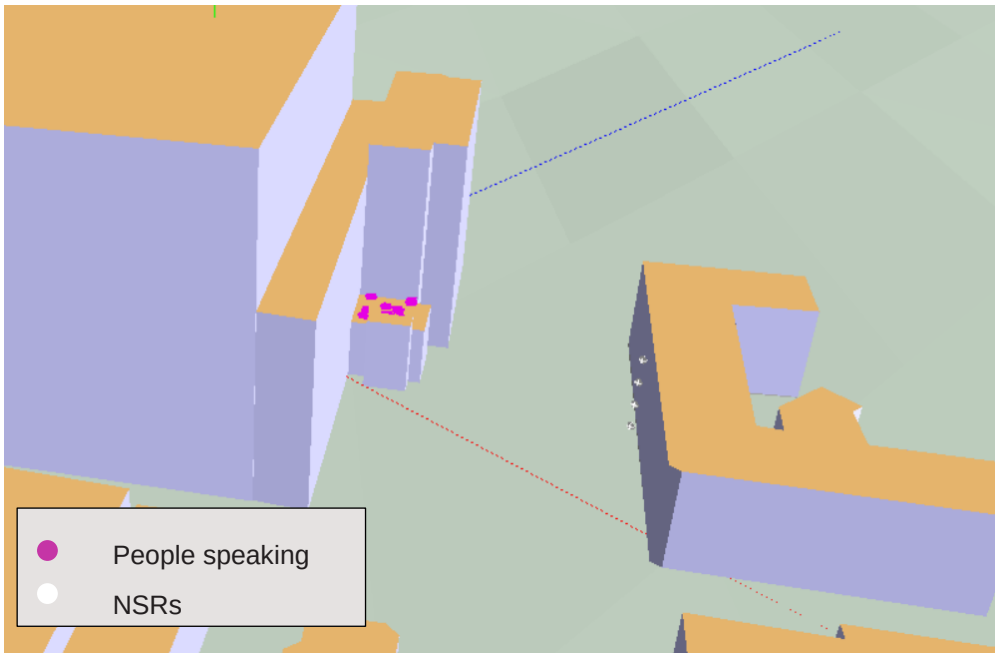


Figure 5.3 Noise Model – 3D View – Northwest – L2 Terrace – Location of People Speaking

6 Results

6.1 The predicted sound levels from activities at L5 terrace, i.e., customers talking, amplified music and speech/talks, are given in Table 6.1 for the nearest NSRs: NSR A and NSR B.

6.2 The predicted sound levels from activities at L2 terrace, i.e., people speaking, are given in Table 6.2 for the nearest NSRs: NSR C and NSR D.

6.3 Sound levels from customers, amplified music and speech/talks have been calculated at each floor of the nearby NSRs. The maximum predicted specific sound level per receptor has been used in the assessment. The same noise modelling techniques have been used by RPS on numerous sites in the UK and worldwide and there is a high degree of confidence in the model.

6.4 As discussed in Section 2, the predicted sound levels from customers, amplified music and speech/talks are given for the evening period (20:00 – 22:00 hours) as a worst-case approach.

Table 6.1 Predicted Sound Levels at NSRs from Customers, Amplified Music and Speech/Talks (free-field)

Noise sensitive receptor	Predicted Sound level dB(A)			
	Unamplified speech (Customer noise) $L_{Aeq,T}$	Amplified Music $L_{Aeq,T}$	Amplified Music L_{Amax}	Speech/Talks $L_{Aeq,T}$
NSR A - Midland Street	50	29	50	38
NSR B - Brill Place Tower	44	26	44	32

Table 6.2 Predicted Sound Levels at NSRs from Customers, Amplified Music and Speech/Talks (free-field)

Noise sensitive receptor	Predicted Sound level dB(A)
	People Speaking $L_{Aeq,T}$
NSR C - Brill Pl	45
NSR D - Ossulston Str	51

7 Noise Impact Assessment

Customer Noise Levels Assessment at L5 Terrace

Customer Noise Levels Assessment Criteria

7.1 Based on Table 2.4 and Table 4.2, the LOAEL and SOAEL levels applied for this assessment in relation to entertainment noise are given in Table 7.1 for the evening period.

Table 7.1 LOAEL and SOAEL Levels for Entertainment Noise – Evening Period

NSR	Assessment location	NOAEL (Dark Green)	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAEL (Red)
Dwellings	Garden used for amenity (free field)	Below 50 dB	50 dB	51 to 55 dB	56 dB and above

Assessment

7.2 Table 7.3 below shows the assessment of the predicted customer noise levels from L5 terrace at NSR A and NSR B against the external LOAEL and SOAEL levels for entertainment noise as given in Table 7.1. The results are highlighted according to the colour scale given in Table 7.1.

7.3 The results in Table 7.3 show that the predicted customer sound levels at NSR A and NSR B are just equal or below the LOAEL. Considering the context of the assessment, i.e., a worst-case approach where at a full-capacity L5 terrace all customers speak simultaneously and with a raised voice, it is considered that the impact from customer noise at NSR A and NSR B would be negligible.

Table 7.2 Assessment of Customer Noise Levels – Evening Period

Noise sensitive receptor	Predicted Sound level dB(A)		
	Customers/People speaking $L_{Aeq, T}$	Assessment	Impact
NSR A - Midland Street	50	Equal to LOAEL	Negligible
NSR B - Brill Place Tower	44	Below LOAEL	Negligible

Unamplified Speech Noise Levels Assessment at L2 Terrace

7.4 The predicted unamplified speech noise levels from people using the L2 terrace to the rear of the FCI building were also assessed against the external LOAEL and SOAEL levels for entertainment noise as given in Table 7.1. The results are given in Table 7.3 for NSR C and NSR D, highlighted according to the colour scale given in Table 7.1.

7.5 The results show that the predicted customer sound levels at NSR C are below the LOAEL and at NSR D are 1 dB above the LOAEL. Considering the context of the assessment, i.e., a worst-case approach where at a full-capacity L2 terrace all people speak simultaneously and with a raised voice[1], it is considered that the impact from unamplified speech at both NSRs is negligible.

Table 7.3 Assessment of Unamplified Speech Noise Levels – Evening Period

Noise sensitive receptor	Predicted Sound level dB(A)		
	Customers/People speaking $L_{Aeq, T}$	Assessment	Impact
NSR C - Brill Pl	45	Below LOAEL	Negligible
NSR D - Ossulston Str	51	1 dB above LOAEL	Negligible, considering the context

Amplified Music Noise Levels Assessment

7.6 Amplified music noise levels were predicted as an absolute L_{Aeq} noise level at the nearest NSRs of the L5 Terrace, i.e., NSR A and NSR B, and were assessed against the existing external background sound levels. The results are given in Table 7.4 shows that the predicted amplified music noise levels will be significantly below the existing background noise levels at the NSRs. Therefore, the impact from amplified music at both NSRs would be negligible.

[1] It should be noted that as no music will be playing in the background at this location, it is unlikely that people using the L2 terrace will be speaking in raised voices.

Table 7.4 Assessment of Amplified Music Noise Levels – Evening Period

Noise sensitive receptor	Predicted Sound level dB(A)		
	Amplified Music $L_{Aeq, T}$	Existing Background Sound Levels $L_{A90, T}$	Difference Between Amplified Music and Existing Background Sound Levels
NSR A - Midland Street	29	53	-24
NSR B - Brill Place Tower	26	53	-27

7.7 It should be noted that as the proposed L5 terrace will be operational until 22:00 hours and will not operate during night-time, i.e., between 23:00 and 07:00 hours, the L_{Amax} noise levels were not assessed against the WHO guidelines for sleep disturbance.

Amplified Speech/Talks Noise Levels Assessment

7.8 Amplified speech/talk noise levels were predicted as an absolute L_{Aeq} noise level at the nearest NSRs of the L5 Terrace, i.e., NSR A and NSR B, and were assessed against the existing external background sound levels. The results are given in Table 7.5 .

7.9 Table 7.5 shows that the predicted amplified speech/talk noise levels will be significantly below the existing background noise levels at the NSRs. Therefore, the impact from amplified speech/talk at both NSRs would be negligible.

Table 7.5 Assessment of Amplified Music Noise Levels – Evening Period

Noise sensitive receptor	Predicted Sound level dB(A)		
	Amplified Speech $L_{Aeq, T}$	Existing Background Sound Levels $L_{A90, T}$	Difference Between Amplified Music and Existing Background Sound Levels
NSR A - Midland Street	38	53	-15
NSR B - Brill Place Tower	32	53	-21

Low Frequency Noise Assessment

7.10 Given the proposed use of the L5 Terrace, the amplified background music that will be emitted from the loudspeakers on the terrace is not expected to have a significant low frequency content.

7.11 The noise model has been used to predict 1/3 octave band noise levels from the amplified music at the nearest NSRs.

7.12 The outcome of the predicted noise levels indicates that at lower frequencies the predicted 1/3 octave band noise levels fall significantly below[2] the values shown in Table 9 of the DEFRA assessment method [8], relaxed by 5 dB as the amplified music will be present only during daytime (see paragraph 2.27).

7.13 Therefore, the impact from low frequency noise at both NSR A and NSR B is considered to be negligible and has not been assessed any further.

[2] At 31.5 Hz the noise levels from amplified music are predicted to be 21 dB below the 62 dB value of the reference curve of Table 9 relaxed by 5 dB to account for daytime noise emission.

8 Summary and Conclusions

8.1 RPS Acoustics Team (RPS) was commissioned to undertake a noise impact assessment to support the planning application for the creation of an amenity area at Level 5, of the Francis Crick Institute (FCI), Midland Road, London, NW1 1DF. The proposals relate to the flat roof area located at Level 5 in the north-eastern quarter of the Francis Crick building, fronting Midland Road. The development is located within the administrative area of the London Borough of Camden (LBC).

8.2 Level 2 in the south-western quarter of the FCI building, above the rear entrance to the FCI, was laid out as part of the original application as a potential amenity area. This noise impact assessment also considered any potential impacts associated with the use of this area.

8.3 A desktop study was undertaken to identify the nearest noise sensitive receptors (NSRs) at the proposed development.

8.4 Consultation was undertaken with LBC to agree the baseline sound level monitoring and assessment methodology for the proposed amenity area.

8.5 An environmental baseline sound survey was undertaken at locations representative of the NSRs at the vicinity of the proposed amenity area to establish the baseline conditions on and around the site and the representative background noise levels at the NSRs.

8.6 A 3D noise model was built to predict:

- Unamplified speech (Customer of L5 terrace and people speaking on L2 Terrace) L_{Aeq} sound levels (customer noise levels) and at the NSRs;
- Amplified music L_{Aeq} and L_{AFmax} sound levels at the NSRs, and
- Speech/ talks' L_{Aeq} sound levels at the NSRs.

8.7 The assessment has shown that the predicted noise emission levels from unamplified speech are expected to have negligible impact at the nearest NSRs.

8.8 The assessment of amplified music and amplified speech has shown that the predicted noise emissions from these activities fall significantly below the existing background noise levels at the NSRs. Therefore, negligible impacts are predicted at all NSRs.

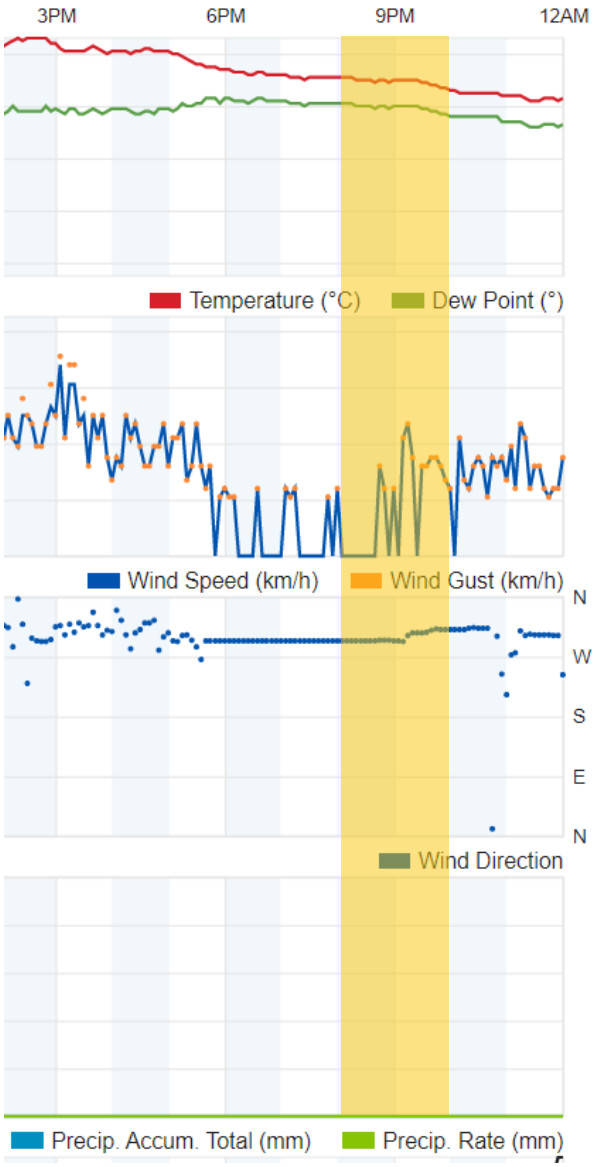
8.9 The qualitative assessment of low frequency noise from amplified music at the L5 Terrace has indicated that the impact from low frequency noise at both NSR A and NSR B is considered to be negligible.

8.10 Assessing the proposed amenity space at L5 terrace and the L2 terrace in accordance with the principles of the NPPF has shown that predicted noise levels would be below the LOAEL.

8.11 On the basis of the above, it is considered that noise related to the proposed uses does not pose a material constraint to the operation of the proposed amenity areas.

Appendix A Weather Data

The weather data during the sound measurements undertaken on 7th October 2021 are given in the following figure, highlighted in yellow.



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