ARUP

MEPC

NOMA – Redfern Building

Noise Impact Assessment

Reference: 283842-61/P01

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1. Introduction

Arup has produced this noise impact assessment report to support a planning application for a retail unit to be tenanted as a restaurant with ancillary bar and public house with provision for live entertainment on the partial floorplate of the lower and upper ground floors of the Redfern Building. The assessment includes:

- A baseline sound survey to determine the existing noise climate around the building and at identified nearest noise sensitive receptors during both day and night.
- Sound insulation testing of the floor slab separating the upper ground floor and first floor level.
- Assessment of proposed mechanical plant items in relation to local authority criteria.
- Assessment of proposed entertainment noise emissions in relation to local authority criteria.

Where appropriate, the study has taken account of relevant national and local planning policy and guidance, along with industry standard building design guidelines.

The following information is presented in the appendices to this report:

- A glossary of acoustic terminology in Appendix A;
- Baseline sound survey results in Appendix B;
- Sound insulation test results in Appendix C.

1.1 Site description and context.

The proposed unit is located in the Grade II listed Redfern Building located in the Victoria area of Manchester City Centre, forming part of the NOMA mixed use redevelopment scheme. The building is bounded by commercial adjacencies consisting of public realm, office accommodation, existing bars and entertainment venues such as the New Century Hall. The building is currently tenanted by The Ministry of Justice (MoJ) probation services as an office space from floors 1 to 5 and a retail space for All Press Espresso, located on the upper ground floor level.

Figure 1 displays the location.

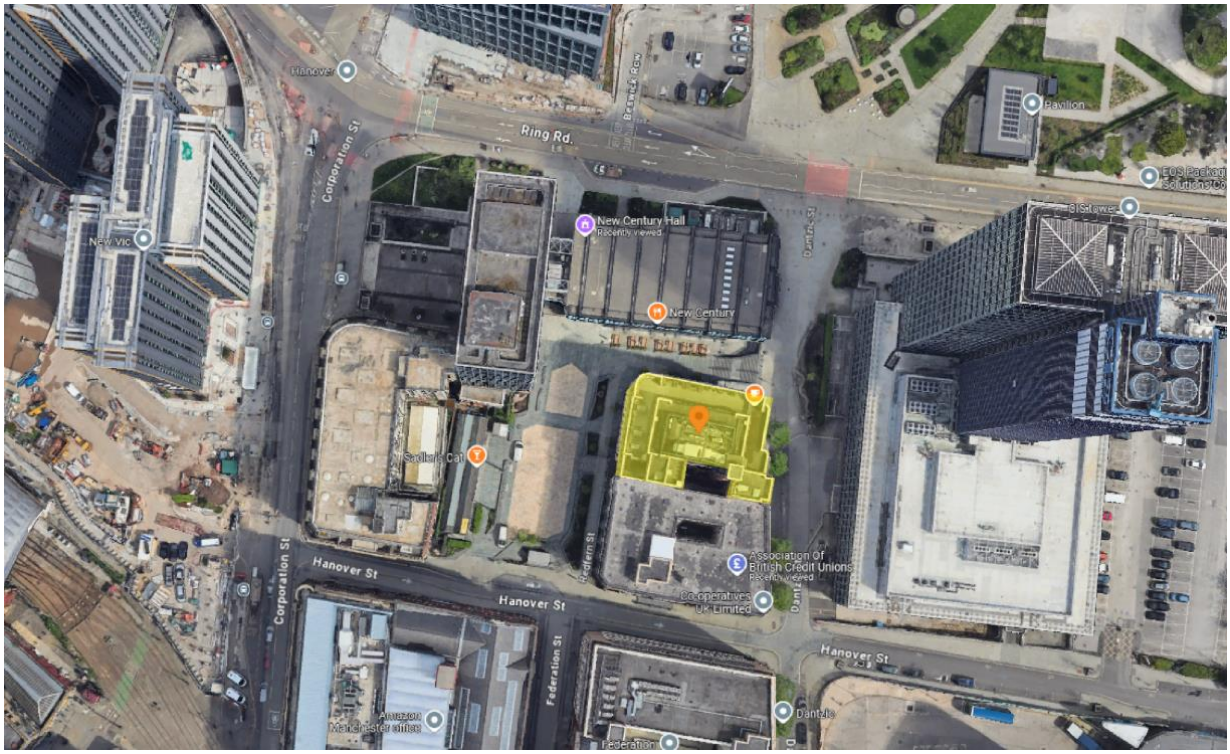


Figure 1 Redfern Building location (shaded yellow)

1.2 Proposed development

Figures 2 and 3 display plan views of the proposed lower ground and upper ground floors of the development.



Figure 2 Plan view of proposed lower ground floor

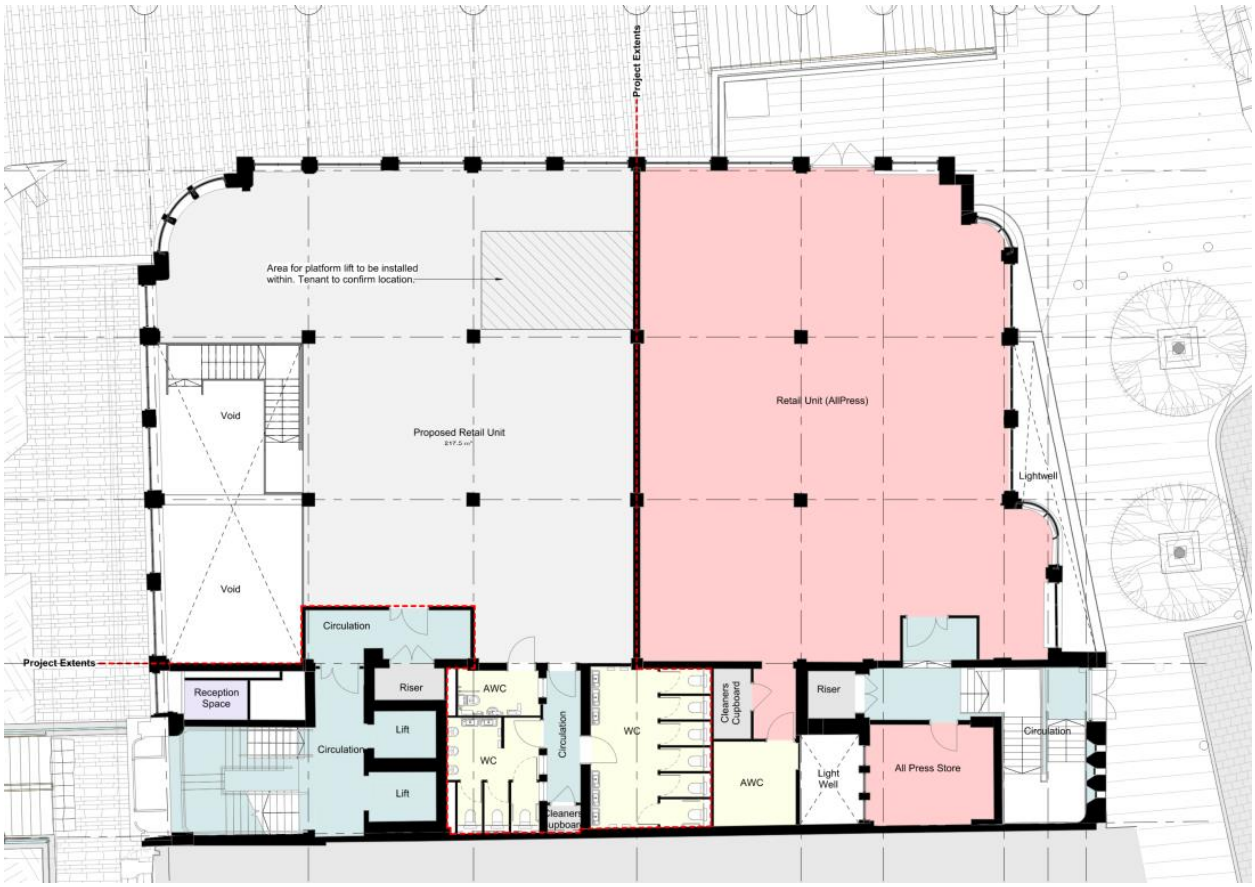


Figure 3 Plan view of proposed upper ground floor

1.2.1 Operational plant

The following building services items are proposed.

Plant item	Quantity	Location
Direct expansion units	2	Roof
MVHR extract points	1	Roof

Table 1 Proposed mechanical plant equipment

1.2.2 Entertainment noise

It is understood that a licensing application is to be submitted for a restaurant with ancillary bar and public house with provision for live entertainment for operational hours of 07:00-01:00 from Monday to Saturday and bank holidays. During design, an intention has been expressed for the restaurant space to provide live music entertainment such as acoustic or vocal performances. However, in accordance with Manchester City Council (MCC) planning guidance, the assessment of impact from entertainment noise also considers additional representative entertainment noise levels, should prospective tenants wish to consider alternate entertainment options in future.

2. Legislative, policy and guidance context

2.1 Noise Policy Statement for England (NPSE)[1]

The Government's policy on noise is set out in the Noise Policy Statement for England (NPSE). It sets out the long-term vision of promoting good health and a good quality of life through the management of noise. The aims of the policy are to:

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

This is achieved through three particular targets:

- 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.

Particularly in relation to the second target, the explanatory notes of the NPSE state that:

"All reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development."

The NPSE sets out concepts to be used in assessing the above aims:

- No Observed Effect Level (NOEL). This is the level of noise exposure below which no effect at all on health and quality of life can be detected;
- Lowest Observed Adverse Effect Level (LOAEL). This is the level of noise exposure above which adverse effects on health or quality of life can be detected; and
- Significant Observed Adverse Effect Level (SOAEL). This is the level of noise exposure above which significant adverse effects on health and quality of life occur.

[1] Noise Policy Statement for England - Department for Environment, Food and Rural Affairs (Defra) March 2010. Available at https://www.gov.uk/government/publications/noise-policy-statement-for-england

Significant adverse impacts occur at and above the SOAEL. Adverse impacts occur between the LOAEL and the SOAEL.

2.2 National Planning Policy Framework and Noise Policy Statement for England[2]

In the case of environmental noise, the National Planning Policy Framework (NPPF) planning objectives are addressed through the Noise Policy Statement for England (NPSE) which states the following 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 health 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."*

2.3 British Standard BS 4142[3]

British Standard BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound.* provides a methodology for rating and assessing the likely impacts of sound of an industrial or commercial nature on residential receptors. The methodology is based on comparing the background sound level (measured as L_{A90}) at a receptor with the level of sound from the source being assessed, including penalties for characteristics such as tonality and impulsivity (known as the rating level $L_{Ar,Tr}$). The following advice is provided for determining the significance of impacts:

- *"Typically, the greater the difference between the background sound level and the rating level, the greater the magnitude of the impact;*
- *A difference of +10 dB or more between the rating level and the background sound level is likely to be an indication of a significant adverse impact, depending on the context;*
- *A difference of around +5dB between the rating level and the background sound level 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 source being assessed will have an adverse or a significant adverse impact."*

Additionally, BS4142 describes the process for obtaining a representative background level at the residential receptors. This process is based on undertaking measurements at the receptor locations, including measurement of the L_{A90}. The measurements should be analysed to determine a typical background level for the relevant time periods. An example method is provided based on statistical analysis of the measured data using a histogram to illustrate the distribution of measured L_{A90} values.

2.4 BS8233:2014[4]

British Standard BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings* provides guidance for the control of noise in and around buildings. This standard includes guidance on internal noise levels suitable for different building types and uses, including sleeping/resting within residences, and office spaces.

The desirable, guideline night-time noise level within a bedroom to provide suitable conditions for sleeping is 30 dB $L_{Aeq,8hr}$ (indoor). BS8233 also advises that a partially open window typically provides a 15 dB

[2] National Planning Policy Framework – Ministry of Housing, Communities & Local Government, December 2024 Available at https://assets.publishing.service.gov.uk/media/67aafe8f3b41f783cca46251/NPPF_December_2024.pdf

[3] BS4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound. BSI Standards Publication.

[4] BS 8233:2014 Guidance on sound insulation and noise reduction for buildings. BSI Standards Publication.

reduction in sound level from the outside to inside. The guideline internal level would therefore be achieved with an external noise level of 45 dB $L_{Aeq,8hr}$.

Additionally, the desirable guideline for meeting rooms is 35-45 dB L_{Aeq} 35-40 dB L_{Aeq} for an executive office, and 45-40 dB L_{Aeq} for an open plan office.

2.5 World Health Organization (WHO) Night Noise Guidelines for Europe[5]

The WHO Regional Office for Europe set up a working group of experts to provide scientific advice to the Member States for the development of future legislation and policy action in the area of assessment and control of night noise exposure. The working group reviewed available scientific evidence on the health effects of night noise, and derived health-based guideline values.

Considering the scientific evidence on the thresholds of night noise exposure, a LOAEL of 40 dB L_{night} outside bedrooms was identified to be the target night noise guideline (NNG) to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly. The L_{night} is a logarithmic (energy) average level for all night-time periods over one year.

2.6 Manchester City Council Planning and Noise Technical Guidance 2022[6]

Manchester City Council (MCC) Planning and Noise Technical Guidance contains extensive information on interpreting relevant local policy relating to noise for a range of developments.

2.6.1 Residential developments

Internal and external noise criteria for residential developments are presented in section 3.7.1.1 and are as follows:

- *Bedrooms (night time 23:00 to 07:00): 30dBL_{Aeq} and individual noise events should not normally exceed 45 dB$L_{Amax,F}$ more than 10 times per night)*
- *Living Rooms (daytime 07:00 to 23:00): 35dBL_{Aeq}*
- *Gardens/External Amenity Areas (daytime): 55 dBL_{Aeq}*

2.6.2 Entertainment venues

Guidance for noise from entertainment venues is presented in section 3.7.1.2 and states:

'When considering the potential impact of a proposal for an entertainment venue, consultants should consider the overall noise level (L_{Aeq}) and the 63 Hz and 125 Hz octave band noise levels (L_{eq}). Music noise in the 63 Hz and 125 Hz octave bands, often described as 'bass noise', is particularly difficult to contain and the impulsive and non-steady character of low frequency music noise is particularly disturbing for local residents exposed to it'.

For structurally connected uses it states:

'A criterion that would achieve a condition of 'inaudible' / 'virtually inaudible' which is applicable for new residential developments that are structurally connected to entertainment venues (or vice versa) would be Music noise levels in the 63Hz and 125Hz octave centre frequency bands (L_{eq}) should be controlled so as not to exceed (in habitable rooms) 47dB and 41dB ($L_{eq,5min}$), respectively'.

New entertainment venues that are structurally detached from other building uses should demonstrate that music noise from the proposal will not be 'audible' in nearby residential properties, assuming that the residential properties in question have their windows open. The criterion here is:

[5] World Health Organization (2009) Night Noise Guidelines for Europe

[6] Manchester City Council Planning & Noise Technical Guidance, June 2022. Available at https://manchester.gov.uk

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

2.6.3 Mixed use developments

Where a planning application includes a proposal to contain a potentially noisy development within the same building as a noise sensitive use or vice versa the noise survey should consider the transfer of noise between the noisy and noise sensitive uses. An example of where this should be considered would be a proposal for a bar or club within the same building as residential properties (see section 3.6.1.2). Consultants should demonstrate that the structure of the development will be sufficient to adequately contain the noise generated within the development. In doing so consultants should consider:

• flanking noise;

• structure borne noise;

• the overall level of noise (L_{Aeq}) generated by the use in question and any tonal or impulsive characteristics that the noise may contain; and

• the acoustic properties of the development (including the construction of party floors and/or walls, windows and doors, ventilation systems, and structural columns.)

2.6.4 Noise from fixed plant/ equipment

Section 3.7.1.5 outlines that the noise assessment from fixed plant/ equipment should utilise BS 4142:2014 and further states:

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

3. Baseline sound level survey

An environmental baseline sound survey has been undertaken to determine the existing sound environment around the proposed site. Attended measurements were made at four locations and one unattended noise logging sound level meter was installed.

The survey was carried out by Holly Cowperthwaite and Danny King of Arup from 10th to 18th April 2025.

Full details of the survey are presented in Appendix B.

3.1 Background sound measurements

The attended measurement locations were:

- Location 1: representative of commercial receptors on Sadler's Yard including offices and Sadler's Cat pub.
- Location 2: representative of commercial receptors on Mayes Street, i.e. New Century Hall.
- Location 3: representative of commercial receptors on Dantzic Street, i.e. CIS Tower.
- Location 4: representative of the residential dwellings at New Vic Apartments south, identified as the nearest residential receptor to the proposed site.

Unattended measurements were also taken at U1, located on the roof of the Redfern Building. Attended and unattended measurements were recorded in 5-minute intervals.

Figure 4 illustrates the measurement locations.



Figure 4 Sound level measurement locations – red circles indicate attended short-term measurement locations, yellow circle indicate the unattended logging location

3.2 Summary of measurement results

The summary tables for each measurement location provided below are the arithmetic average of the individual measurements during each time period for L_{A90} and L_{A10}, a logarithmic average for L_{Aeq} and a range of the values for L_{Amax}.

Location	Sound Pressure Level, dB(A) (re 20 µPa)			
	L_{90}	L_{10}	L_{eq}	$L_{max,F}$
Daytime (07:00 – 23:00)				
Location 1 – Sadler's Yard	53	60	59	65-80
Location 2 – Mayes Street	52	63	57	65-81
Location 3 – Dantzic Street	52	59	57	67-75
Location 4 – New Vic Apartments South	57	66	64	74-86

Table 2 Sound survey summary results during daytime period for attended measurements.

Location	Sound Pressure Level, dB(A) (re 20 µPa)			
	L_{90}	L_{10}	L_{eq}	$L_{max,F}$
Daytime (07:00 – 23:00)				
Location U1 – Redfern Building	50	55	55	61-90
Night-time (23:00 – 07:00)				
Location U1 – Redfern Building	45	52	50	54-88

Table 3 Sound survey summary results during day and night-time periods for unattended measurements.

4. Sound insulation testing

Sound insulation testing has been undertaken to assess the acoustic performance of the existing floor construction between the upper ground floor level and first floor office accommodation, which currently is tenanted by the Ministry of Justice.

Full details of the survey are presented in Appendix C.

4.1 Method

The sound insulation testing was undertaken by Adam Thomas and Sam Peckham of Arup on Thursday 1 May 2025. Sound insulation measurements were taken following the procedure set out in BS EN ISO 16283-1:2014[7]. A diffuse sound field was created within the unit using two loudspeaker sources playing pink noise simultaneously. A 30 second moving microphone measurement of the sound levels within the source room was taken. With the sound source still operational, a 30 second sound level measurement was made in a receiver room vertically adjacent within the Level 01 office space. Measurement were also made of the internal ambient sound level in the receiver room with the sound source turned off. Throughout testing the building was unoccupied.

4.2 Sound insulation test results

The measured ambient sound levels in the first floor office space were 31dB $L_{Aeq,5min.}$

Table 4 presents the measured sound level difference between the upper ground floor and first floor office accommodation.

Test Element	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Separating floor between upper ground floor retail unit and first floor office accommodation	34	44	51	58	68	73	74	79

Table 4 Measured sound level difference, D (dB)

It was not possible to conduct measurements with external doors open due to the high number of patrons outside at the New Century Hall.

5. Assessment

5.1 Operational noise emission limits from fixed plant items

A statistical analysis of the sound levels measured at location U1 has been undertaken in line with BS4142 to determine the representative background sound level at the closest receptors for the day and night-time periods. Periods during which concerts occurred at the New Century Hall have been omitted from the overall results.

The results are presented in Figures 5 and 6.

[7] BS EN ISO 16283-1:2014 +A1:2017Acoustics - field measurement of sound insulation in buildings and of building elements. Airborne sound insulation, The British Standards Institution 2018

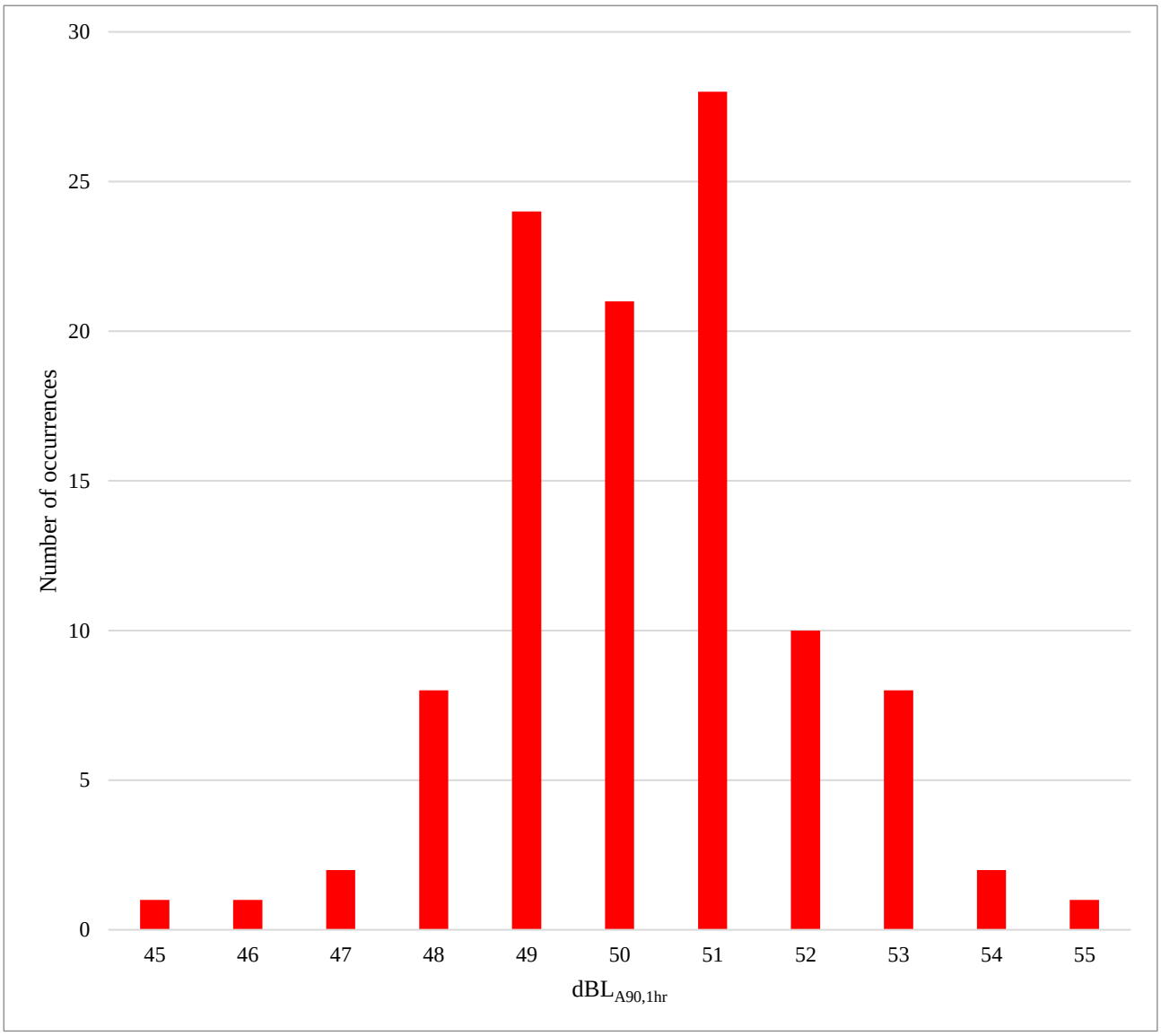


Figure 5 Histogram of number of occurrences of dBL$_{A90,1hr}$ values during daytime hours

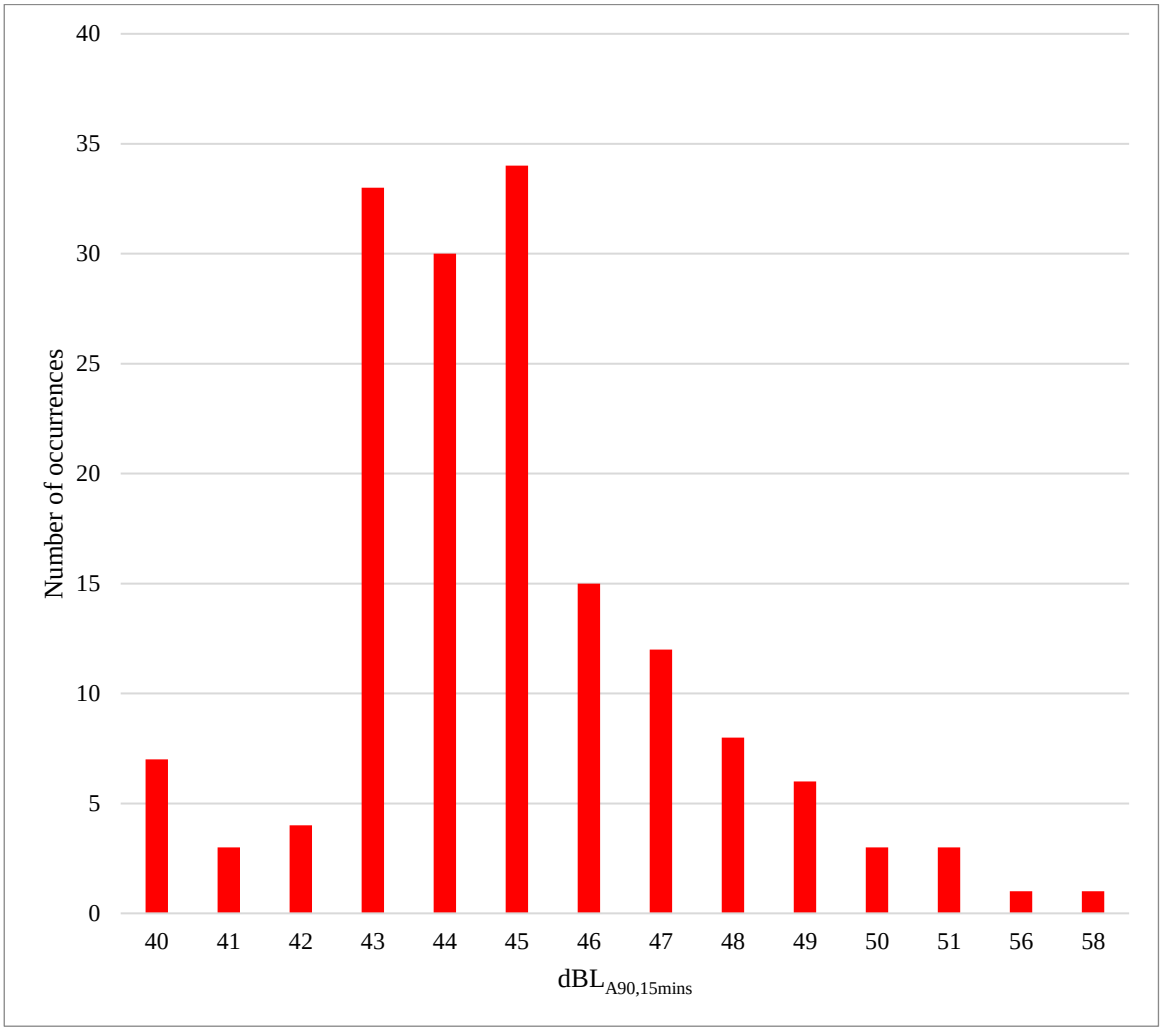


Figure 6 Histogram of number of occurrences of $dBL_{A90,15min}$ values during night-time hours

Based on the results presented in Figure 6 and Figure 7, proposed rating level criteria are presented in Table 6, which are 5dB below the representative background level derived from the sound level survey and in accordance with BS4142 and MCC policy. For location U1, the representative background level for the day and night are determined directly from the statistical analysis of the logging sound level meter. For locations 1, 2, and 3 the assumption is made that the night-time conditions are the same as for location U1, due to the close proximity of the locations; they therefore use the same results of the statistical analysis.

Prior to attending site for the baseline sound survey, discussions were conducted between Arup and the building management of New Vic South Apartments to try to establish a suitable location for installing unattended logging equipment, however, this was not possible to achieve. Representative noise level criteria have been derived from statistical analysis of the noise logging data at location U1. This is deemed to be a worst case approach considering the proximity of New Vic South to busy road and rail links.

Criteria for operational fixed plant for daytime (07:00-23:00) is determined to be 44dB L_{Aeq}, and night-time criteria (23:00-07:00) is 38dB $L_{Aeq.}$

5.1.1 Mechanical plant equipment

Plant and equipment of the proposed redevelopment, identified as having the potential to emit appreciable levels of sound are:

- 2 no. direct expansion units
- MVHR extract.

Plant equipment	Octave band centre frequency (Hz)								
	L_W dB(A)	63	125	250	500	1000	2000	4000	8000
Direct expansion unit	78	82	82	79	76	72	69	66	58

Table 5 Sound power levels of direct expansion unit equipment (dB)

Plant equipment	Octave band centre frequency (Hz)								
	L_W dB(A)	63	125	250	500	1000	2000	4000	8000
MVHR – Induct Intake	71	83	75	75	64	64	62	54	54
MVHR – Induct Discharge	80	88	81	85	71	72	72	66	64

Table 6 Sound power levels of MVHR unit equipment (dB)

Whilst final plant selections have not been established at the time of writing, noise data for plant items have been derived from manufacturer data sheets for appropriate units.

5.1.2 Building services noise to nearest receptors

Predicted external noise levels at the receptors, with all the proposed rooftop plant running simultaneously at 100% load, are presented in Table 7.

Measurement location	Representative receptor location	Predicted specific sound level dB $L_{Aeq, Tr}$
Location 1	Sadler's Yard	25
Location 2	Mayes Street	26
Location 3	Dantzic Street	23
Location 4	New Vic Apartments South	18

Table 7 Predicted external sound levels at identified receptors from proposed plant items

5.1.3 BS4142 Assessment

Using the sound power level data for plant items presented in Tables 5 and 6, without any additional mitigation measures implemented, a BS4142 assessment is presented below to assess the potential impacts from the proposed development on the identified receptors.

5.1.3.1 Location 1 – Sadler's Yard

Description	Descriptor and value	Relevant clause	Commentary
Specific sound level	L_{Aeq} 25 dB	7.3.4 7.3.5	Predicted specific sound level
Background sound level, daytime	L_{A90} 49 dB	8.1.3 8.3	Determined using statistical analysis of the unattended sound level meter in conjunction with supplementary attended measurements. Considered representative of receptors on Sadler's Yard.
Background sound level, night-time	L_{A90} 43 dB	8.1.3 8.3	Determined using statistical analysis of the unattended sound level meter measurements. Considered

			representative of receptors on Sadler's Yard.
Acoustic character correction	+ 3dB	9.2	Penalty of +3dB has been applied for "Other sound characteristics" as the specific sound may be readily distinctive against the residual acoustic environment.
Rating level	25 + 3 = $L_{Ar,Tr}$ 28 dB	9.2	
Excess of rating level over daytime background sound levels	= 25 – 49 = -24 dB	11	Assessment indicates no significant impact from proposed plant items.
Excess of rating level over night-time background sound levels	= 25 – 43 = -18dB	11	Assessment indicates no significant impact from proposed plant items.
Uncertainty	A sound level logger was installed on the site for a period of 8 days to reduce uncertainty associated with determining the background sound levels. Plant selections for the proposed development have not been finalised and are to be determined at a later date.		

Table 8 BS4142 assessment for Location 1, representative of the commercial receptors on Sadler's Yard

Location 2 – Mayes Street

Description	Descriptor and value	Relevant clause	Commentary
Specific sound level	L_{Aeq} 26 dB	7.3.4 7.3.5	Predicted specific sound level
Background sound level, daytime	L_{A90} 49 dB	8.1.3 8.3	Determined using statistical analysis of the unattended sound level meter in conjunction with supplementary attended measurements. Considered representative of receptors on Sadler's Yard.
Background sound level, night-time	L_{A90} 43 dB	8.1.3 8.3	Determined using statistical analysis of the unattended sound level meter measurements. Considered representative of receptors on Sadler's Yard.
Acoustic character correction	+ 3dB	9.2	Penalty of +3dB has been applied for "Other sound characteristics" as the specific sound may be readily distinctive against the residual acoustic environment.
Rating level	23 + 3 = $L_{Ar,Tr}$ 26 dB	9.2	
Excess of rating level over daytime background sound levels	= 26 – 49 = -23 dB	11	Assessment indicates no significant impact from proposed plant items.
Excess of rating level over night-time background sound levels	= 26 – 43 = -17 dB	11	Assessment indicates no significant impact from proposed plant items.
Uncertainty	A sound level logger was installed on the site for a period of 8 days to reduce uncertainty associated with determining the background sound levels. Plant selections for the proposed development have not been finalised and are to be determined at a later date.		

Table 9 BS4142 assessment for Location 2, representative of the commercial receptors on Mayes Street

Location 3 – Dantzic Street

Description	Descriptor and value	Relevant clause	Commentary
Specific sound level	L_{Aeq} 23 dB	7.3.4 7.3.5	Predicted specific sound level
Background sound level, daytime	L_{A90} 49 dB	8.1.3 8.3	Determined using statistical analysis of the unattended sound level meter in conjunction with supplementary attended measurements. Considered representative of receptors on Sadler's Yard.
Background sound level, night-time	L_{A90} 43 dB	8.1.3 8.3	Determined using statistical analysis of the unattended sound level meter measurements. Considered representative of receptors on Sadler's Yard.
Acoustic character correction	+ 3dB	9.2	Penalty of +3dB has been applied for "Other sound characteristics" as the specific sound may be readily distinctive against the residual acoustic environment.
Rating level	25 + 3 = $L_{Ar,Tr}$ 28 dB	9.2	
Excess of rating level over daytime background sound levels	= 23 – 49 = -26 dB	11	Assessment indicates no significant impact from proposed plant items.
Excess of rating level over night-time background sound levels	= 23 – 43 = -20dB	11	Assessment indicates no significant impact from proposed plant items.
Uncertainty	A sound level logger was installed on the site for a period of 8 days to reduce uncertainty associated with determining the background sound levels. Plant selections for the proposed development have not been finalised and are to be determined at a later date.		

Table 10 BS4142 assessment for Location 3 , representative of the commercial receptors on Dantzic Street

Location 4 – New Vic Apartments South

Description	Descriptor and value	Relevant clause	Commentary
Specific sound level	L_{Aeq} 18 dB	7.3.4 7.3.5	Predicted specific sound level
Background sound level, daytime	L_{A90} 49 dB	8.1.3 8.3	Determined using statistical analysis of the unattended sound level meter in conjunction with supplementary attended measurements. Considered representative of receptors on Sadler's Yard.
Background sound level, night-time	L_{A90} 43 dB	8.1.3 8.3	Determined using statistical analysis of the unattended sound level meter measurements. Considered representative of receptors on Sadler's Yard.
Acoustic character correction	+ 3dB	9.2	Penalty of +3dB has been applied for "Other sound characteristics" as the specific sound may be readily distinctive against the residual acoustic environment.
Rating level	25 + 3 = $L_{Ar,Tr}$ 28 dB	9.2	
Excess of rating level over daytime background sound levels	= 18 – 49 = -31 dB	11	Assessment indicates no significant impact from proposed plant items.
Excess of rating level over night-time background sound levels	= 18 – 43 = -25 dB	11	Assessment indicates no significant impact from proposed plant items.
Uncertainty	A sound level logger was installed on the site for a period of 8 days to reduce uncertainty associated with determining the background sound levels. Plant selections for the proposed development have not been finalised and are to be determined at a later date.		

Table 11 BS4142 assessment for Location 4 , representative of the commercial receptors at New Vic Apartments

At the locations of the nearest noise sensitive receptors, the rating level is significantly lower than the background sound level during daytime and night-time for all assessed locations. In BS4142 terms, it is likely that the plant equipment introduced as part of the proposed development would not have an adverse impact for all assessed locations.

5.2 Entertainment Noise emission limits

5.2.1 Entertainment noise to external noise sensitive receptors

MCC guidance for entertainment noise has been outlined above and contains relevant guidance to establish noise emission limit criteria for entertainment venues to residential properties. However, the planning guidance does not stipulate recommended criteria for noise emission limits from entertainment venues to non-residential/commercial receptors such as offices and other entertainment venues, that are considered relevant for this assessment. It is therefore proposed that entertainment noise limit criteria to both residential and commercial receptors adhere to 5dB below the representative background level derived from the sound level survey. It is anticipated that operational office hours for the CIS tower on Dantzic street will not coincide with night time operation of the proposed venue, therefore night time criteria have been omitted from the assessment of receptors on Dantzic Street.

5.2.2 Internal noise

MCC planning guidance does not stipulate criteria for noise intrusion from entertainment venues to office spaces within the same building. However, the criteria for residential developments has been adopted due to the sensitive nature of the office use. It is understood that the offices tenanted by the MoJ are operational from 07:00-21:00, with working conditions that require high levels of speech privacy and concentration.

It is proposed that noise generated from the entertainment venue should be controlled to not exceed an internal ambient level of 30dB L_{Aeq} within the MoJ office spaces during operational office hours. This is based on limiting noise to 10dB below the recommended noise limit in an office in BS8233.

In addition, intrusive noise levels should also not exceed 47dB L_{eq} and 41dB L_{eq} within the 63Hz and 125Hz octave bands respectively. Entertainment noise source levels

In accordance with MCC's planning guidance, the assessment of impact from entertainment noise has been undertaken, referencing multiple representative entertainment noise levels should prospective tenants wish to consider alternate entertainment options in future. Spectra for representative entertainment noise levels that have been used in the assessment are presented in Table 12 below.

Representative noise source	dB(A)	Octave Band Frequency, Hz							
		63	125	250	500	1k	2k	4k	8k
Background music within restaurant	76	72	75	74	74	70	68	62	60
Live music consisting of acoustic or vocal performances within restaurant	79	79	82	81	77	71	70	63	61
Bar with small music system	98	85	83	86	92	95	91	86	82
Amplified live music	101	95	96	96	95	95	90	92	90

Table 12 Representative spectra for possible events

5.3 External noise breakout from entertainment noise

It is understood that the existing building façade consists of solid masonry with curtain wall glazing at lower ground floor level, and solid masonry with single glazing at upper ground floor level. During design consultations, a requirement to assess the option of retrofitting glazing elements with secondary glazing has been expressed.

The assessment of noise break out from proposed entertainment noise sources from the unit to external receptors has been conducted considering two scenarios, presented as follows:

- Scenario 1 – External doors closed, existing glazing without secondary glazing.
- Scenario 2 – External doors closed, with secondary glazing.

Noise breakout calculations from entertainment noise sources to identified noise sensitive receptors for each scenario are presented below.

5.3.1 Scenario 1 - External doors closed, existing glazing without secondary glazing

Representative noise source	Receptor	Target Criteria L_{Aeq}		Predicted level L_{Aeq}	Commentary
		Day	Night		
Background music within restaurant	Sadler's Yard	44	38	17	No exceedance of entertainment noise emission limits predicted
	Mayes Street	44	38	23	No exceedance of entertainment noise emission limits predicted

Representative noise source	Receptor	Target Criteria L_{Aeq}		Predicted level L_{Aeq}	Commentary
		Day	Night		
	Dantzic Street	44	-	10	No exceedance of entertainment noise emission limits predicted
	New Vic Apartments South	44	38	5	No exceedance of entertainment noise emission limits predicted
Live music consisting of acoustic or vocal performances within restaurant	Sadler's Yard	44	38	21	No exceedance of entertainment noise emission limits predicted
	Mayes Street	44	38	28	No exceedance of entertainment noise emission limits predicted
	Dantzic Street	44	-	16	No exceedance of entertainment noise emission limits predicted
	New Vic Apartments South	44	38	9	No exceedance of entertainment noise emission limits predicted
Bar with small music system	Sadler's Yard	44	38	36	No exceedance of entertainment noise emission limits predicted
	Mayes Street	44	38	42	Exceedance of entertainment noise emission limits predicted at night time
	Dantzic Street	44	-	30	No exceedance of entertainment noise emission limits predicted
	New Vic Apartments South	44	38	24	No exceedance of entertainment noise emission limits predicted
Amplified live music	Sadler's Yard	44	38	41	Exceedance of entertainment noise emission limits predicted at night time
	Mayes Street	44	38	47	Exceedance of entertainment noise emission limits predicted
	Dantzic Street	44	-	34	No exceedance of entertainment noise emission limits predicted
	New Vic Apartments South	44	38	29	No exceedance of entertainment noise emission limits predicted

Table 13 Summary of predicted impact from proposed events to nearest noise sensitive receptors - Scenario 1

Table 13 indicates the following:

- Risk of exceedance for 'Bar with small music system' during night time.
- Risk of exceedance for 'Amplified live music' during day and night time.

5.3.2 Scenario 3 - External doors closed with secondary glazing.

Representative noise source	Receptor	Target Criteria L_{Aeq}		Predicted level L_{Aeq}	Commentary
		Day	Night		
Background music within restaurant	Sadler's Yard	44	38	14	No exceedance of entertainment noise emission limits predicted

Representative noise source	Receptor	Target Criteria L_{Aeq}		Predicted level L_{Aeq}	Commentary
		Day	Night		
	Mayes Street	44	38	19	No exceedance of entertainment noise emission limits predicted
	Dantzic Street	44	-	6	No exceedance of entertainment noise emission limits predicted
	New Vic Apartments South	44	38	2	No exceedance of entertainment noise emission limits predicted
Live music consisting of acoustic or vocal performances within restaurant	Sadler's Yard	44	38	17	No exceedance of entertainment noise emission limits predicted
	Mayes Street	44	38	24	No exceedance of entertainment noise emission limits predicted
	Dantzic Street	44	-	7	No exceedance of entertainment noise emission limits predicted
	New Vic Apartments South	44	38	7	No exceedance of entertainment noise emission limits predicted
Bar with small music system	Sadler's Yard	44	38	31	No exceedance of entertainment noise emission limits predicted
	Mayes Street	44	38	37	No exceedance of entertainment noise emission limits predicted
	Dantzic Street	44	-	24	No exceedance of entertainment noise emission limits predicted
	New Vic Apartments South	44	38	19	No exceedance of entertainment noise emission limits predicted
Amplified live music	Sadler's Yard	44	38	37	No exceedance of entertainment noise emission limits predicted
	Mayes Street	44	38	42	Exceedance of entertainment noise emission limits predicted at night time
	Dantzic Street	44	-	29	No exceedance of entertainment noise emission limits predicted
	New Vic Apartments South	44	38	25	No exceedance of entertainment noise emission limits predicted

Table 14 Summary of predicted impact from proposed events to nearest noise sensitive receptors - Scenario 2

Table 14 indicates the following:

- Risk of exceedance only for 'Amplified live music' during night time.

5.4 Internal noise transfer to level 01 offices

It is understood that the existing separating construction between the upper ground floor level and the level 01 office space consists of a 150mm concrete slab with a 150mm raised access floor. Using the representative entertainment noise source data and the measured data from sound insulation testing, noise transfer from the proposed development to the offices is presented below.

	Octave Band Frequency, Hz							
	63	125	250	500	1k	2k	4k	8k
Background music within restaurant dB L_{Aeq}	72	75	74	74	70	68	62	60
Measured sound insulation performance D (dB) of separating floor between upper ground floor retail unit and first floor office accommodation	34	44	51	58	68	73	74	79
Predicted noise level in office space, dB L_{Aeq}	38	31	23	16	2	-5	-12	-19
BS8233 Noise Limit	55	44	35	29	25	22	20	18
MCC Low frequency criteria, dB L_{eq}	47	41	-	-	-	-	-	-

Table 15 Predicted noise levels within L01 office space – background music within restaurants

	Octave Band Frequency, Hz							
	63	125	250	500	1k	2k	4k	8k
Live music consisting of acoustic or vocal performances within restaurant	79	82	81	77	72	70	63	61
Measured performance D (dB) of separating floor between upper ground floor retail unit and first floor office accommodation	34	44	51	58	68	73	74	79
Predicted noise level in office space,L_{aeq}	45	38	30	19	4	-3	-11	-18
BS8233 Noise Limit	55	44	35	29	25	22	20	18
MCC Low frequency criteria, dB L_{eq}	47	41	-	-	-	-	-	-

Table 16 Predicted noise levels within L01 office space – live music consisting of acoustic or vocal performances within restaurants

	Octave Band Frequency, Hz							
	63	125	250	500	1k	2k	4k	8k
Bar with small music system	85	83	86	92	95	91	86	82
Measured performance D (dB) of separating floor between upper ground floor retail unit and first floor office accommodation	34	44	51	58	68	73	74	79
Predicted noise level in office space,L_{aeq}	51	39	36	34	27	18	12	3
BS8233 Noise Limit	55	44	35	29	25	22	20	18
MCC Low frequency criteria, dB L_{eq}	47	41	-	-	-	-	-	-

Table 17 Predicted noise levels within L01 office space – lively bar with background music

	Octave Band Frequency, Hz							
	63	125	250	500	1k	2k	4k	8k
Amplified music	95	96	96	95	95	90	92	90
Measured performance D (dB) of separating floor between upper ground floor retail unit and first floor office accommodation	34	44	51	58	68	73	74	79
Predicted noise level in office space, L_{aeq}	61	52	45	37	27	17	18	11
BS8233 Noise Limit	55	44	35	29	25	22	20	18
MCC Low frequency criteria, dB L_{eq}	47	41	-	-	-	-	-	-

Table 18 Predicted noise levels within L01 office space – amplified music

5.4.1 Discussion

Based on the measured performance of the separating floor between the upper ground floor retail unit and first floor office accommodation, it is recommended that levels representative of background music within a restaurant and live music consisting of acoustic or vocal performances are not exceeded to comply with the proposed criteria during the operational office hours of the MoJ. Outside of operational office hours, limiting noise source levels should be based on the external noise breakout assessment to nearest sensitive receptors.

6. Conclusion

Arup has produced a noise impact assessment report to support a planning application for a retail unit to be tenanted as a restaurant with ancillary bar and public house with provision for live entertainment on the partial floorplate of the lower and upper ground floors of the Redfern Building, Manchester.

An environmental baseline sound survey has been conducted to establish the representative sound levels at the closest identified noise sensitive receptors to the proposed development. The results have been used to establish noise emission criteria for fixed plant and entertainment noise breakout in accordance with identified policy and criteria from Manchester City Council.

Noise impacts from proposed fixed plant at the noise sensitive receptors has been assessed according to BS4142. At all nearest noise sensitive receptors, the rating level for the assumed plant is significantly below the background sound level during daytime and night-time and is unlikely to cause any adverse impact.

Sound insulation of the floor slab separating the upper ground floor and first floor level has been measured. Based on the measured performance, it is recommended that levels representative of background music within a restaurant and live music consisting of acoustic or vocal performances are not exceeded to comply with the proposed criteria during the operational office hours of the MoJ. Outside operational office hours, limiting noise source levels should be based on the external noise breakout assessment to nearest sensitive receptors.

Noise break out from proposed entertainment venue to external receptors has been assessed considering two potential scenarios. Predictions indicate that the proposed introduction of secondary glazing would improve the overall sound insulation performance of the façade. Thus, enabling entertainment noise levels representative of a bar with a small music system without exceeding the assessment criteria.

Appendix A

Glossary of acoustic terminology

A.1 Glossary of acoustic terminology

Decibel

The ratio of sound pressures, which we can hear, is a ratio of 10^6 (one million: one). For convenience, therefore, a logarithmic measurement scale is used. The resulting parameter is called the 'sound pressure level' (L_p) and the associated measurement unit is the decibel (dB). As the decibel is a logarithmic ratio, the laws of logarithmic addition and subtraction apply.

dB(A)

The unit used to define a weighted sound pressure level, which correlates well with the subjective response to sound. The 'A' weighting follows the frequency response of the human ear, which is less sensitive to low and very high frequencies than it is to those in the range 500Hz to 4kHz.

In some statistical descriptors the 'A' weighting forms part of a subscript, such as L_{A10}, L_{A90}, and L_{Aeq} for the 'A' weighted equivalent continuous noise level.

Equivalent continuous sound level

Another index for assessment for overall noise exposure is the equivalent continuous sound level, L_{eq}. This is a notional steady level which would, over a given period of time, deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating levels can be described in terms of a single figure level.

Statistical noise levels

For levels of noise that vary widely with time, for example road traffic noise, it is necessary to employ an index which allows for this variation. The L_{10}, the level exceeded for ten per cent of the time period under consideration, has been adopted in this country for the assessment of road traffic noise. The L_{90}, the level exceeded for ninety per cent of the time, has been adopted to represent the background noise level. The L_1, the level exceeded for one per cent of the time, is representative of the maximum levels recorded during the sample period. A-weighted statistical noise levels are denoted L_{A10}, dBL_{A90} etc. The reference time period (T), is normally included, e.g. $dBL_{A10,\ 5min}$ or $dBL_{A90,\ 8hr}$.

Maximum noise level

This is generally expressed as the maximum A-weighted noise level (L_{Amax}) and represents the maximum instantaneous noise level that occurred with the monitoring period. Certain assessment criteria recommend maximum noise levels to avoid disturbance as well as limits for longer-term averaged noise exposures

Frequency

The rate of repetition of a sound wave. The subjective equivalent in music is pitch. The unit of frequency is the Hertz (Hz), which is identical to cycles per second. A thousand hertz is often denoted kHz, e.g. 2kHz = 2000Hz. Human hearing ranges approximately from 20Hz to 20kHz. For design purposes, the octave bands between 63Hz to 8kHz are generally used. The most commonly used frequency bands are octave bands, in which the mid frequency of each band is twice that of the band below it. For more detailed analysis, each octave band may be split into three one-third octave bands or in some cases, narrow frequency bands.

Sound pressure level

The sound power emitted by a source results in pressure fluctuations in the air, which are heard as sound.

The sound pressure level (Lp) is 10 times the logarithm of the ratio of the measured sound pressure (detected by a microphone) to the reference level of 2×10^{-5} Pa (the threshold of hearing).

Thus Lp (dB) = 10 log $(P1/Pref)^2$ where Pref, the lowest pressure detectable by the ear, is 0.00002 pascals (i.e. $2x10^{-5}$ Pa).

The threshold of hearing is 0dB, while the threshold of pain is approximately 120dB. Normal speech is approximately 60dB(A) or more and a change of 3dB is only just detectable. A change of 10dB is subjectively twice, or half, as loud.

Noise level, dB(A)	Example
130	Threshold of pain
120	Jet aircraft take-off at 100m
110	Chain saw at 1m
100	Inside disco
90	Heavy lorries at 5m
80	Kerbside of busy street
70	Loud radio (in typical domestic room)
60	Office or restaurant
50	Domestic fan heater at 1m
40	Living room
30	Theatre
20	Remote countryside on still night
10	Sound insulated test chamber
0	Threshold of hearing

Appendix B

Baseline Sound Survey

B.1 Introduction

An environmental baseline sound survey has been undertaken to determine the existing sound environment around the proposed site. Attended measurements were made at four locations and one unattended noise logging sound level meter was installed.

The survey was carried out by Holly Cowperthwaite and Danny King of Arup between 10 and 17 April 2025.

B.1.1 Site Description

The proposed unit is located on the lower ground, and ground floor of the Redfern Building in the Victoria area of Manchester City Centre. The building is bounded by commercial adjacencies predominantly consisting of office accommodation, such as the CIS building on Dantzic Street. Additionally, existing bars and entertainment venues are located in the immediate vicinity, such as the New Century Hall on Mayes Street.

B.1.2 Instrumentation

The sound level meters (SLMs), microphones and sound pressure level calibrators used by Arup are Class 1 instruments, conforming to BS EN 61672-1:2013. All Arup instrumentation is calibrated annually and has full traceable calibration to national and international standards, which are undertaken by an accredited calibration laboratory. Calibration certificates can be provided upon request.

The SLMs were checked for correct calibration before and after each series of measurements. No significant fluctuation in level was noted.

The instrumentation is described in Tables B.1 and B.2

Equipment	Description	Manufacturer	Model number	Serial number
Brüel & Kjær 2250 (Kit G) – Used for attended measurement at locations 1-4	Sound level meter	Brüel & Kjær	2250 G4	3001795
	Microphone	Brüel & Kjær	4189	2839721
	Calibrator	Brüel & Kjær	4231	3015461
	Preamplifier	Brüel & Kjær	ZC-0032	18156

Table B.1 Measurement instrumentation – attended

Equipment	Description	Manufacturer	Model number	Serial number
RION NL-52 (Kit H)	Sound level meter	RION	NL-52	00721057
	Microphone	RION	UC-59	22045
	Calibrator	RION	NC-74	34824366
	Preamplifier	RION	NH-25	22163
Kestrel Weather Station (Kit C)	Anemometer	Kestrel	5500L	2119013

Table B.2 Measurement instrumentation – unattended

B.1.3 Measurement Methodology

At each location, the L_{Aeq}, L_{A90}, L_{A10} and L_{Amax} metric parameters were measured and recorded. All broadband measurements were A-weighted and used a fast time constant (0.125s).

At each measurement location, the SLM was mounted on a tripod with the microphone set between 1.2m and 1.5m above local ground level. All measurements were taken under acoustically free-field conditions. The appropriate windshield for the SLM was fitted to the microphone throughout to minimise wind-induced noise.

Measurements of 5 minute duration were made at each location, which was deemed appropriate to provide a good representation of the sound environment.

B.2 Measurement results

The summary tables for each measurement location, provided below, are the arithmetic average of the individual measurements during each time period for L_{A90} and L_{A10}, a logarithmic average for L_{Aeq} and the range of the values for L_{Amax}.

B.2.1 Location 1

Location description:
The measurement location was on Sadler's Yard adjacent from the Redfern Building and Sadler's Cat pub.
Measurement period:
Thu 10/04/2025 12:35 to 14:56

Weather conditions:
Wind speed: <5 ms^{-1}
Wind direction: S
Summary: Warm and dry throughout measurement period, low cloud coverage with very little breeze.

Personnel:
Holly Cowperthwaite and Danny King

Environment and observations:
Throughout the measurement period road traffic noise from the ring road was audible. Additionally, a high number of patrons at Sadler's Cat were outside eating lunch. The latter was the dominant noise source throughout the measurement period.

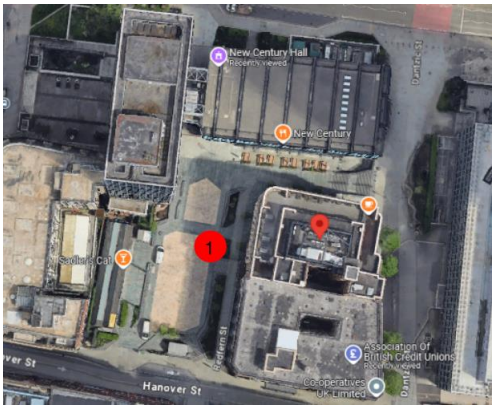




Figure B.2.1 Sound level meter at attended measurement Location 1

Period	Sound Pressure Level, dB(A) (re 20 µPa)			
	L_{90}	L_{eq}	L_{10}	L_{max}
Day (07:00-19:00)	53	59	60	65-80

Table B2.1 Summary of averaged sound pressure levels at location 1

Date	Time		Sound Pressure Level, dB(A) (re 20 µPa)				Comments
	Start [hh:mm]	Duration [hh:mm:ss]	L_{90}	L_{eq}	L_{10}	L_{max}	
10/04/2025	12:35	00:05:00	53	58	59	79	Lots of people sat around eating lunch chatting. Traffic noise from ring road and Corporation Street audible. Delivery vans unloading on Hanover Street
10/04/2025	12:42	00:05:00	53	57	59	74	Lots of people sat around eating lunch chatting. Traffic noise from ring road and Corporation Street audible. Reversing alarm from Lorry audible.
10/04/2025	12:47	00:05:00	53	56	58	65	Lots of people sat around eating lunch chatting. Traffic noise from ring road and Corporation Street audible. Lorry beeping
10/04/2025	14:23	00:05:00	52	56	59	69	Increased number of patrons at Sadler's Cat pub, encroaching closer to the meter. Traffic noise from ring road and Corporation Street audible.
10/04/2025	14:46	00:05:00	52	59	62	73	Patron noise from Sadler's cat pub. Traffic noise from ring road and Corporation Street audible.
10/04/2025	14:51	00:05:00	55	60	66	80	Traffic noise from ring road and Corporation Street audible. Metallic banging noise audible, appearing to emanate from New Century Hall.

Table B2.2 Measured sound pressure levels at location 1

B.2.2 Location 2

Location description:
The measurement location was on Mayes Street, adjacent from the Redfern Building and New Century Hall.
Measurement period:
Thu 10/04/2025 13:14 to 15:35

Weather conditions:
Wind speed: <5 ms^{-1}
Wind direction: S
Summary: Warm and dry throughout measurement period, low cloud coverage with very little breeze.

Personnel:
Holly Cowperthwaite and Danny King

Environment and observations:
Road noise from the Ring Road was present throughout the measurement period. Initially this was identified as the dominant source whilst no patrons were outside the New Century Hall. During the second round of measurements commencing at 15:20, patron noise was then identified as the dominant noise source.





Figure B.2.2 Sound level meter at attended measurement Location 2

Period	Sound Pressure Level, dB(A) (re 20 µPa)			
	L_{90}	L_{eq}	L_{10}	L_{max}

Day (07:00-19:00)	52	57	63	65-81

Table B2.1 Summary of averaged sound pressure levels at location 2

Date	Time		Sound Pressure Level, dB(A) (re 20 µPa)				Comments
	Start [hh:mm]	Duration [hh:mm:ss]	L_{90}	L_{eq}	L_{10}	L_{max}	
10/04/2025	13:14	00:05:00	51	54	60	71	Less patrons observed at this location. No patrons outside New Century Hall during this measurement. Traffic noise from Ring Road and Corporation Street audible and considered to be dominant noise source.
10/04/2025	13:20	00:05:00	50	53	57	72	Less patrons observed at this location. No patrons outside New Century Hall during this measurement. Traffic noise from Ring Road and Corporation Street audible and considered to be dominant noise source.
10/04/2025	13:25	00:05:00	51	54	61	65	Less patrons observed at this location. No patrons outside New Century Hall during this measurement. Traffic noise from Ring Road Corporation Street audible and considered to be dominant noise source.
10/04/2025	15:20	00:05:00	54	57	63	68	Increased number of patrons outside New Century Hall, identified as the dominant noise source during measurement. Traffic noise from Ring Road and Corporation Street audible
10/04/2025	15:25	00:05:00	54	59	66	71	Increased number of patrons outside New Century Hall, identified as the dominant noise source during measurement. Traffic noise from Ring Road and Corporation Street audible
10/04/2025	15:30	00:05:00	54	59	67	81	Increased number of patrons outside New Century Hall, identified as the dominant noise source during measurement period. Traffic noise from Ring Road and Corporation Street audible L_{max} value from door slamming at New Century Hall.

Table B2.2 Measured sound pressure levels at location 2

B.2.3 Location 3

Location description:
The measurement location was on
Measurement period:
Thu 10/04/2025 13:31 to 16:02

Weather conditions:
Wind speed: <5 ms^{-1}
Wind direction: S
Summary: Warm and dry throughout measurement period, low cloud coverage with very little breeze.

Personnel:
Holly Cowperthwaite and Danny King

Environment and observations:
Throughout the measurement period road traffic noise from the ring road was audible and has been identified as the dominant noise source.

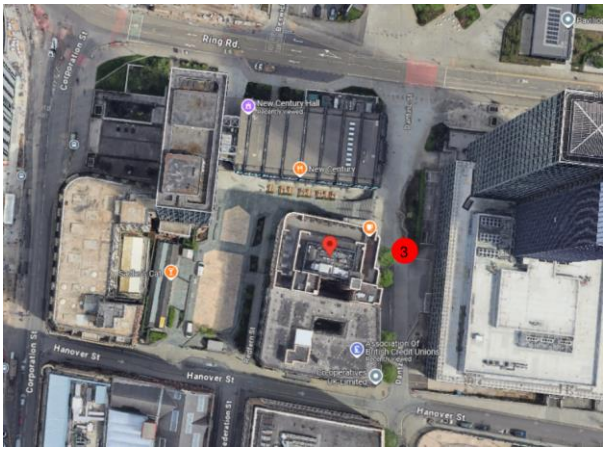




Figure B.2.2 Sound level meter at attended measurement Location 3

Period	Sound Pressure Level, dB(A) (re 20 µPa)			
	L_{90}	L_{eq}	L_{10}	L_{max}
Day (07:00-19:00)	52	57	59	67-75

Table B2.1 Summary of averaged sound pressure levels at location 3

Date	Time		Sound Pressure Level, dB(A) (re 20 µPa)				Comments
	Start [hh:mm]	Duration [hh:mm:ss]	L_{90}	L_{eq}	L_{10}	L_{max}	
10/04/2025	13:31	00:05:00	52	55	57	69	Lots of pedestrians walking past the meter chatting. Regular noise from pedestrian crossing audible. Traffic noise from the ring road audible throughout measurement period. This was identified as the dominant noise source during the measurement period.
10/04/2025	13:37	00:05:00	52	56	58	67	Lots of pedestrians walking past the meter chatting. Regular noise from pedestrian crossing audible. Traffic noise from the ring road audible throughout measurement period. This was identified as the dominant noise source during the measurement period.
10/04/2025	13:42	00:05:00	51	55	58	67	Lots of pedestrians walking past the meter chatting. Regular noise from pedestrian crossing audible. Traffic noise from the ring road audible throughout measurement period. This was identified as the dominant noise source during the measurement period.
10/04/2025	15:46	00:05:00	54	58	60	75	Lots of pedestrians walking past the meter chatting. Regular noise from pedestrian crossing audible. Traffic noise from the ring road audible throughout measurement period. This was identified as the dominant noise source during the measurement period.
10/04/2025	15:51	00:05:00	52	56	59	67	Lots of pedestrians walking past the meter chatting. Regular noise from pedestrian crossing audible. Traffic noise from the ring road audible throughout measurement period. This was identified as the dominant noise source during the measurement period.

10/04/2025	15:57	00:05:00	54	59	62	74	Lots of pedestrians walking past the meter chatting. Regular noise from pedestrian crossing audible. Traffic noise from the ring road audible throughout measurement period. This was identified as the dominant noise source during the measurement period. Loud vehicle noise from car backfiring on ring road $L_{max.}$

Table B2.2 Measured sound pressure levels at location 3

B.2.4 Location 4

Location description:
The measurement location was located outside the entrance of the New Vic apartments south, identified as the nearest noise sensitive residential receptor.
Measurement period:
Thu 10/04/2025 12:55 to 15:15

Weather conditions:
Wind speed: <5 ms^{-1}
Wind direction: S
Summary: Warm and dry throughout measurement period, low cloud coverage with very little breeze.

Personnel:
Holly Cowperthwaite and Danny King

Environment and observations:

Noise from road traffic along Corporation Street and the Ring Road has been identified as the dominant noise source at the location.

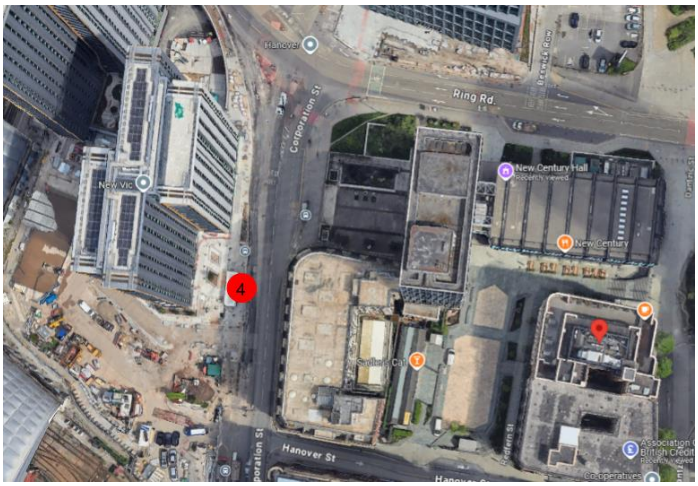




Figure B.2.2 Sound level meter at attended measurement Location 4

Period	Sound Pressure Level, dB(A) (re 20 µPa)			
	L_{90}	L_{eq}	L_{10}	L_{max}
Day (07:00-19:00)	57	64	66	74-86

Table B2.1 Summary of averaged sound pressure levels at location 4

Date	Time		Sound Pressure Level, dB(A) (re 20 µPa)				Comments
	Start [hh:mm]	Duration [hh:mm:ss]	L_{90}	L_{eq}	L_{10}	L_{max}	
10/04/2025	12:55	00:05:00	57	64	67	75	Road traffic on Corporation Street was the dominant noise source. Noise from the train station audible throughout including wheel squeal
10/04/2025	13:02	00:05:00	58	65	68	86	Road traffic on Corporation Street was the dominant noise source. Noise from the train station audible throughout including wheel squeal Vans delivering parcels to the New Vic were observed during the measurement period. L_{max} from car revving passing by the meter.
10/04/2025	13:07	00:05:00	57	64	67	77	Road traffic on Corporation Street was the dominant noise source. Noise from the train station audible throughout including wheel squeal
10/04/2025	14:59	00:05:00	57	64	67	78	Road traffic on Corporation Street was the dominant noise source. Noise from the train station audible throughout including wheel squeal
10/04/2025	15:04	00:05:00	57	62	65	74	Road traffic on Corporation Street was the dominant noise source. Noise from the train station audible throughout including wheel squeal
10/04/2025	15:09	00:05:00	55	63	65	78	Road traffic on Corporation Street was the dominant noise source. Noise from the train station audible throughout including wheel squeal

Table B2.2 Measured sound pressure levels at location 4

B.2.5 Location U1

Location description:
The measurement location was located on the roof of the Redfern Building.
Measurement period:
Thu 10/04/2025 12:55 to 18/04/2025 07:0015

Weather conditions:
During the measurement period temperatures ranged from a minimum of 4°C to a maximum of 26°C. Weather conditions during the logger installation were warm and dry with low cloud coverage. During logger collection the weather was warm with low to medium cloud coverage.
An anemometer was installed at the location. Wind direction was southerly.

Personnel:
Holly Cowperthwaite and Danny King

Environment and observations:
Busy urban area, noise from road traffic sources from the Ring Road and Corporation Street identified as dominant sources at the time of logger installation and collection. Additional significant noise sources were pedestrian and patron noise around Sadler's Yard from staff at commercial premises and patrons of the New Century Hall and Sadler's Cat. Periods in which concerts occurred at New Century Hall have been excluded from data analysis.





Figure B.2.2 Sound level meter at unattended measurement Location U1

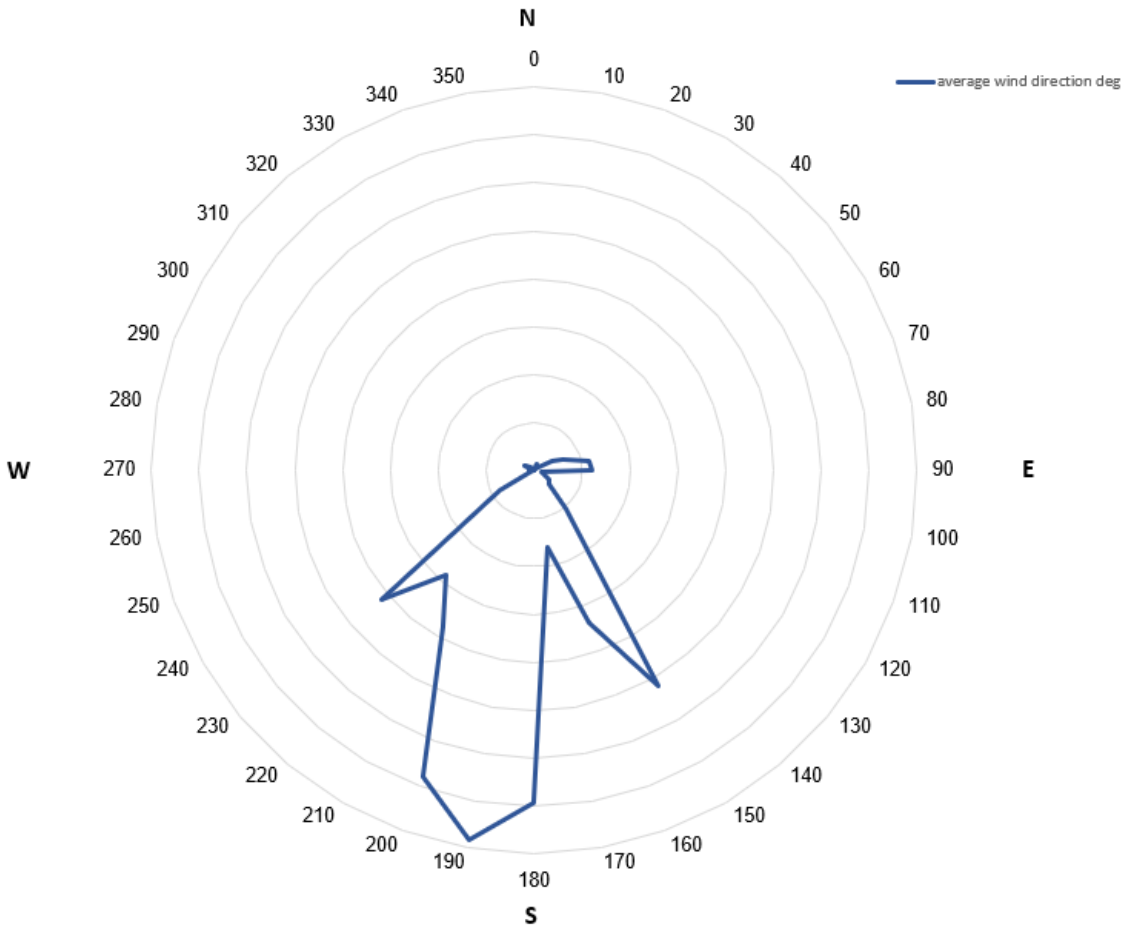


Figure B.2.5 Prevailing wind direction during the survey.

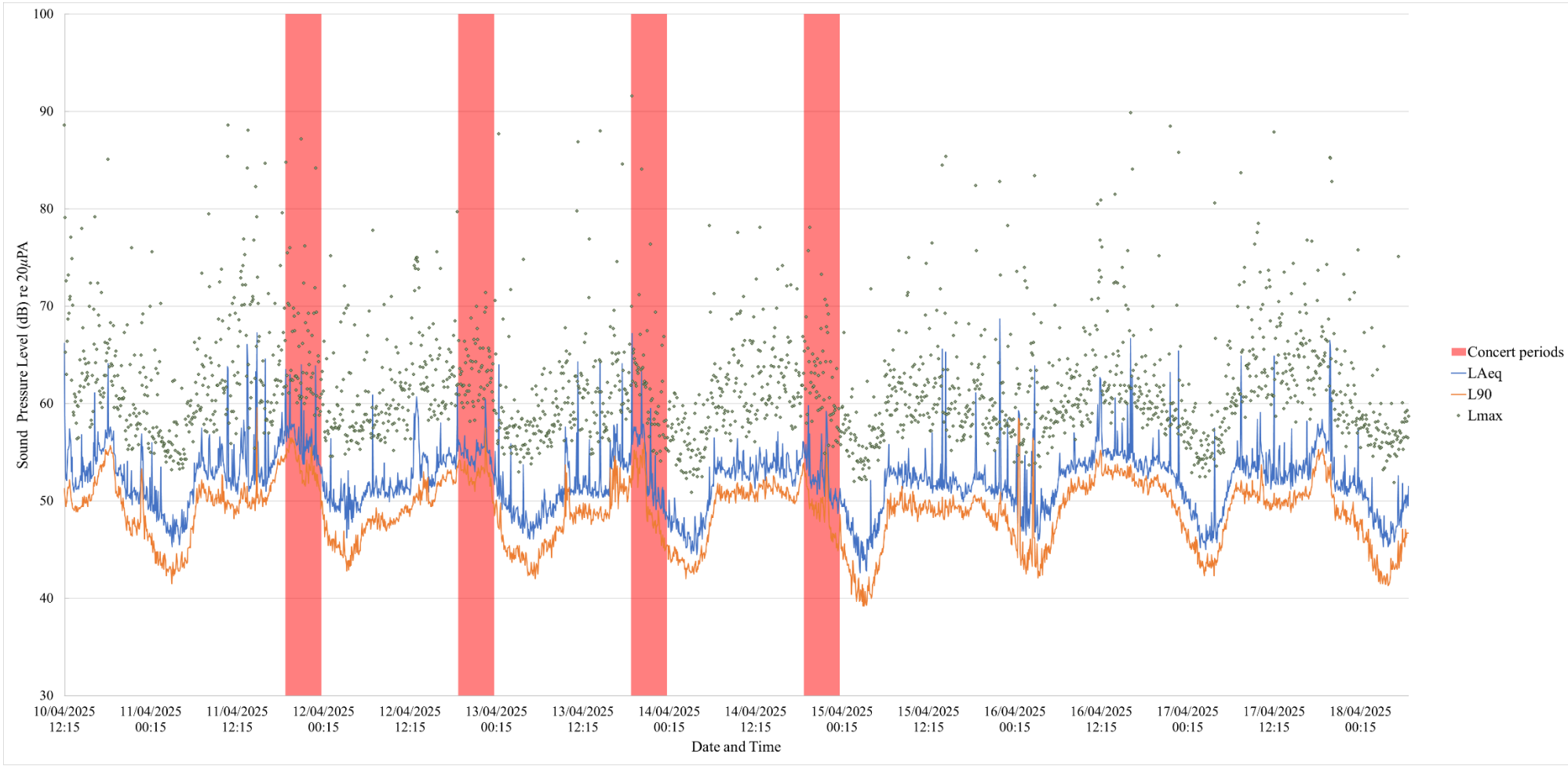


Figure B.2.6 Time History of unattended noise logging at location U1

Appendix C

Sound insulation testing

C.1.1 Introduction

Sound insulation testing has been undertaken to assess the acoustic performance of the existing floor construction between the upper ground floor level and first floor office accommodation above which currently is tenanted by the Ministry of Justice.

C.1.2 Method

The sound insulation testing was undertaken by Adam Thomas and Sam Peckham of Arup on Thursday 1 May 2025. Sound insulation measurements were taken following the procedure set out in BS EN ISO 16283-1:2014[8]. A diffuse sound field was created within the unit using two loudspeaker sources playing pink noise simultaneously. A 30 second moving microphone measurement of the sound levels within the source room was taken. With the sound source still operational, a 30 second sound level measurement was made in a receiver room vertically adjacent within the Level 01 office space. Additional measurement of the internal ambient sound level in the receiver room were made with the sound source turned off. Throughout testing the building was unoccupied.

C.1.3 Equipment

The sound level meters (SLMs), microphones and sound pressure level calibrators used by Arup are Class 1 instruments, conforming to BS EN 61672-1:2013. All Arup instrumentation is calibrated annually and has full traceable calibration to national and international standards, which are undertaken by an accredited calibration laboratory. Calibration certificates can be provided upon request.

The SLM was checked for correct calibration before and after each series of measurements. No significant fluctuation in level was noted throughout each survey period.

The equipment used to undertake the survey is described in Table C1.1

Description	Manufacturer	Model number	Serial number
Sound level meter	B&K	2250	3001795
Microphone	B&K	4189	2839721
Preamplifier	B&K	ZC-0032	18156
Calibrator	B&K	4213	3015461
Amplifier	B&K	2734-A	070010
Dodecahedron loudspeaker	B&K	4292-L	058004
Loudspeaker	JBL	EON 15	15G2230-42793
Minirator signal generator	NTi Audio	221A	GTU839F1D0

Table C1.1 Test equipment sound insulation testing

C.1.4 Sound insulation test results

The measured ambient sound levels in the first floor office space were 31dB $L_{Aeq,5min.}$

Table 6 presents the measured sound level difference between the upper ground floor and first floor office accommodation.

[8] BS EN ISO 16283-1:2014 +A1:2017Acoustics - field measurement of sound insulation in buildings and of building elements. Airborne sound insulation, The British Standards Institution 2018

Test Element	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Separating floor between upper ground floor retail unit and first floor office accommodation	34	44	51	58	68	73	74	79

Table 19 Measured sound level difference, D (dB)

Notes:

It was not possible to conduct measurements with external doors open due to the high number of patrons outside at the New Century Hall.