KP Acoustics Ltd.
info@kpacoustics.com
1 Galena Road, W6 0LT London, UK
+44 (0) 208 222 8778
www.kpacoustics.com

Lina Stores (17 Quay Street) Manchester

Noise Impact Assessment Report
Report 28650.NIA.01

Storey Project
128 City Road
London
United Kingdom
EC1V 2NX

Registered in England Company No. 7947892. KP Acoustics is the Trading Name of KP Acoustics Limited

Report 28650.NIA.01 Revision History			
First Issue Date: 26/07/2024			
A		D	
B		E	
C		F	

Written by:	Checked by:	Approved by:
Jamie Murray MIOA Principal Acoustic Consultant	**Jacob Tyler MIOA** Senior Acoustic Consultant	**Marie Gauthier MIOA** Senior Acoustic Consultant

Disclaimer

KP Acoustics Ltd. has used reasonable skill and care to complete this technical document, within the terms of its brief and contract with the resources devoted to it by agreement with the client. We disclaim any responsibility to the client and others in respect of any matters outside the stated scope. This report is confidential to the client and we accept no responsibility to third parties to whom this report, or any part thereof, is made known. KP Acoustics Ltd. accepts no responsibility for data provided by other bodies and no legal liability arising from the use by other persons of data or opinions contained in this report.

KP Acoustics Ltd. 2024

Contents

1.0 INTRODUCTION 1

2.0 SITE SURVEYS 1

2.1 Overview/Context 1

2.2 Site Description 1

2.3 Environmental Noise Survey Procedure 1

2.4 Measurement Positions 1

2.5 Equipment 2

3.0 RESULTS 3

4.0 SOUND INSULATION INVESTIGATION 4

4.1 Procedure 4

4.2 Equipment 4

4.3 Results 5

5.0 NOISE ASSESSMENT GUIDANCE 5

5.1 Local Authority Guidance 5

5.2 BS4142: 2014 '*Methods for rating and assessing industrial and commercial sound*' 5

6.0 ASSESSMENT OVERVIEW 7

7.0 ENTERTAINMENT NOISE TRANSFER ASSESSMENT 8

7.1 Criteria 8

7.2 Assessment 8

8.0 ENTERTAINMENT NOISE BREAKOUT ASSESSMENT 9

8.1 Criteria 9

8.2 Overview / Parameters 10

8.3 Preliminary Assessment of Noise Breakout 10

9.0 FIXED PLANT NOISE EMISSIONS 11

10.0 CONCLUSION 12

List of Attachments

28650.TH1-2	Environmental Noise Time History
Appendix A	Glossary of Acoustics Terminology

1.0 INTRODUCTION

This report has been prepared by KP Acoustics on behalf of Storey Projects to support a planning application for a new restaurant/bar to be developed within an existing shell unit at 17 Quay Street, Manchester M3 3HN.

This report presents the results of the environmental survey undertaken in order to measure prevailing background noise levels and outlines any necessary mitigation measures, with regards to the following assessments of noise:

- Operational noise transfer to offices above via the building structure.
- Operational noise emissions to nearby receptors via the façade.
- Fixed plant noise emissions to nearby receptors.

2.0 SITE SURVEYS

2.1 Overview/Context

Although a noise survey has previously been undertaken at the site (by others) as part of the wider office redevelopment, a full noise survey has been repeated at the site to capture an additional measurement position at the rear of the site, to be representative of the potentially lower noise levels (and therefore more onerous for the assessment of noise emissions) that may be experienced by the residential receptors at this location, shielded from Quay Street.

2.2 Site Description

The site is bounded by Quay Street to the north, Byrom Street to the west, Artillery Street to the south, and adjacent buildings to the east. The proposed unit is on the ground floor of a mixed use/office development at 17 Quay Street. At the time of the survey, the background noise climate was dominated by road traffic noise from surrounding roads.

2.3 Environmental Noise Survey Procedure

A noise survey was undertaken on the proposed site as shown in Figure 2.1. Continuous automated monitoring was undertaken for the duration of the survey between 15:00 hours on 14/06/2024 and 15:00 hours on 21/06/2024.

Weather conditions were generally dry with light winds and therefore suitable for the measurement of environmental noise.

2.4 Measurement Positions

The environmental noise measurement position, proposed plant installation locations, and the closest noise sensitive receiver relative to the plant installations are described within Table

2.1 and shown within Figure 2.2. Further plant location information is seen in Figures 2.3 and 2.4.

Icon	Descriptor	Location Description
1	Noise Measurement Position 1	The microphone was installed at rooftop level overlook Quay Street, as shown in Figure 2.2. The microphone was located at least 3.5 metres from the nearest surface in free-field conditions.
2	Noise Measurement Position 2	The microphone was installed at rooftop level overlook Byrom Street / Artillery Street, as shown in Figure 2.2. The microphone was located at least 3.5 metres from the nearest surface in free-field conditions.

Table 2.1 Measurement positions and descriptions

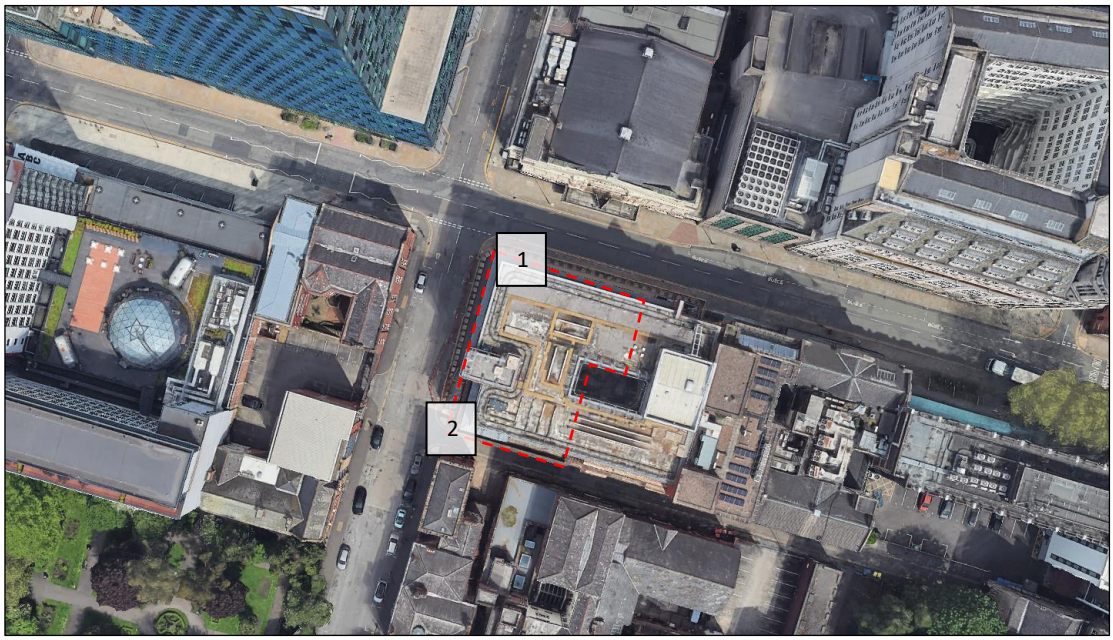

Figure 2.2 Site measurement positions (Image Source: Google Maps)

2.5 Equipment

The equipment calibration was verified before and after use and no abnormalities were observed. The equipment used is described within Table 2.2.

Measurement instrumentation		Serial no.	Date	Cert no.
Larson Davis CAL200 Class 1 Calibrator		17148	21/03/2023	UCRT23/1363
Noise Kit 34	NTI Audio XL2 Class 1 Sound Level Meter	A2A-21069-E0	04/08/2022	UK-22-077

Measurement instrumentation		Serial no.	Date	Cert no.
	Free-field microphone NTI Acoustics MC230A	A23544		
	Preamp NTI Acoustics MA220	11020		
	NTI Audio External Weatherproof Shroud	-	-	-
Noise Kit 35	NTI Audio XL2 Class 1 Sound Level Meter	A2A-21110-E0	04/08/2022	UK-22-080
	Free-field microphone NTI Acoustics MC230A	A23570		
	Preamp NTI Acoustics MA220	10995		
	NTI Audio External Weatherproof Shroud	-	-	-

Table 2.2 Measurement instrumentation

3.0 RESULTS

The $L_{Aeq: 5min}$, $L_{Amax: 5min}$, $L_{A10: 5min}$ and $L_{A90: 5min}$ acoustic parameters were measured throughout the duration of the survey. Measured levels are shown as a time history in Figure 28650.TH1-TH2 and are summarised in Table 3.1.

Typical background noise levels have been determined in accordance with the guidance set out in Appendix A of Manchester City Council 'Planning and Noise' Technical Guidance Document (October 2022).

Position	Typical $L_{A90,15min}$ (dB)	
	Daytime (07:00-23:00)	Night-time (23:00-07:00)
1	55	46
2	50	44

Table 3.1 Measured noise levels for daytime and night time

The typical octave band background sound levels measured at each position are presented below, based on the typical lowest levels during the proposed operational hours.

Position	Typical Background Sound Level ($L_{90,15min}$, dB) at Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
1	51	46	46	41	41	36	26

Position	Typical Background Sound Level ($L_{90,15min}$, dB) at Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
2	52	48	45	42	42	36	29

Table 3.3 Typical background noise levels

4.0 SOUND INSULATION INVESTIGATION

4.1 Procedure

High volume pink noise was generated from a loudspeaker within the ground floor unit, positioned to obtain a diffuse sound field. A spatial average of the resulting one-third octave band noise levels between 100 Hz and 3150 Hz was obtained by using a moving microphone technique over a minimum period of 15 seconds at each of two positions, corrected for the background noise level.

The results of the tests were rated in accordance with BS EN ISO 717-1: 1997 '*Rating of sound insulation in buildings and of building elements. Part 1 Airborne sound insulation*'.

4.2 Equipment

The instrumentation used during the sound insulation investigation is shown in Table 3.1 below.

Instrument	Manufacturer and Type	Serial Number
SLM4 Precision integrating sound level meter & analyser	NTi Audio, XL2-TA Calibration No: UCRT23/1957, UCRT23/1965 & UCRT23/1964 Calibration Dates: 20/07/2023 Calibration Due: 19/07/2025	A2A-09207-E0
Class 1 Calibrator	Larson Davis CAL200 Calibration No: UCRT23/1949 Calibration Dates: 19/07/2023 Calibration Due: 18/07/2024	8932
LS11 Active Loudspeaker	RCF ART 310A	VCCY00254
GEN 13 Pink Noise Source	NTi Audio Minirator MR-PRO	G2P-RAPFP-G1

Table 4.1 Instrumentation used during testing

4.3 Results

The results of the airborne sound insulation testing are presented in below.

Source	Receiver	Measured Level Difference (dB, D) at Octave Band Centre Frequency (Hz)						
		63	125	250	500	1k	2k	4k
Restaurant area	1st floor office	28	29	37	46	48	51	53
Bar area	1st floor office	38	37	50	57	56	66	63

Table 4.2 Testing results

5.0 NOISE ASSESSMENT GUIDANCE

5.1 Local Authority Guidance

The proposed development falls within the jurisdiction of Manchester City Council (MCC). Guidance on the assessment of noise affecting and associated with new developments is provided in Manchester City Council's 'Planning and Noise' Technical Guidance Document (October 2022), the relevant extracts of this guidance are presented below.

Noise Affecting Proposed Development

'Bedrooms (night time - 23.00 - 07.00) 30 dB L_{Aeq} (individual noise events should not normally exceed 45dB $L_{Amax,F}$ by more than 10 times), Living Rooms (daytime - 07.00 - 23.00) 35 dB L_{Aeq}'

Fixed Plant Noise Emissions

'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'.

Noise from Proposed Entertainment Venues

'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'.

Although noise transfer from the restaurant/bar to offices must be considered, there is no fixed criteria for such an assessment.

5.2 BS4142: 2014 '*Methods for rating and assessing industrial and commercial sound*'

British Standard BS4142:2014 '*Methods for rating and assessing industrial and commercial sound*' describes a method for rating and assessing sound of an industrial and/or commercial nature, which includes:

- Sound from industrial and manufacturing processes

- Sound from fixed installations which comprise mechanical and electrical plant and equipment
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises, and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes.

This Standard compares the Rating Level due to the noise source/s under assessment for a one-hour period during the daytime (07:00 – 23:00 hours) and a fifteen-minute period during the night-time (23:00 – 07:00 hours) with the existing background noise level in terms of an L_{A90} when the noise source is not operating.

It should be noted that the Rating Level is the Specific Sound Level in question ($L_{Aeq,\ Tr}$), including any relevant acoustic feature corrections, as follows:

- **Tonality** – '*For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0dB and +6dB for tonality. Subjectively, this can be converted to a penalty of 2dB for a tone which is just perceptible at the noise receptor, 4dB where it is clearly perceptible, and 6dB where it is highly perceptible'*
- **Impulsivity** – '*A correction of up to +9dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3dB for impulsivity which is just perceptible at the noise receptor, 6dB where it is clearly perceptible, and 9dB where it is highly perceptible'*
- **Intermittency** – '*If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied'*
- **Other sound characteristics** – '*Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied'*

Once the Rating Level has been obtained, the representative background sound level is subtracted from the Rating Level to obtain an initial estimate of the impact, as follows:

- Typically, the greater this difference, the greater the magnitude of the impact
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context
- A difference of around +5 dB could 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 there will be an adverse impact or significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound having a low impact, depending on the context

NOTE: Adverse impacts may include but not be limited to annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.

The initial estimate of the impact may then be modified by taking consideration of the context in which the sound occurs.

6.0 ASSESSMENT OVERVIEW

The following sections present our assessment of the various potential noise impacts associated with the development proposals, covering:

- **Entertainment Noise Transfer**: The assessment of noise from the operation of the restaurant / bar to the offices located directly above via the building structure.
- **Entertainment Noise Breakout**: The assessment of noise emissions from the operation of the restaurant / bar breaking out to nearby receptors via the building facade.
- **Fixed Plant Noise Emissions**: Setting plant noise emission limits in accordance with the requirements of MCC.

The proposed development comprises two distinct (and separate) bar and restaurant areas. The front area of the unit will be used as a restaurant, with the rear of the unit (Artillery St) used primarily as a late bar with lively amplified music.

Typical noise levels as used in all subsequent assessment for these uses are set out below.

Description	Typical Noise Level ($L_{eq,5min}$, dB) at Octave Band Centre Frequency (Hz)							dBA
	63	125	250	500	1k	2k	4k	
Restaurant with background music	76	72	71	75	75	75	70	80
Busy bar with DJ	84	80	77	83	82	79	72	86

Table 6.1 Typical noise levels

Nearby receptors have been considered as follows:

- Manchester Opera House
- Sunlight House (offices)

- One Spinningfields (offices)
- Cobden House Chambers (offices)
- Artillery House (apartments)
- 18-24 St Johns (offices)

In the following sections, only the nearest and worst-affected receptors have been presented for brevity, but all have been considered and assessed.

7.0 ENTERTAINMENT NOISE TRANSFER ASSESSMENT

7.1 Criteria

In the absence of specific Local Authority criteria for noise transfer to the offices above, it is recommended that the aim should be to limit noise transfer to 10 dB below the standard internal ambient noise level criteria for offices.

It is therefore proposed to limit noise transfer to no greater than NR 28 L_{eq} in the office space above.

7.2 Assessment

Noise transfer has been assessed based on the typical noise levels in Section 6.0 and the measured sound insulation of the separating floor.

Noise Transfer from Restaurant to Office	Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
Internal noise level (dB L_{eq})	76	72	71	75	75	75	70
Measured Level Difference of Wall (dB D_{nT})	28	29	37	46	48	51	53
Predicted Noise Level within Living Room (dB L_{eq})	48	43	34	29	27	24	17
Predicted Noise Level (NR L_{eq})	27						
Maximum Criterion (NR L_{eq})	28						

Table 8.1 Assessment of noise transfer from restaurant to offices

Noise Transfer from Bar to Office	Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
Internal noise level (dB L_{eq})	84	80	77	83	82	79	72
Measured Level Difference of Wall (dB D_{nT})	38	37	50	57	56	66	63
Predicted Noise Level within Living Room (dB L_{eq})	46	43	27	26	26	13	9
Predicted Noise Level (NR L_{eq})	26						
Maximum Criterion (NR L_{eq})	28						

Table 8.2 Assessment of noise transfer from bar to offices

As shown above, the existing floor should be capable of controlling noise transfer from the proposed unit to the offices above, thus indicating that no further acoustic enhancements of the separating floor should be considered necessary.

8.0 ENTERTAINMENT NOISE BREAKOUT ASSESSMENT

8.1 Criteria

MCC recommends that noise (L_{eq}) breaking out through the building frontage of an entertainment venue should not exceed 5 dB below the background noise level (L_{90}) at all octave band frequencies at the nearest residential windows.

The following limits would therefore apply at the nearest residential receptor for new entertainment noise sources within the proposed development.

Period	Entertainment Noise Level Limit ($L_{Aeq,5min}$, dB) at Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
Proposed Operational Hours	47	41	40	36	36	31	21
[1] *Based upon threshold of audibility, see below.*							

Table 8.1 Entertainment noise limits

At low frequencies, achieving 5 dB below the background levels at this particular site is unnecessarily onerous, the breakout noise limits have therefore been increased to 47 dB and 41 dB at 63 Hz and 125 Hz, respectively. These limits are based upon the MCC criterion for entertainment noise intrusion to bedrooms, which itself is based upon the threshold of audibility at low frequencies. It is expected, therefore, that relaxing the limits in this way will have no effect on the impact to nearby sensitive receptors.

8.2 Overview / Parameters

The assessment has drawn upon typical noise levels as presented in Section 6.0.

Glazing has been installed to the ground floor unit with the following minimum sound reduction performance.

Description	Sound Reduction Index (R dB) at Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
Ground Floor Glazing	19*	25	29	36	41	36	48

Table 8.2 Estimated sound reduction performance of glazing

** Test data not available at 63 Hz, pessimistic performance assumed.*

8.3 Preliminary Assessment of Noise Breakout

Noise breakout has been assessed to the nearest receptor based on standard calculation procedures for reverberant noise breakout and the source noise levels and sound reduction performances in Section 8.2. The resultant external noise level has been calculated using the following equation:

$$SPL_{out} = SPL_{in} - SRI + 10\log_{10}\left(\frac{S}{r^2}\right) - 14$$

Where:
SRI *estimated sound reduction performance of façade element*
r *distance from radiating element to receptors*
S *approximate area of radiating element*

Restaurant to Manchester Opera House	Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
Internal noise level (dB L_{eq})	76	72	71	75	75	75	70
Distance & radiating area propagation correction (dB)	-4	-4	-4	-4	-4	-4	-4
Internal diffuse field to external free-field hemispherical radiation correction (dB)	-14	-14	-14	-14	-14	-14	-14
Façade sound reduction (dB R)	19	25	29	36	41	36	48
External noise level (dB L_{eq})	38	29	24	21	16	21	4
Maximum Criterion (dB L_{eq})	47	41	40	36	36	31	21
Compliant with Criterion ?	✓	✓	✓	✓	✓	✓	✓

Table 8.3 Noise breakout from restaurant to nearest receptor

Bar to Artillery House	Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
Internal noise level (dB L_{eq})	84	80	77	83	82	79	72
Distance & radiating area propagation correction (dB)	-4	-4	-4	-4	-4	-4	-4
Internal diffuse field to external free-field hemispherical radiation correction (dB)	-14	-14	-14	-14	-14	-14	-14
Façade sound reduction (dB R)	19	25	29	36	41	36	48
External noise level (dB L_{eq})	47	37	30	29	23	25	6
Maximum Criterion (dB L_{eq})	47	41	40	36	36	31	21
Compliant with Criterion ?	✓	✓	✓	✓	✓	✓	✓

Table 8.4 Noise breakout from bar to nearest receptor

As demonstrated above, assessment of entertainment noise breakout indicates that noise should be readily controllable through appropriate management of each space and the currently installed glazing.

9.0 FIXED PLANT NOISE EMISSIONS

With consideration for the requirements of Manchester City Council and based upon the typical background sound level measured at the site, the following plant noise emission limits would apply at the nearest noise sensitive receptors.

Period	Plant Noise Emission Limit at the Nearest Receptor
Daytime (07:00 - 23:00)	45 dB $L_{Ar,1h}$
Night-time (23:00 - 07:00)	39 dB $L_{Ar,15min}$

Table 7.1 Fixed plant noise emission limits

Noise shall be assessed in accordance with BS 4142:2014 with corrections applied for any plant emitting noise of a tonal or irregular quality. Emergency plant items (e.g. standby generators, smoke extract equipment) should be subject to more relaxed criteria.

The above limits shall be subject to the final approval of Manchester City Council.

10.0 CONCLUSION

An environmental noise survey has been undertaken at 17 Quay Street, Manchester allowing the assessment of noise emissions from the proposed bar/restaurant on nearby receptors.

An assessment of operational noise breakout to nearby receptors, and noise transfer to the offices above has indicated that the requirements of MCC should be readily achievable with the current construction.

Fixed plant noise emission limits have been set for new items of fixed plant associated with the tenant unit.

17 Quay Street, Manchester - Position 1
Environmental Time History
14/06/2024 to 18/06/2024

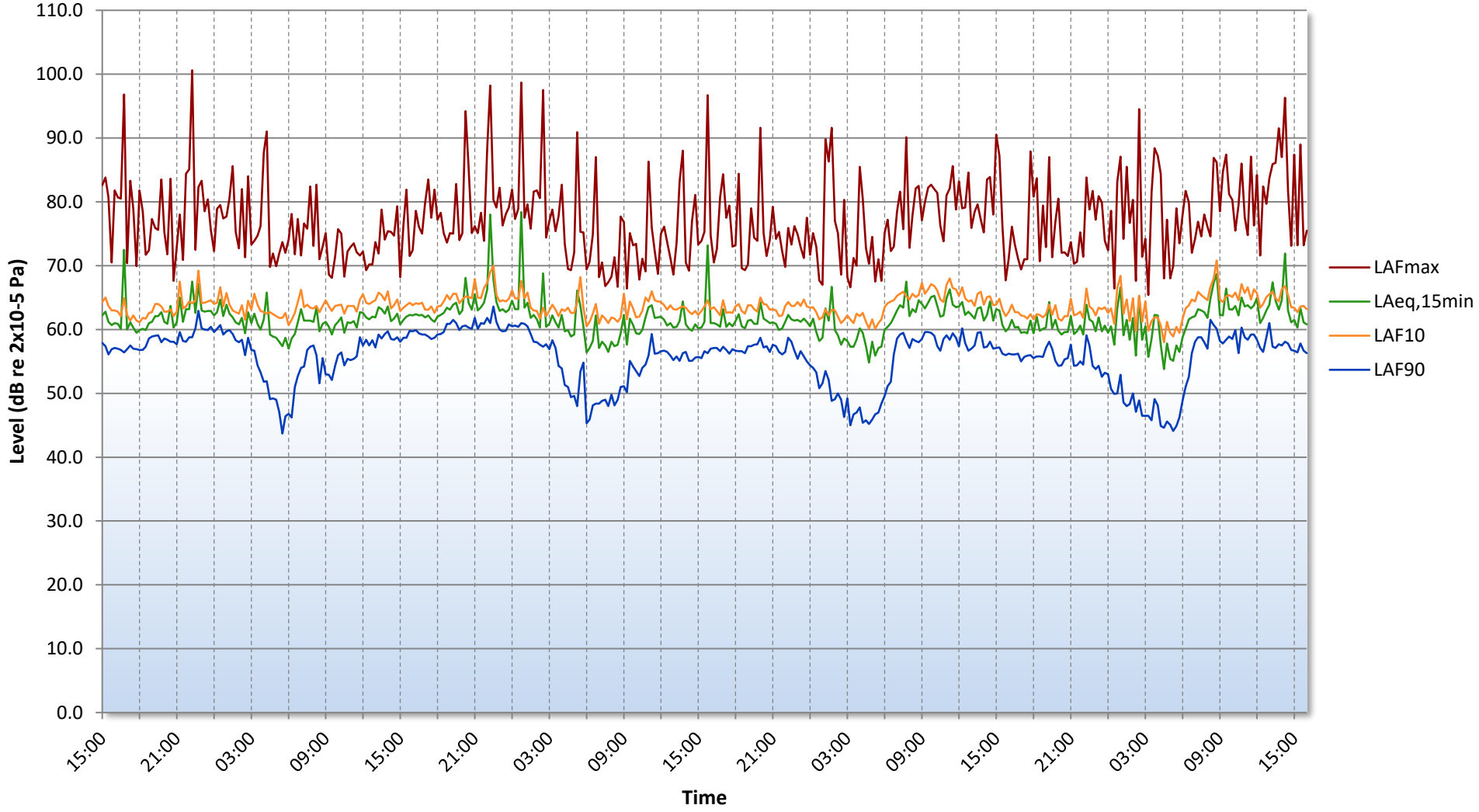

Figure 28650.TH1

17 Quay Street, Manchester - Position 2
Environmental Time History
18/06/2024 to 21/06/2024

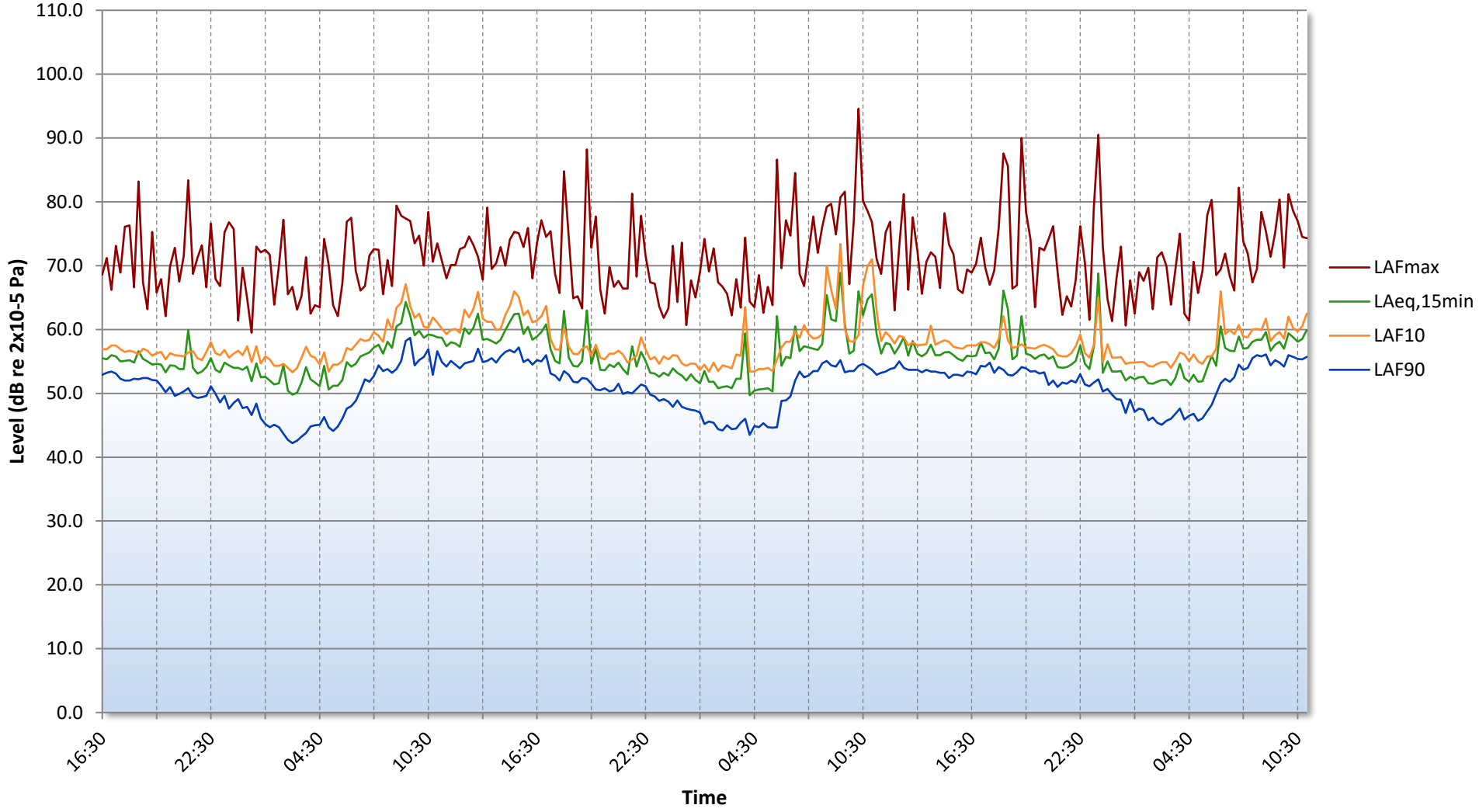

Figure 28650.TH2

APPENDIX A

GENERAL ACOUSTIC TERMINOLOGY

Decibel scale - dB

In practice, when sound intensity or sound pressure is measured, a logarithmic scale is used in which the unit is the 'decibel', dB. This is derived from the human auditory system, where the dynamic range of human hearing is so large, in the order of 10^{13} units, that only a logarithmic scale is the sensible solution for displaying such a range.

Decibel scale, 'A' weighted - dB(A)

The human ear is less sensitive at frequency extremes, below 125Hz and above 16Khz. A sound level meter models the ears variable sensitivity to sound at different frequencies. This is achieved by building a filter into the Sound Level Meter with a similar frequency response to that of the ear, an A-weighted filter where the unit is dB(A).

L_{eq}

The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level L_{eq}. The L_{eq} is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period.

L_{10}

This is the level exceeded for no more than 10% of the time. This parameter is often used as a "not to exceed" criterion for noise.

L_{90}

This is the level exceeded for no more than 90% of the time. This parameter is often used as a descriptor of "background noise" for environmental impact studies.

L_{max}

This is the maximum sound pressure level that has been measured over a period.

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 11 such octave bands whose centre frequencies are defined in accordance with international standards. These centre frequencies are: 16, 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000 and 16000 Hertz.

Environmental noise terms are defined in BS7445, *Description and Measurement of Environmental Noise*.

APPENDIX A

APPLIED ACOUSTIC TERMINOLOGY

Addition of noise from several sources

Noise from different sound sources combines to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than a single source and 4 sources produce a 6dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3dB for each doubling of distance.

Subjective impression of noise

Hearing perception is highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a guide to explain increases or decreases in sound levels for many scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud

Transmission path(s)

The transmission path is the path the sound takes from the source to the receiver. Where multiple paths exist in parallel, the reduction in each path should be calculated and summed at the receiving point. Outdoor barriers can block transmission paths, for example traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and construction.

Ground-borne vibration

In addition to airborne noise levels caused by transportation, construction, and industrial sources there is also the generation of ground-borne vibration to consider. This can lead to structure-borne noise, perceptible vibration, or in rare cases, building damage.

Sound insulation - Absorption within porous materials

Upon encountering a porous material, sound energy is absorbed. Porous materials which are intended to absorb sound are known as absorbents, and usually absorb 50 to 90% of the energy and are frequency dependent. Some are designed to absorb low frequencies, some for high frequencies and more exotic designs being able to absorb very wide ranges of frequencies. The energy is converted into both mechanical movement and heat within the material; both the stiffness and mass of panels affect the sound insulation performance.