



Blackfriars House

Noise Impact Assessment

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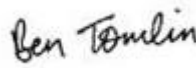
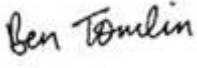
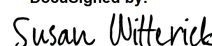
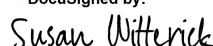
18087 Blackfriars House R01C

Client: Bruntwood

Date: 8 October 2019

Table of Contents

Introduction	2
Assessment Criteria	3
Noise Survey	5
Proposals	7
Activity Noise	8
Blackfriars Bridge Terrace.....	8
Rooftop Restaurant	9
Ground Floor Cafe	10
Conclusion	16
Appendix A: Glossary of Acoustic Terminology	17

Revision	Date	Revision Details	Author	Checked
R01	5/10/2018	Original Issue	 Ben Tomlin BSc MIOA	 Susan Witterick BSc MIOA
R01A	21/8/2019	Added Century Buildings as receptor. Updated for scheme development. Added cumulative assessment for patron noise and amplified music. Added BS4142 assessment for plant. Responded to MCC comments.	 Susan Witterick BSc MIOA	 Ben Tomlin BSc MIOA
R01B	22/8/2019	Updated terrace opening hours	 Susan Witterick BSc MIOA	 Susan Witterick BSc MIOA
R01C	8/10/2019	Removed amplified music and Terrace B.	DocuSigned by:  Susan Witterick BSc MIOA	DocuSigned by:  Susan Witterick BSc MIOA

Introduction

dBx Acoustics Ltd has been appointed by Bruntwood to carry out a noise impact assessment for the proposed ground floor café, rooftop terrace, rooftop restaurant and seating area, and new rooftop HVAC plant at Blackfriars House, Blackfriars Road, Manchester.

A noise survey has been carried out at a location representative of the nearest noise sensitive premises (The Edge, on Clowes Street which is approximately 40m away, and Century Buildings, on Parsonage Gardens which is approximately 50m away). This allows noise emission limits to be set for plant and activity noise, in accordance with the requirements of Manchester City Council (MCC) in support of the planning application for the proposed development.

This report presents an assessment of noise impact from use of the rooftop Terrace area, the rooftop restaurant, the ground floor café, and roof mounted plant.

Assessment Criteria

The following assessment criteria are referred to within this report:

Manchester City Council – Planning & Noise Technical Guidance (December 2015)

This document sets out Manchester City Council's requirements with regard to current guidance and policy, with the aspiration that new developments achieve the highest standards without compromising the health and wellbeing of residents. The guidance refers to the NPPF and NPSE as described below.

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 BS 4142 rating level (see below) of 5 dB L_{Aeq} below the typical background L_{A90} level at the nearest noise sensitive location.

With regard to entertainment noise (e.g. ambient music within the restaurant), MCC's typical requirement is as follows;

Where entertainment noise is proposed the L_{Aeq} (entertainment noise) shall be controlled to 10 dB below the L_{A90} (without entertainment noise) in each octave band at the façade of the nearest noise sensitive location, and internal noise levels at structurally adjoined residential properties in the 63 Hz and 125 Hz octave frequency bands shall be controlled so as not to exceed (in habitable rooms) 47 dB and 41 dB respectively.

In terms of the proposed ground floor café, for commercial uses, MCC require that activity noise should achieve "a rating level no higher than 5dB below the background noise level at the nearest noise sensitive location".

There are no structurally adjoined residential premises to this scheme.

BS 4142:2014 – Methods for Rating and Assessing Industrial and Commercial Sound

BS 4142:2014 sets out a procedure for assessing noise impact whereby a Noise Rating is determined and compared with the existing local background sound level. The MCC guidance refers to a noise rating level for externally mounted ancillary plant.

The Rating Level ($dB_{L_{A,T}}$) is evaluated from the specific noise level by including several, cumulative corrections to account for factors such as distinguishable tone, impulse, intermittency or other readily distinguishable sound characteristics.

BS 4142:2014 seeks to determine a “representative” background sound level, stating that *“...the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods”*.

The assessment of the impact depends upon the margin by which the rating level of the specific sound source exceeds the background sound level. An initial estimate of the impact of the specific sound is made by subtracting the background sound level from the rating level, while considering the following points:

- a) Typically, the greater this difference, the greater the magnitude of the impact.
- b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
- d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

Noise Survey

To assess the sound environment at the site, a survey was carried out between around 23:00h on Thursday 20th and 04:00h on Tuesday 25th September 2018. The survey comprised one primary measurement position, on the western end of the roof of Blackfriars House, as shown on Figure 1, below. It was considered that this location would represent the background sound levels at both The Edge and Century Buildings.

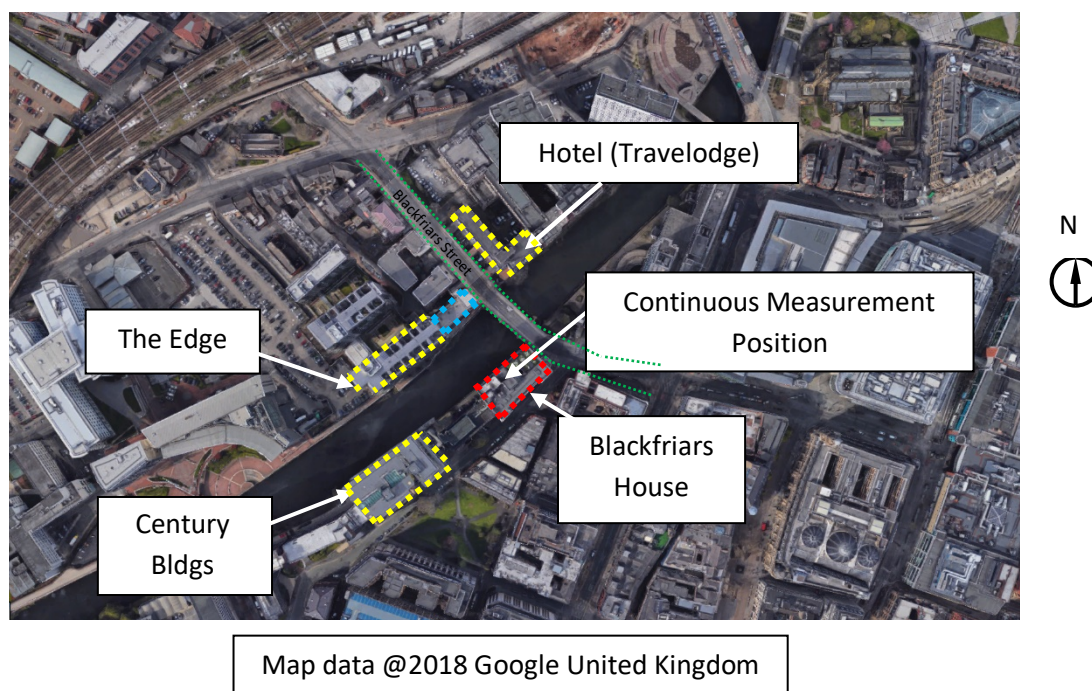


Figure 1: Site Plan Showing Measurement Location

The noise monitoring equipment used during the survey was a CEL 633C Type 1 Sound Level Meter serial number 3921025. On site calibration checks were performed on the meter before and after the measurements using a CEL 1201 sound calibrator serial number 2045151 and were found to be within the permitted tolerance of BS EN 61672-1:2013. All equipment had a valid calibration certificate at the time of the survey and all microphones were fitted with a windshield to prevent wind noise from affecting the measurements.

The microphone was mounted on a tripod approximately 1.5m above the flat roof surface with a direct line of sight to The Edge and Century Buildings.

During the measurement periods, the average temperature was 17°C falling to 5°C at night. There was heavy rain on Thursday 20th and Friday 21st September, and hence the noise levels measured in this period have been discounted. The average wind speed was 2ms⁻¹ with gusts up to 5ms⁻¹.

Measurements were undertaken in accordance with BS 7445-1:2003 *Description and Measurement of Environmental Noise*.

Sound Climate

The surveyor selected the microphone location to be representative of typical sound levels affecting The Edge and Century Buildings.

Subjective observations of the noise climate suggested road traffic noise dominates the noise climate at this location, and hence at residential receptors. The surveyor also observed the noise climate at the façade of the Travelodge hotel and found conditions to be similar.

Survey Results

The measurement results from the continuous noise monitor are shown in Table 1 below.

Date	Period	Ambient Noise Level, $\text{dBL}_{\text{Aeq,T}}$	Background Sound Level, $\text{dBL}_{\text{A90,T}}$
Thursday 20 Sept	Day (07:00-23:00)*	62**	52**
	Night (23:00-07:00)	58**	50**
Friday 21 Sept	Day (07:00-23:00)	60**	52**
	Night (23:00-07:00)	54**	50**
Saturday 22 Sept	Day (07:00-23:00)	55	51
	Night (23:00-07:00)	54	49
Sunday 23 Sept	Day (07:00-23:00)	55	50
	Night (23:00-07:00)	54	48
Monday 24 Sept	Day (07:00-23:00)	57	49
	Night (23:00-07:00)*	53	48

*only part of period measured

**heavy rain and wind observed

Table 1: Summary of day and night time measured noise levels

The measurement data is consistent throughout the survey period (when weather was fine), and there was very little variation in the background noise level L_{A90} between the day and night time periods.

Overall, therefore, a background sound level of $48\text{dBL}_{\text{A90,T}}$ is considered representative of the typical lowest background sound level at the residential properties during both day and night time periods.

The associated spectrum is provided in Table 2, below.

	Noise Level in Octave Band Centre Frequency, Hz							
	63	125	250	500	1000	2000	4000	dBA
Lowest Background, dBL ₉₀	55	50	47	45	43	38	30	48

Table 2: Lowest Measured Background Sound Level Spectrum

Proposals

The proposed roof layout is shown as Figure 2, below.

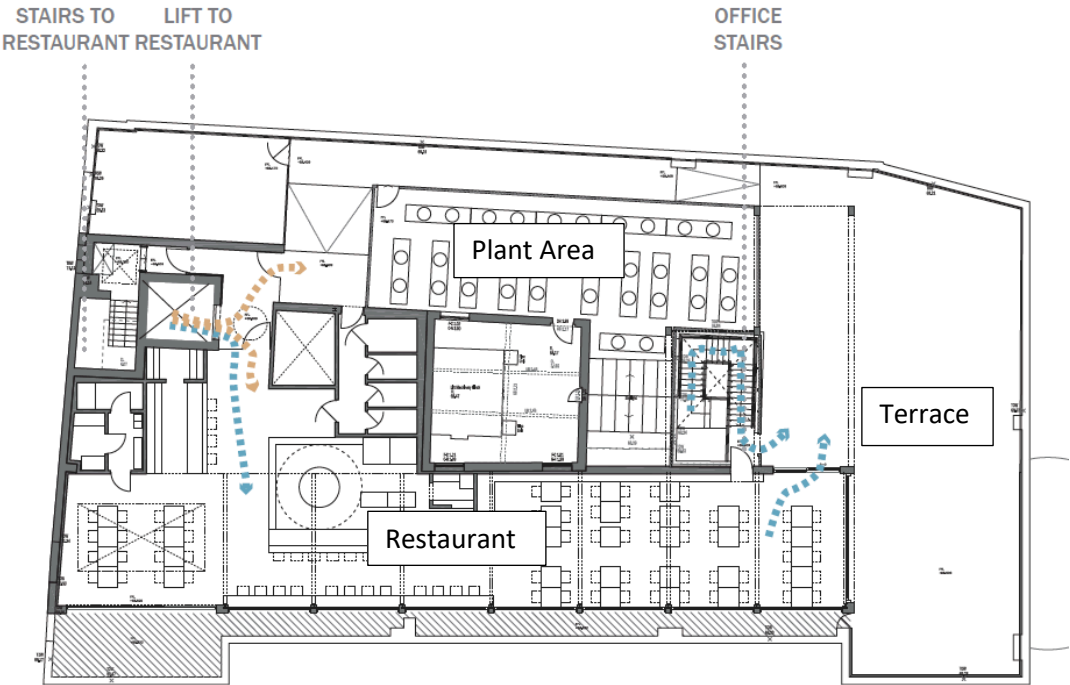


Figure 2: Proposed Roof Layout

The Terrace overlooks Blackfriars Bridge and will operate from 07:00-23:00 on weekdays and Saturdays, and 10:00-23:00 on Sundays and Bank Holidays. This terrace will be used for occasional customer events and as a breakout space for building tenants.

Activity Noise

Blackfriars Bridge Terrace

This terrace is to be used largely as a tenant social area, with occasional events such as yoga and socials. No amplified music will be permitted on the terrace.

This assessment therefore considers a potential worst-case noise impact assessment to the residential properties for a lively social event taking place on the terrace; clearly, events such as yoga would have a much lower impact.

The Edge is most likely to be affected by noise from the Terrace due to its slightly closer proximity and as it does not benefit as significantly from screening from the rooftop structures. The following calculation therefore considers the potential noise impact from the raised voices of people on the roof at an average distance of 60m.

The prediction has been made based on data measured in an anechoic chamber under test conditions at various speech efforts¹. The study found that in an urban environment, with background noise levels of 61 dB, the speech level was measured as 65 dB at 1 metre. This equates to the sound level of a raised male voice when measured in an anechoic chamber. Where background levels were lower, the study found that speech levels dropped to approximately 55 dB. The higher speech level has been used in this assessment to provide a worst case.

A worst case of 80 people on the roof has been used in the calculation. Although there may be 80 people in the external area, the nature of conversation means that there would only ever be, at most, half of the occupants talking at any one time, for this reason 40 noise sources are used in the calculation.

The screening effect of the parapet and rooftop structures has not been considered within the calculation, in order to provide a worst-case assessment of noise impact.

Stage of Calculation	Equivalent Continuous Noise Level L _{Aeq, 1h}
Male voice (raised) at 1 m	65 dB
40 sources at 1 m	81 dB
Corrected for a distance of 60 m	45 dB
Predicted level at The Edge	45 dB

Table 3: Speech Noise From Terrace to The Edge

¹ Speech Levels in Various Noise Environments - Pearsons, Bennett, & Fidell (1977)

The lowest daytime L_{A90} background sound level measured during the noise survey was 49dBA. The predicted sound level arising from 40 simultaneous raised male voices on the terrace is 4dB below this and it is therefore considered that there will be no adverse noise impact on residential properties as a result of use of the terrace even for heavily attended social events.

Rooftop Restaurant

MCC have queried whether there is likely to be a noise issue when the restaurant door is open. Based on a level of 85dBA within the Restaurant (based on measurements made in busy city-centre restaurants), and allowing for a 5dB loss through an open door, the calculation shown in Table 10, below, indicates the likely noise impact at The Edge due to activity within the restaurant when the door to the external area is open.

The restaurant will be fully enclosed, and it is assumed that the external envelope construction will achieve a minimum sound insulation performance of 25dBR_w. Noise breakout via the façade will therefore be more than 10dB below noise breakout via the door, and therefore does not contribute to the assessment. The Edge is closer to the Restaurant than Century Buildings and so in this case represents the most sensitive receptor. There is no direct line of sight between the restaurant door and residential receptors.

The calculation demonstrates that the noise impact with lively activity in the Restaurant with the door open, based on a 'worst case' for noise generation, is compliant with MCC criteria for entertainment noise to be at least 10dB below background in all octave bands at the nearest noise sensitive receptor. The overall sound pressure level is also more than 10dB below the lowest background sound level at the residential receptors.

	Noise Level in Octave Band Centre Frequency, Hz							
	63	125	250	500	1000	2000	4000	dBA
Restaurant Noise Level, dBL _{eq}	73	72	76	77	79	77	70	84
Loss via open door	-5	-5	-5	-5	-5	-5	-5	-5
Screening attenuation (typical)	-10	-10	-10	-10	-10	-10	-10	-10
Distance correction (50m) (20*log(1/50))	-35	-35	-35	-35	-35	-35	-35	-35
Resultant SPL at The Edge from restaurant, dBL _{eq}	23	22	26	27	29	27	20	34
Lowest measured BG, dBL ₉₀	55	50	47	45	43	38	30	48
Exceedance	-32	-28	-21	-18	-14	-11	-10	-14

Table 4: Restaurant (Door Open) to The Edge

Ground Floor Cafe

The café is a small unit located on the ground floor, as identified in Figure 3, below.

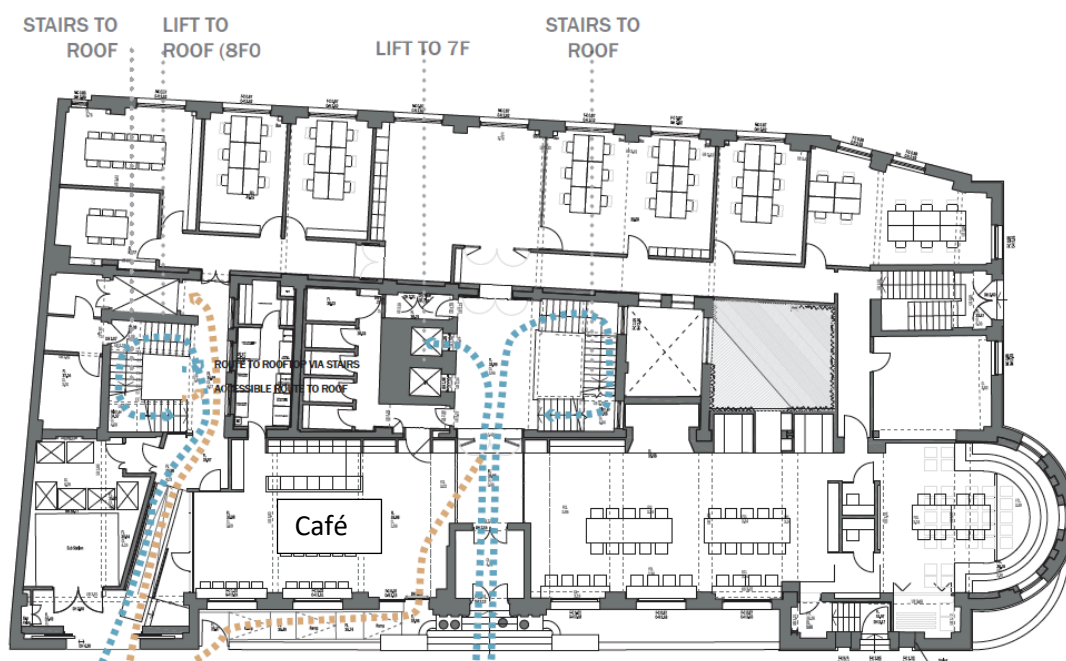


Figure 3: Proposed Ground Floor Layout

It is assumed that the café would only operate in the daytime period 07:00 – 23:00h.

The acoustic design of the café at ground floor is based on a busy cafe, with no live or amplified music. Any potential noisier use will be dealt with by Employers' Requirements for the tenant to enhance sound insulation to meet MCC requirements regarding noise emissions.

Noise emissions from the A3 unit have been predicted based on the following 'worst case' internal noise levels, which are based on typical measurements within a busy cafe where the sound climate is dominated by speech with some amplified background music.

	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dBA
Internal sound pressure level, dB L_{eq}	69	69	66	71	69	65	59	73

Table 5: Assumed Worst Case Sound Pressure Level in Cafe

The calculation below shows the predicted noise impact at the nearest noise sensitive receptor (commercial building on Parsonage immediately opposite) assuming the use of standard thermal double glazing.

Room to Exterior

Date: 8-Oct-19
Job No: 18087
Project: Blackfriars House
Title: Noise Break Out From Café

Frequency	63	125	250	500	1k	2k	4k	8k	A	NR
Room Lp	69	69	66	71	69	65	59	57	73	69
Wall SRI	23	25	20	27	40	44	41	40	47	Composite

Wall dimensions length: 8.00 m
height: 6.00 m

Distance from wall to receive: 10.0 m

Directivity index of location (0, 3, 6 or 9): 3
0 = free space
3 = junction with surface
5 = junction of two surfaces
6 = junction of three surfaces

Frequency	63	125	250	500	1k	2k	4k	8k	A	NR
Receive Lp	29.9	27.9	29.9	28.0	13.1	4.9	1.9	0.9	26.8	23.6
Limit	55	50	47	45	43	38	30	30	Measured L90	
Difference	-25.1	-22.1	-17.1	-17.0	-29.9	-33.1	-28.1	-29.1		

Figure 4: Noise Emissions from Cafe (Ground Floor)

Calculations indicate that, assuming a distance of 10m to the nearest window, cafe noise breakout would easily meet MCC's requirements.

Plant Noise

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 BS 4142 rating level (see below) of 5 dB below the typical background sound level (dB_{LA90}) at the nearest noise sensitive location.

Based on the noise survey data presented above, this means that plant should therefore be designed for a rating level of no more than $43 \text{ dBAL}_{Ar,T}$ to allow night time operation (after 23:00 hours).

The proposed plant comprises 16 no. Mitsubishi PURY-P550YSNW-A R2 units. These are fully screened using a Caice single bank acoustic louvre. The following calculation identifies the specific sound level arising at the nearest noise sensitive receptor (The Edge). The calculation assumes that the units are operating in heating mode which is their loudest condition.

	Noise Level in Octave Band Centre Frequency, Hz							
	63	125	250	500	1000	2000	4000	dBA
Sound pressure level at 1m, single unit	76	71	70	67	62	58	55	68
Correction for 16 units	+12	+12	+12	+12	+12	+12	+12	+12
Louvre attenuation (Caice Louvre)	-4	-4	-6	-8	-11	-11	-11	-11
Screening from roof edge	-10	-10	-10	-10	-10	-10	-10	-10
Distance correction (50m) ($20 \cdot \log(1/50)$)	-35	-35	-35	-35	-35	-35	-35	-35
Specific plant sound level at The Edge, dB_{Leq}	39	44	41	36	28	24	21	34

Table 6: Plant Noise to The Edge

The following calculation considers the specific plant sound level arising at Century Buildings.

	Noise Level in Octave Band Centre Frequency, Hz							
	63	125	250	500	1000	2000	4000	dBA
Sound pressure level at 1m, single unit	76	71	70	67	62	58	55	68
Correction for 16 units	+12	+12	+12	+12	+12	+12	+12	+12
Louvre attenuation (Caice Louvre)	-4	-4	-6	-8	-11	-11	-11	-11
Screening from roof edge	0	0	0	0	0	0	0	0
Distance correction (75m) ($20 \cdot \log(1/75)$)	-38	-38	-38	-38	-38	-38	-38	-38
Specific plant sound level at The Edge, dB_{Leq}	46	41	38	33	25	21	18	31

Table 7: Plant Noise to Century Buildings

It can be seen that The Edge is the receptor most affected by plant noise. A BS4142:2017 assessment for this receptor is therefore presented in Table 16 below. This assessment is based on plant operation beyond 23:00 hours and therefore again represents a worst-case assessment of potential noise impact.

Item	Calculation	Relevant Clause	Comments
Measured background sound level – night time	48 dB $L_{A90,15min}$	8.3	The lowest background sound level measured during the night time period.
Specific sound level	31 dB $L_{Aeq,T}$	7.3.3	A prediction made using the methodology outlined above, includes all sources, screening and distance corrections.
Assessment made during the night time so reference period is 15 minutes		7.2	-
Acoustic feature correction	0 dB	9.2	No acoustically distinct characteristics
Rating Level	31 dB $L_{Ar,T}$	9.2	The predicted Rating Level during the daytime and night-time period.
Background sound level – night-time	48 dB $L_{A90,15min}$	8	The typical background sound level measured.
Excess of Rating Level over background sound level	-17 dB	11	-
Assessment indicates low likelihood of adverse impact		11	Predicted Rating Level does not exceed the lowest measured background level. This is an indication of the development having a low impact.
Uncertainty of the assessment	Minor	10	Background sound level based on repeatable measurements. The predicted Rating Level is based on established prediction methodologies.

Table 8: Plant Noise BS4142 Assessment

It can be seen that plant noise arising at The Edge (and by extension at Century Buildings) is significantly more than 5dB below the lowest measured night-time background sound pressure level. Therefore there is no adverse noise impact anticipated due to plant operation, and the requirements of MCC with regard to plant noise emissions are met.

Risers

MCC have requested consideration of noise within risers affecting occupants within Blackfriars House. The risers are understood to be within the main core of the building and therefore adjacent to ancillary and circulation space rather than passing through office areas. The risers are thought to be generally of masonry construction. No noise impact upon tenants from the proposed plant (extract and supply fan) associated with the ground floor Café is therefore expected. Plant associated with the rooftop commercial unit will be at roof level as detailed above and will not affect riser noise levels.

Parsonage Gardens

It is understood that the impact of noise from the proposed development on Parsonage Gardens has been queried during the consultation process. Although noise measurements were not made in Parsonage Gardens, it can be expected that due to proximity to road traffic, the background sound level at this location during the daytime would be equal to or higher than that measured at roof level. This location will be fully acoustically screened from rooftop activity by the roof edge. It therefore follows that, if noise impact to residential receptors with a direct line of sight to the roof is appropriately controlled, as demonstrated above, there will be no adverse noise impact at Parsonage Gardens.

Conclusion

This report presents the results of an environmental noise survey carried out at Blackfriars House. Noise emissions from building services plant, and from activity associated with the proposed rooftop restaurant, external terrace, and ground floor café unit, have been predicted and assessed in accordance with Manchester City Council requirements. This assessment considers residential receptors both at The Edge and at Century Buildings, and considers noise from plant, use of external terraces, patron noise, and noise breakout from the commercial unit.

It is demonstrated that noise emissions from both plant and activity will be compliant with MCC requirements and that, therefore, no adverse noise impact is expected from the proposed redevelopment of the rooftop and ground floor space at Blackfriars House.

Appendix A: Glossary of Acoustic Terminology

Decibel, dB	A unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. For sound pressure level (L_p) the reference quantity is $2 \times 10^{-5} \text{ N/m}^2$. The sound pressure level existing when microphone measured pressure is $2 \times 10^{-5} \text{ N/m}^2$ is 0 dB, the threshold of hearing.
L	Instantaneous value of Sound Pressure Level (L_p) or Sound Power Level (L_w).
Frequency	Number of cycles per second, measured in hertz (Hz), related to sound pitch.
A weighting	Arithmetic corrections applied to values of L_p according to frequency. When logarithmically summed for all frequencies, the resulting single "A weighted value" becomes comparable with other such values from which a comparative loudness judgement can be made, then, without knowledge of frequency content of the source.
$L_{eq,T}$	Equivalent continuous level of sound pressure which, if it actually existed for the integration time period T of the measurement, would possess the same energy as the constantly varying values of L_p actually measured.
$L_{Aeq,T}$	Equivalent continuous level of A weighted sound pressure which, if it actually existed for the integration time period, T, of the measurement would possess the same energy as the constantly varying values of L_p actually measured.
$L_{n,T}$	L_p which was exceeded for n% of time, T.
$L_{An,T}$	Level in dBA which was exceeded for n% of time, T.
$L_{max,T}$	The instantaneous maximum sound pressure level which occurred during time, T.
$L_{Amax,T}$	The instantaneous maximum A weighted sound pressure level which occurred during time, T.