



35 Liverpool Road, Manchester

Noise Impact Assessment

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Client: Maurice Shapero

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Revision History

Revision	Date	Revision Details	Author	Checked
R01	29/4/2021	Original Issue	DocuSigned by: <i>Matt Jones</i> 45C749F61A3B42E... Matt Jones MEng AMIOA	DocuSigned by: <i>Ben Tomlin</i> 2DD2C00AF12B454... Ben Tomlin BSc MIOA



Introduction

dBx Acoustics Ltd has been appointed by Maurice Shapero to carry out a noise survey and noise impact assessment for the proposed residential development at 35 Liverpool Road, Manchester, M3 4NN.

The development comprises of converting an existing commercial unit into a single residence. An extension to the rear is also proposed.

A glossary of acoustic terminology has been supplied in Appendix A in order to assist the reader.

Basis of Noise Assessment

The principal aims of the assessment are summarised below:

- Assess the suitability of the site for residential accommodation;
- Control noise breakout from building services and any noise generating uses associated with the proposed development to nearby sensitive receptors.

The noise impact assessment is based on the following:

- Local Authority criteria;
- BS 8233:2014 '*Guidance on sound insulation and noise reduction for buildings*';
- World Health Organisation (2000) '*Guidelines for Community Noise*';
- BS 4142:2014 '*Methods for Rating and Assessing Industrial and Commercial Sound*'.

Manchester City Council: Assessment Criteria

It is understood that Manchester City Council (MCC) use NPSE, BS 8233:2014, WHO Guidelines for Community Noise 1999 and BS 4142:2014 as a basis for their noise impact assessments.

MCC's specific noise requirements are summarised below;

- Bedrooms (night time 23:00-07:00h) 30 dB $L_{Aeq,8h}$ (individual noise events should not normally exceed 45 dB L_{Amax} more than 15 times)
- Living Rooms (daytime – 07:00-23:00h) 35 dB $L_{Aeq,16h}$
- Gardens and terraces (daytime) 55 dB $L_{Aeq,16h}$.

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 ($dB_{L_{Ar,Tr}}$) of 5 dB below the typical background $L_{A90,T}$ level at the nearest noise sensitive location.

Noise Policy Statement for England (NPSE)

NPPF affirms that National Policy Statements form part of the overall framework of national planning policy, and should be a material consideration in decisions on planning applications. The Noise Policy Statement for England came into force in 2010 and states:

This Noise Policy Statement for England (NPSE) should apply to all forms of noise including environmental noise, neighbour noise and neighbourhood noise. The NPSE does not apply to noise in the workplace (occupational noise).

Noise Policy Vision

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

Noise Policy Aims

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

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

The NPPF noise aims widely reflect those in NPSE. The NPSE does however include some context within the explanatory note to assessing noise impact and uses established concepts from toxicology currently being applied to noise impacts, these include:

- **NOEL** – *No Observed Effect Level*. This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
- **SOAEL** – *Significant Observed Adverse Effect Level*. This is the level above which significant adverse effects on health and quality of life occur.
- **LOAEL** – *Lowest Observed Adverse Effect Level*. This is the level above which adverse effects on health and quality of life can be detected.
- However, it is clear that it is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times.

The table on the following page is extracted from the Government's Planning Practice Guidance on noise¹. It summarises the noise exposure hierarchy, based on the likely average response.

Table 1 - Noise Exposure Hierarchy

Perception	Examples of outcomes	Increasing effect level	Action
Not noticeable	No effect	No observed effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life	No observed adverse effect	No specific measures required
		Lowest observed adverse effect level (LOAEL)	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude. E.g. turning up the volume of the television; speaking more loudly; where there is no alternative ventilation, having to close windows are some of the time because of the noise. Potential for some reportedly disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed adverse effect	Mitigate and reduce to a minimum
		Significant observed adverse effect level (SOAEL)	
Noticeable and disruptive	The noise causes material change in behaviour and/or attitude e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep the windows closed most of the time because of the noise. Potential for sleep disturbance result in difficulty in getting to sleep. Premature awakening and difficulty getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant observed adverse effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate the effect of noise leading to psychological stress or psychological effects e.g. regular sleep deprivation/awakening; loss of appetite; significant, medically definable harm e.g. auditoria and non-auditory	Unacceptable adverse effect	Prevent

¹ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69533/pb13750-noise-policy.pdf

BS 8233:2014: 'Guidance on sound insulation and noise reduction for buildings'

Internal Noise Level Limits

BS 8233 gives guidance for noise levels within residential properties. It discusses appropriate criteria for reasonable rest and sleep conditions and provides noise levels which are considered to provide appropriate conditions in accordance with WHO guidelines. The guidance on limits from the standard is reproduced in Table 2, below;

Table 2 - Internal Ambient Noise Limits, BS8233

Activity	Location	07:00 – 23:00 hrs	23:00 – 07:00 hrs
Resting	Living room	35 dB $L_{Aeq,16h}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16h}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16h}$	30 dB $L_{Aeq,8h}$

It should be noted that these levels represent the average noise level over the 16-hour day or 8-hour night period. This potentially means that higher noise levels may be experienced internally over a shorter period of time (e.g. individual passing trams or vehicles). These equivalent noise levels over a period of time are the best representation of the average noise level and are generally the main focus when it comes to evaluating noise exposure.

Under the updates to BS 8233 in 2014, for both day and night time cases, a relaxation of up to 5 dB is considered to provide "reasonable internal conditions" where development is considered necessary or desirable.

To assess the maximum noise levels, the World Health Organisation (WHO) document "Guidelines for Community Noise: 1999" recommends that maximum noise levels ($dB L_{Amax,F}$) do not exceed $45dB L_{Amax,F}$ more than 10-15 times a night.

BS 8233 also states that for traditional external amenity areas, such as gardens and patios, it is desirable that the external ambient noise level does not exceed an upper guideline of 55 dB $L_{Aeq,T}$. It is also recognised in BS 8233 that this may not be achievable in higher noise environments.

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 Rating Level ($dB_{L_{Ar,Tr}}$) 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.

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:

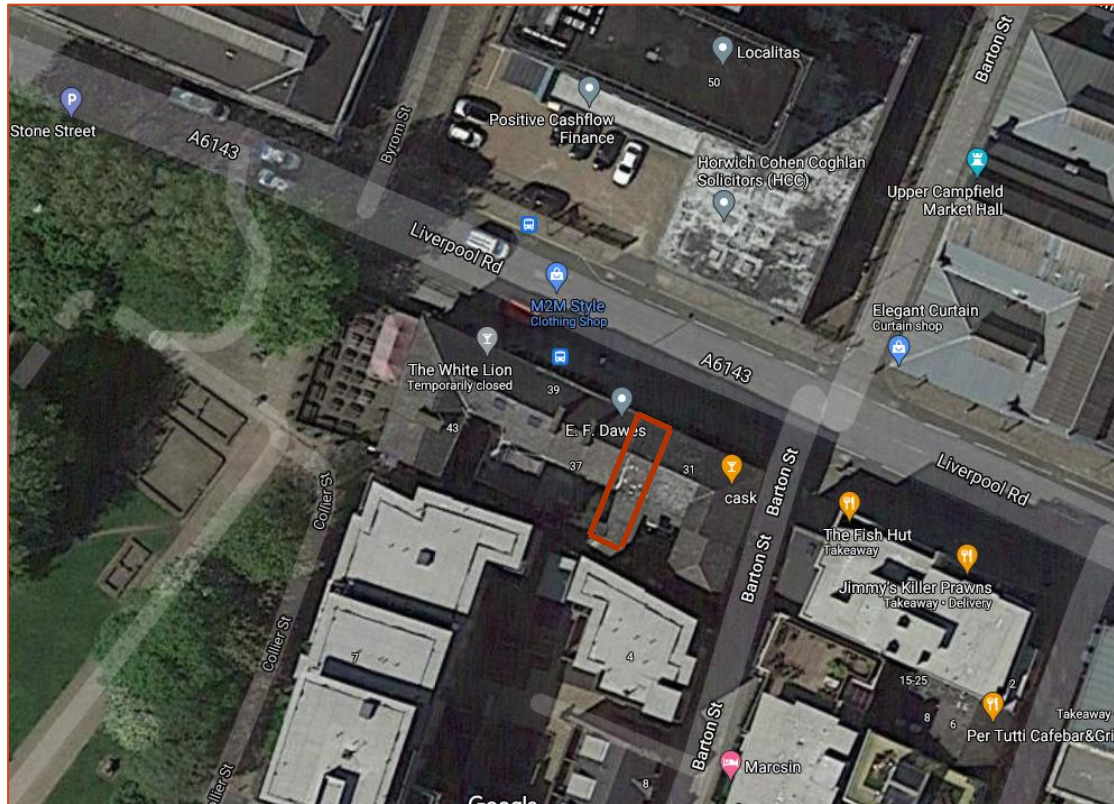
- a) Typically, the greater this difference, the greater the magnitude of the impact.
- b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- c) A difference of around +5 dB is likely to be an indication of an adverse impact, 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.

Site Description

Site Description

The development comprises the refurbishment of an existing (but currently unoccupied) commercial unit building at 35 Liverpool Road, Manchester, M3 4NN, as indicated in Figure 1, below.

Figure 1 – Site Location Plan



The building is located on Liverpool Road, which has frequent traffic of cars and light commercial vehicles, with the occasional HGV. Surrounding the site are a number of bars and pubs, with Cask to the east and The White Lion to the west. The nearest noise sensitive receptors (NNSRs) have been considered to be 39 and 41 Liverpool Road, which are understood to be residential properties.

Noise Sources

During the daytime, the noise across the site was caused by road traffic on Liverpool Road, with background noise being caused by road traffic from the surrounding road network. Maximum noise events observed were caused by HGV pass-bys on Liverpool Road.

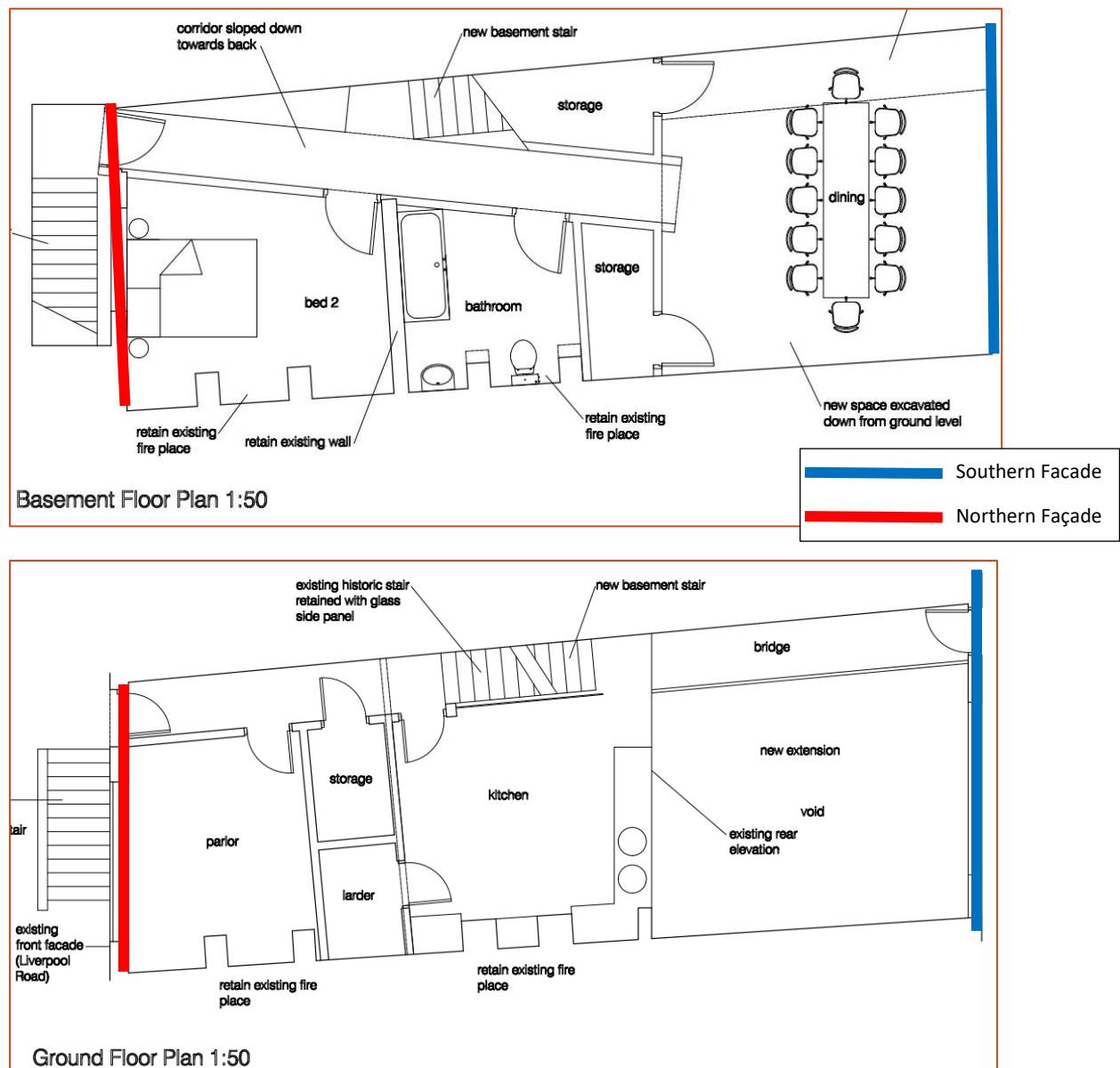
At night, the noise source observed was distant plant operating from the surrounding area. The background source was distant road traffic with maximum noise events observed being caused by HGV passes on Liverpool Street.

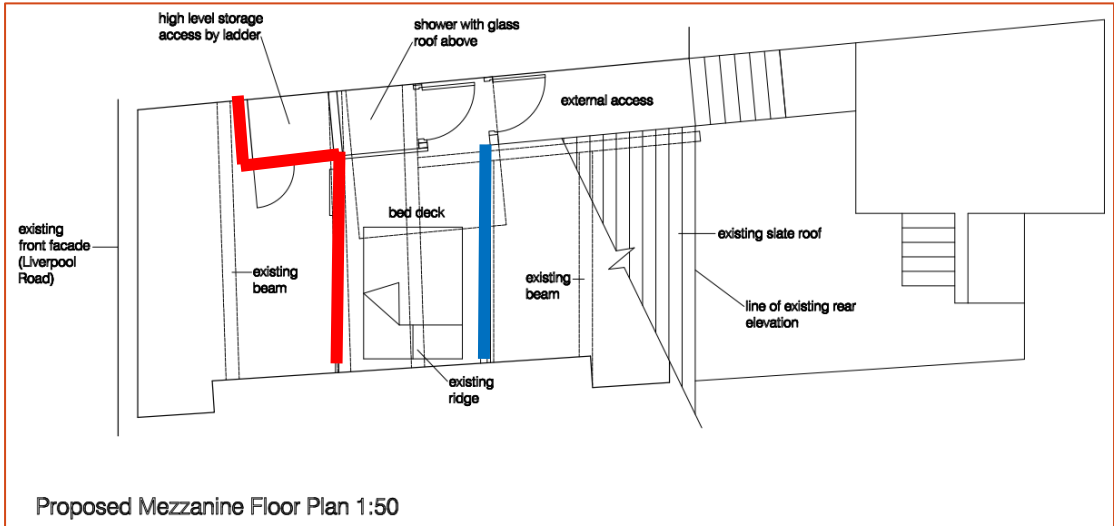
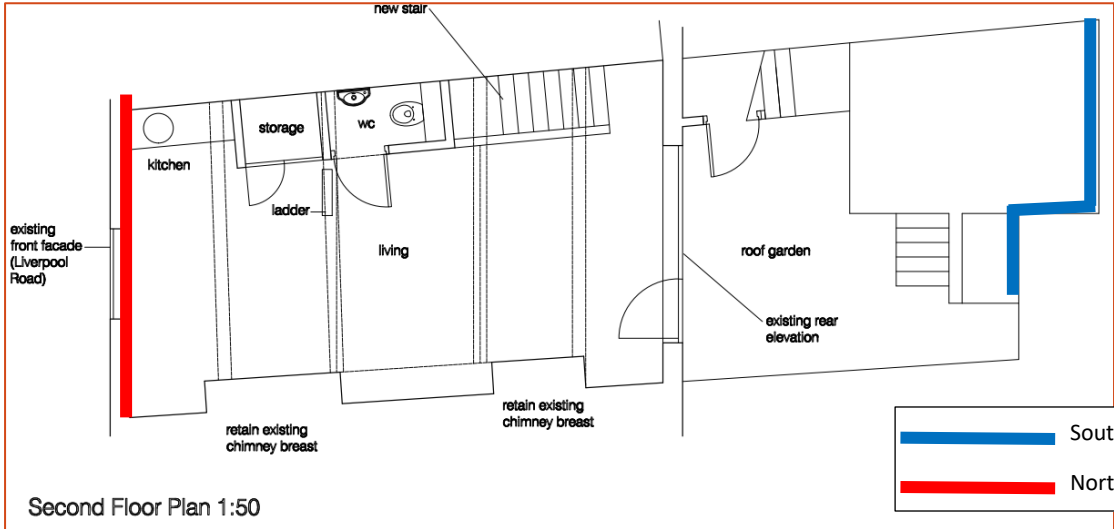
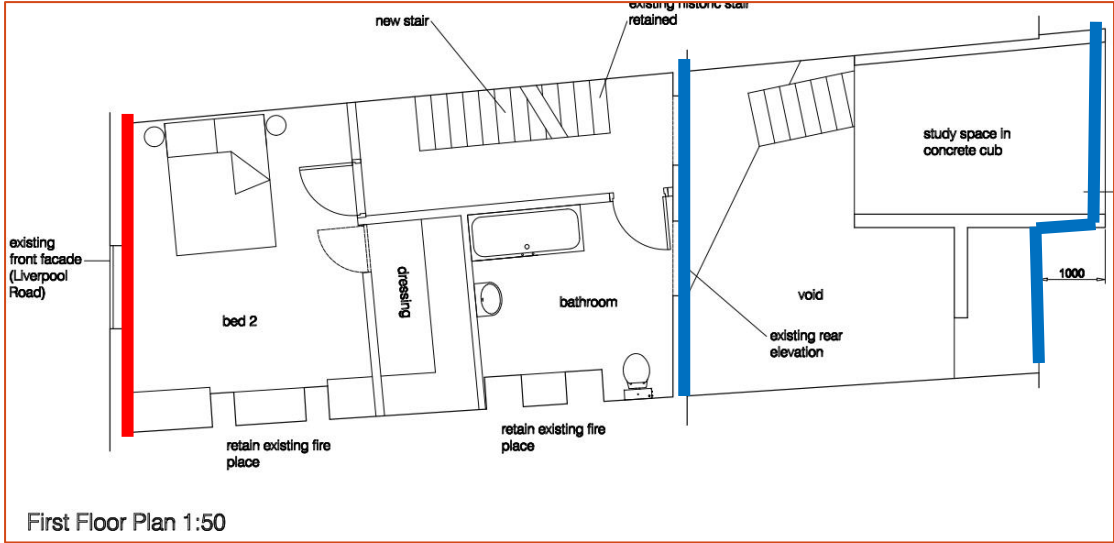
Some noise associated with the nearby bars/pubs would also be expected during the night-time period when COVID restrictions are fully lifted. This is discussed in the *Environmental Noise Survey Results* section of this report, below.

Proposed Development

The proposed development comprises one house shared over the four existing floors with a proposed mezzanine level and extension to the south. Figure 2, below, shows the proposed layout of the building and the façade references.

Figure 2 – Proposed Floor Plans



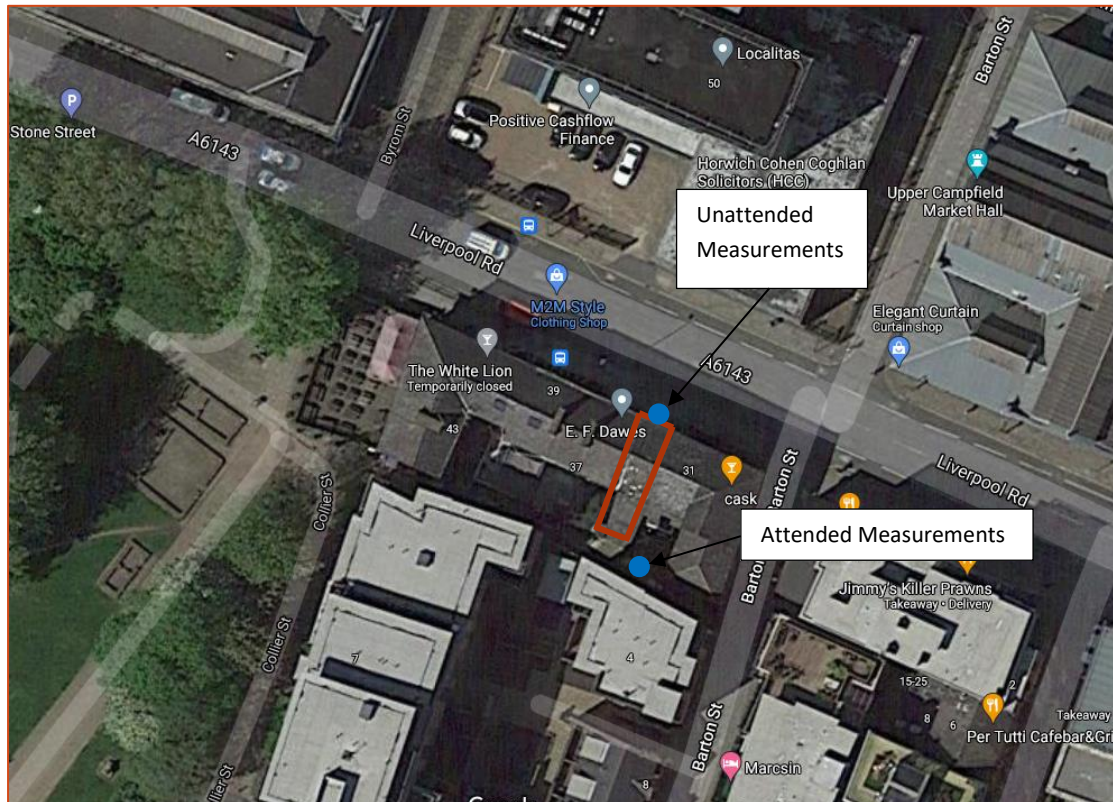


Environmental Noise Survey

Methodology

To assess the noise environment at the site, a unattended noise survey was carried out on Friday 9th and Tuesday 13th April 2021 (daytime and night-time). Additional attended measurements were taken on the night between Tuesday 20th and Wednesday 21st April 2021. The measurement locations are shown in Figure 3, below.

Figure 3 – Site Location Showing Measurement Locations



The unattended measurements were taken out of a second floor window at 35 Liverpool Road, approximately 0.5m from the façade, while the attended measurements were taken down the alley to the rear of the site, approximately 5m from Barton Street.

The night-time attended measurements were carried out between 00:00h and 01:00h, which, as the surrounding pubs/restaurants were closed at that time due to COVID restrictions, is considered representative of the quietest period at night outside of COVID restriction, as the background noise comprised constant distant plant noise.

Weather Conditions

Weather conditions during the measurement periods were generally cloudy and dry. Wind speeds were within suitable parameters for the measurement of environmental noise (i.e. generally under 5 ms⁻¹). All microphones were protected with a windshield for the duration of the survey.

Equipment

The equipment used during the environmental noise survey is detailed in Table 3, below.

Table 3 – Equipment used in the environmental noise survey

Equipment	Manufacturer & Part No. (Unattended/Attended)	Serial Number (Unattended/Attended)
Sound Level Meters	NOR140/Cirrus CR:171C	1405619/G300656
Pre-amplifiers	NOR 1209/Cirrus Pre-amp	15526/9136F
Microphones	NOR 1225/MK:224	168247/211733D
Calibrators	NOR1251/Cirrus CR:515	33827/87921

The sound level meters were calibrated before and after measurements, with no significant drift recorded. An accredited laboratory calibrated the equipment not more than two years prior to the measurements being made, with the exception of the calibrator, which had been calibrated not more than one year prior to the survey.

Environmental Noise Survey Results

Measured Unattended Noise Levels

A summary of the unattended noise levels measured are presented in Table 4, below.

Table 4 – Summary of unattended measured noise levels

Date	Period	Ambient Noise Level $L_{Aeq,T}$ (dB)	Background Noise Level L_{A90} (dB)	Highest maximum Noise Level $L_{Amax,F}$ (dB)
Friday 9 April 2021	Day*	67	53	96
	Night	60	41	93
Saturday 10 April 2021	Day	67	51	103
	Night	61	43	86
Sunday 11 April 2021	Day	65	49	90
	Night	60	45	90
Monday 12 April 2021	Day	68	56	99
	Night	62	44	97

*Indicates only part of the period was measured.

The unattended measurements can be considered as representative of the façade noise levels.

Measured Attended Noise Levels

A summary of the measured attended night-time noise levels is presented in Table 5, below. The measurements were carried out between 00:00h and 01:00h, representative of the quietest period at night, as the background noise was constant plant noise.

Table 5 - Summary of night-time measured noise levels

Start Time (hh:mm)	End Time (hh:mm)	Ambient Noise Level $L_{Aeq,T}$ (dB)	Background Noise Level L_{A90} (dB)	Highest maximum Noise Level $L_{Amax,F}$ (dB)
00:04	00:19	48	42	75
00:19	00:34	48	42	64

Measurements were taken in free-field conditions.

Previously Measured Noise Levels

Given the Covid19 lockdowns in 2021, which are likely to have affected noise levels, a review of noise levels measured before the lockdowns was undertaken, to determine whether the measured noise levels in the survey are representative of the noise environment at the site.

To determine the impact of lockdown restriction/entertainment venue closures, a *Nova Acoustics* report, 'No 39 – 41 Liverpool Road: Noise Impact Assessment and Noise Survey', (MCC Planning reference 117116/LO/20107) has been reviewed.

The measured noise levels detailed in this report are summarised in Table 6, below;

Table 6 - Summary of previously measured noise levels

Period	Ambient Noise Level $L_{Aeq,T}$ (dB)	Background Noise Level $L_{A90,T}$ (dB)	Highest maximum Noise Level $L_{Amax,F}$ (dB)	Typical Maximum Noise Level $L_{Amax,F}$ (dB)
Daytime	69	63	103	86
Night-time	69	62	100	87

As shown in Table 6, the measured daytime and night-time ambient noise levels are the same during normal conditions. The daytime levels are similar to those measured by dBx Acoustics, but night-time noise levels are significantly higher than those measured during Covid restrictions. The difference in the night-time ambient noise levels are likely due to the pubs/bars in the surrounding area being open at the time of the survey.

Noise Levels Used In The Assessment

With the previously measured daytime and night-time ambient noise levels being the same, using the same value for the daytime and night-time noise levels in this assessment would be representative of the noise environment of the site under normal conditions. The highest measured daytime ambient noise level of **68 dBL_{Aeq,16hour}** has therefore also been used as the night-time ambient noise level in the assessment.

To assess the maximum noise levels impacting the site, the number of maximum noise levels should be considered. The maximum noise levels shown in Tables 4, 5 and 6 are the highest maximum noise levels measured, however, these only occurred once and can be considered as atypical. The typical maximum noise level used in the assessment is **82dBL_{AF,max}** as this presents the 'typical' maximum noise level, exceeded just 10 times over the survey period.

To assess the noise levels impacting the southern façade, the difference between the measured unattended noise levels on the northern façade and the measured attended noise levels on the southern façade can be calculated. The northern façade noise levels used in the

assessment can then be corrected by this difference to determine the façade noise levels on the southern façade.

The lowest background noise levels measured at the northern and southern facades have been used to set plant noise limits at the respective NNSRs.

The noise levels used in the break-in assessment are presented in Table 7, below.

Table 7 – Noise levels used in the assessment

Facade	Daytime Ambient Noise Level (dB $L_{Aeq,16hour}$)	Daytime Background Noise Level (dB $L_{A90,16hour}$)	Night-time Ambient Noise Level (dB $L_{Aeq,8hour}$)	Night-time Background Noise Level (dB $L_{A90,15min}$)	Night-time Maximum Noise Level (dB $L_{Amax,F}$)
Northern	68	50	68	41	82
Southern	53	43	53	42	68

Building Envelope Sound Insulation

Internal Ambient Noise Criteria

The internal noise criteria which have been adopted for the proposed development using BS 8233:2014 and WHO guidelines are outlined in Table 8, below.

Table 8 – Internal ambient noise criteria

Daytime (07:00 – 23:00 hrs)	Night-time (23:00– 07:00 hrs)	
$L_{Aeq, 16h}$	$L_{Aeq, 8h}$	L_{Amax}
35 dB	30 dB	45 dB ¹
¹ It is generally agreed that this limit would not apply to atypical night-time maximum events. The previous version of BS 8233:1999 stated that, “...individual noise events should not normally exceed 45 dB L_{Amax} .”		

External Noise Break-In Assessment

Based on a reduction in external noise levels to internal noise levels of 15dB for a partially opened window (based WHO 1999), allowable external noise levels are therefore 50dB $L_{Aeq,T}$ outside living rooms in the day, and 45dB $L_{Aeq,T}$ and 60dB $L_{Amax,F}$ outside bedrooms at night.

It can be seen in Table 6 that the **required internal ambient noise levels cannot be achieved using open windows for natural ventilation.**

The required internal ambient noise levels can therefore only be achieved with closed windows, and ventilation will need to be provided via alternative means.

Due to the layout of the second floor and mezzanine layout, the living space with the bed deck has been considered as one room.

Based on the predicted noise levels on each elevation with windows, the requirements for the glazing and ventilators required to achieve the internal ambient and maximum noise level limits have been calculated, as detailed in Table 9, below.

Table 9 – Glazing and Ventilator Sound Insulation Requirements

Façade	Room	Period	Glazing Sound Insulation Performance, $\text{dBR}_w (+ C_{tr})$	Example Glazing Construction, mm	Ventilator Sound Insulation Performance, $\text{dBD}_{n,e,w} (+ C_{tr})$
Northern (Liverpool Road)	Second floor Living space	Daytime & Night-time	31 (25)	4mm/Thermal Cavity/4mm	33 (33)
	Basement and First Floor Bedrooms	Night-time	36 (29)	10mm/Thermal Cavity/4mm	46 (41)
Southern	Second floor Living space - rooflight	Daytime & Night-time	31 (25)	4mm/Thermal Cavity/4mm	26 (22)

The glazing configuration shown in Table 9 is a suggestion only, and alternative configurations may be acoustically suitable.

Windows may be openable at the resident's discretion for purge ventilation purposes, however, must be well sealed when closed. The frames should not downgrade the sound insulation performance of the glazing.

The southern façade also has a door into the second floor living space. This door should have a minimum sound insulation performance of **29 dBR_w and 25 $\text{dBR}_w + C_{tr}$** . An example door construction is a standard solid core door which should be well sealed around the door frame.

The external walls should have a sound insulation performance of at least **10dB** higher than the glazing or door. This would be expected to be achieved with a standard cavity masonry wall.

The sound insulation performance of the roof is not onerous and the existing roof, assuming it is in good condition, should have a sufficient sound insulation performance when lined with plasterboard with mineral fibre in the cavity.

External Amenity Areas

Looking at the provided floor plans, there are external amenity areas located on the southern façade of the proposed development. The predicted external ambient noise level during the daytime period is around $53 \text{ dBL}_{\text{Aeq},16\text{hr}}$, which is below the BS8233 upper guideline value of $55 \text{ dBL}_{\text{Aeq},16\text{hr}}$.

Building Services Noise Emissions

Manchester City Council typically require a plant noise limit of a rating level 5 dB below the background noise levels during the period of operation. The rating level is defined in BS4142 and described above. Based on the background noise levels presented in Table 7, the rating levels at the nearest noise sensitive receptor can be calculated. These are presented in Table 10, below.

Table 10 – Rating levels at the nearest noise sensitive receptor.

Receptor	Facade	Daytime Rating Noise Level (dBL _{Af,Tr})	Night-time Rating Noise Level (dBL _{Af,Tr})
Residences (39 & 41 Liverpool Road)	Northern	45	36
	Southern	38	37

Conclusions

dBx Acoustics Ltd has been appointed by Maurice Shapero to carry out a noise survey and noise impact assessment for the proposed residential development at 35 Liverpool Road, Manchester. The proposed development comprises a single residence over four floors with a mezzanine level.

To assess the noise environment at the site, a noise survey was conducted across the site by dBx Acoustics. This was reviewed in conjunction with previously measured noise data.

Using the measured noise levels, calculations have been undertaken to determine the requirements for glazing and ventilators to achieve internal noise level limits in compliance with BS8233:2014 and Manchester City Council.

It has been determined that natural ventilation by means of openable windows **will not be** appropriate for this site and ventilation via trickle vents is suggested. Minimum sound insulation requirements for glazing, ventilators, external wall, roof and doors have been provided.

Plant noise limits have been set such that plant noise at the nearest noise sensitive properties would not be expected to affect residential amenity.

On this basis, noise should not be a limiting factor in any planning application.

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.