Freetrade Exchange Manchester

Environmental Noise Survey and Plant Noise Assessment Report

29443/PNA1

3 February 2022

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Document Control

Rev	Date	Comment	Prepared by	Authorised by
2	03/02/2022	Minor alterations to wording		
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1	03/02/2022	Updated plant selection		
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Hann Tucker Associates

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1.0 Introduction

A proposal has been put forward for the installation of several new units of plant servicing the Freetrade Exchange in Manchester City Centre.

Hann Tucker Associates have therefore been commissioned to undertake a detailed environmental noise survey and impact assessment of the site for its intended use. The assessment considers the suitability of the new proposed plant and outlines measures required to (a) achieve acceptable internal noise levels within the spaces, and (b) prevent the plant causing an adverse noise impact on the locality.

Our findings and recommendations are presented herein.

2.0 Objectives

To inspect the site to familiarise ourselves with its layout and surroundings in order to identify suitable accessible locations for environmental noise measurements.

To establish by means of an unmanned 24 hour survey the existing L_{Amax}, L_{Aeq} and L_{A90} environmental noise levels at selected secure and accessible on-site positions, using fully computerised noise monitoring equipment.

Measurement procedures shall be in general accordance with British Standard BS 7445 “Description and measurement of environmental noise”.

Measurement procedures shall be in general accordance with those described in BS 4142: 2014, Method for rating industrial noise affecting mixed residential areas, published by the British Standards Institution.

The survey will enable noise emission limits from the development to be identified with reference to the requirements of the Local Authority and/or the application of BS 4142: 2014 and to minimise the possibility of noise nuisance to neighbours.

To assess the noise emissions from the proposed plant, based upon data with which we are provided, and comment upon the acceptability.

To outline noise control measures if required, with reference to the requirements of the Local Authority.

To present our methodology and findings in a detailed Environmental Noise Survey and Plant Noise Impact Assessment Report to accompany the planning application.

3.0 Site Description

3.1 Location

The proposed development is located on Peter Street in Manchester City Centre, and falls under the jurisdiction of Manchester City Council. See site location below.



Location Map (Map Data ©2021 Google)

3.2 Description

The Freetrade Exchange is a 35000 sqft, grade II listed building and under the current proposal, will undergo refurbishment. The lower-ground floor will be converted to a drinking establishment and the upper floors will remain office spaces.

The site is situated within a popular commercial area of the city, with ground floor restaurants and bars in close proximity to the building. The neighbouring building highlighted in yellow and red has a ground floor Brewdog Bar and a Rudy's pizza establishment whilst the upper floors comprise of office spaces. The nearest noise sensitive receptor overlooking the roof is noted to be The Edwardian Hotel, highlighted in purple below. Plant is also being proposed to be

installed on the ground floor at the rear of the building, for this case the nearest noise sensitive receptor are the office windows on Bootle Street.

The site is shown in the Site Plan below.



Site Plan (Map Data ©2021 Google)

4.0 Acoustic Terminology

For an explanation of the acoustic terminology used in this report please refer to Appendix A enclosed.

5.0 Acoustic Standards and Guidelines

5.1 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) was published in March 2010 (i.e. before the NPPF). The NPSE is the overarching statement of noise policy for England and applies to all forms of noise other than occupational noise, setting out the long term vision of Government noise policy which is 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."

"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 Explanatory Note to the NPSE has three concepts for the assessment of noise in this country:

NOEL – No Observed Effect Level
This is the level below which no effect can be detected and below which there is no detectable effect on health and quality of life due to noise.

LOAEL – Lowest Observable Adverse Effect Level
This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level
This is the level above which significant adverse effects on health and quality of life occur.

None of these three levels are defined numerically and for the SOAEL the NPSE makes it clear that the noise level is likely to vary depending upon the noise source, the receptor and the time of day/day of the week, etc. The need for more research to investigate what may represent an SOAEL for noise is acknowledged in the NPSE and the NPSE asserts that not stating specific SOAEL levels provides policy flexibility in the period until there is further evidence and guidance.

The NPSE concludes by explaining in a little more detail how the LOAEL and SOAEL relate to the three NPSE noise policy aims listed above. It starts with the aim of avoiding significant adverse effects on health and quality of life, then addresses the situation where the noise impact falls between the LOAEL and the SOAEL when *"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 final aim envisages pro-active management of noise to improve health and quality of life, again taking into account the guiding principles of sustainable development which include the need to minimise travel distance between housing and employment uses in an area.

5.2 National Planning Policy Framework (NPPF)

The following paragraphs are from the NPPF (published July 2021):

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

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

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

187. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."

Paragraph 185 also references the Noise Policy Statement for England (NPSE). This document does not refer to specific noise levels but instead sets out three aims:

- "Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development."

5.3 Planning Practice Guidance on Noise

Planning Practice Guidance (PPG) under the NPPF has been published by the Government as a web based resource at http://planningguidance.planningportal.gov.uk/blog/guidance/. This includes specific guidance on Noise although, like the NPPF and NPSE the PPG does not provide any quantitative advice. It seeks to illustrate a range of effect levels in terms of examples of outcomes as set out in the following table:

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	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed Adverse Effect Level	
Noticeable and disruptive	The noise causes a 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 windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable hard, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

5.4 Local Authority Requirements

Manchester City Council requirements are outlined in Section 3.0 of Manchester City Council's Planning & Noise Technical Guidance document (December 2015).

Entertainment Noise

Section 3.6.1.2 offers the following guidance regarding entertainment/music noise impacts:

"Noise from entertainment venues e.g. noise from recorded music, live bands, or karaoke, can be particularly annoying for local residents and businesses if it is not adequately contained within the venue.

When considering the potential impact of a proposal for an entertainment venue consultants should consider the overall noise level (L_{eq}) and the 63 Hz and 125 Hz octave band noise levels (L_{eq})."

The document then proposes the following assessment criteria for structurally connected uses, although this only makes reference to the impact on habitable rooms (not offices):

"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}) respectively."

In relation to noise egress MCC state that planning applications 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:*

"Entertainment noise (L_{Aeq}) should be controlled to 10dB below the background noise level (L_{A90}) without the entertainment noise present, in each octave band at the nearest noise sensitive location."

Plant Noise

Section 3.6.1.5.1 outlines that the noise assessment for fixed plant should be based on BS 4142:2014 and the assessment must demonstrate that:

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

5.5 BS 4142:2014 + A1:2019

When setting plant noise emission criteria reference is commonly made to BS 4142:2014 "*Methods for rating and assessing industrial and commercial sound".*

The procedure contained in BS 4142:2014 provides an assessment of the likely effects of sound on people when comparing the specific noise levels from the source with representative background noise levels. Where the noise contains "a tone, impulse or other characteristic" then various corrections can be added to the specific (source) noise level to obtain the "rating level".

BS 4142 states that: *"The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs". An estimation of the impact of the specific noise can be obtained by the difference of the rating noise level and the background noise level and considering the following:*

• *"Typically, the greater this difference, the greater the magnitude of the impact."*

• *"A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context."*

• *"A difference of around +5dB 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 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."*

The determination of the "rating level" and the "background level" are both open to interpretation, depending on the context.

In summary it is not possible to set plant noise emission criteria purely on the basis of BS 4142:2014+A1:2019. It is reasonable to infer from the above, however, that a difference of around -5dB corresponds to "No Observed Effect Level" as defined in the Noise Policy Statement for England. It is also reasonable to infer from the above that if the plant noise rating level does not exceed the existing background noise level outside any noise sensitive residential window then the plant noise is of "low impact".

5.6 World Health Organisation Guidelines on Community Noise

BS8233:2014 is based upon the current World Health Organisation (WHO) guidance "*Guidelines on Community Noise".* A summary of the noise guidelines relevant to the proposed scheme is presented in the table below.

Residential Environment	Critical Health Effect(s)	L_{Aeq}	L_{AFmax}	Time Base
Outdoor living area	Serious annoyance, daytime and evening	55	-	07:00-23:00
	Moderate annoyance, daytime and evening	50	-	07:00-23:00
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	-	07:00-23:00
Inside bedrooms	Sleep disturbance, night-time	30	45	23:00-07:00
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	60	23:00-07:00

These WHO guidelines are based, in almost all cases, on the lower threshold below which the occurrence rates of any particular effect can be assumed to be negligible.

5.7 British Standard BS8233: 2014

British Standard 8233: 2014 "Guidance on sound insulation and noise reduction for buildings" provides guidance for the control of noise in and around buildings.

BS8233:2014 Section 7.7.2 titled "Internal ambient noise levels for dwellings" states:

"In general for steady external noise sources, it is desirable that internal ambient noise levels do not exceed the following guideline values:

Activity	***Location***	***Desirable Internal Ambient Criteria***	
		07:00 - 23:00	***23:00 - 07:00***
Resting	*Living Rooms*	*35 dB $L_{Aeq,16hour}$*	-
Dining	*Dining Room/Area*	*40 dB $L_{Aeq,16hour}$*	-
Sleeping (Daytime Resting)	*Bedroom*	*35 dB $L_{Aeq,16hour}$*	*30 dB $L_{Aeq,8hour}$*

5.8 Statutory Noise Nuisance

There is no quantitative definition of statutory noise nuisance. It is generally accepted however, that if the plant noise level is at least 5dB (or 10dB if tonal) below the minimum background $L_{90(15minutes)}$ at 1m from the nearest noise sensitive residential window, then the risk of a statutory noise nuisance is avoided. By adopting this as a design criterion the guidance contained in BS 4142:2014 should also be complied with.

6.0 Survey Methodology

The survey was undertaken by Cameron Maskew, Assistant Engineer B.Eng (Hons).

6.1 Procedure

Fully automated environmental noise monitoring was undertaken from approximately 11:30 hours on Monday 6th December 2021 to hours 09:00 on Wednesday 8th December 2021.

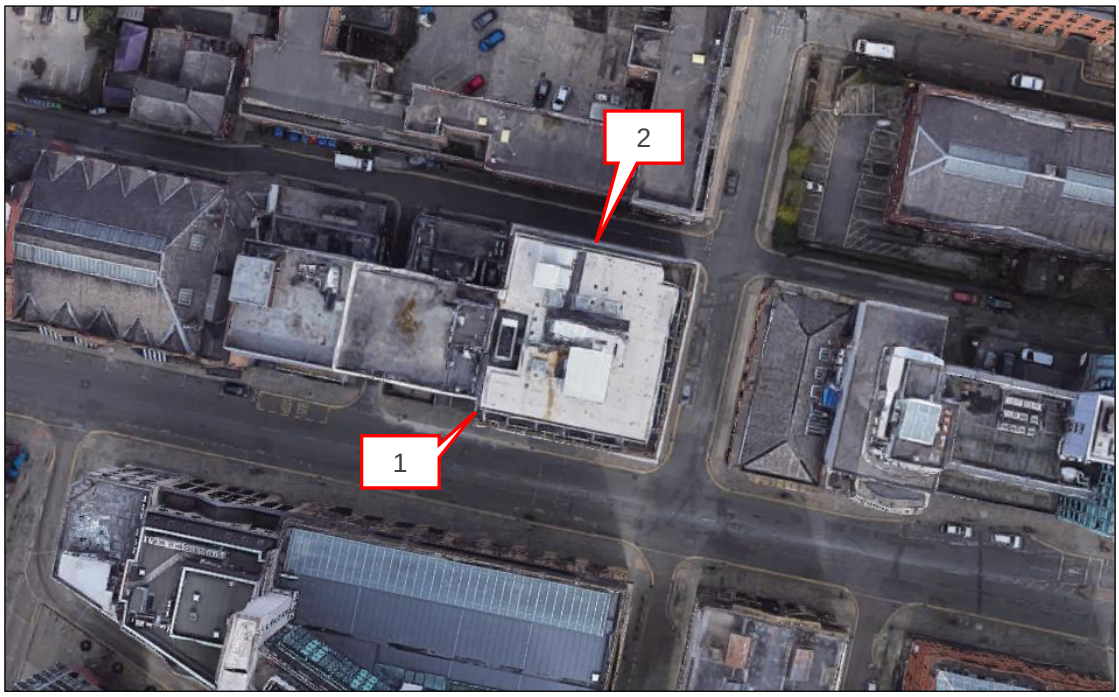
During the periods we were on site the wind conditions were light. The sky was generally overcast with intermittent periods of light rainfall. We understand that generally throughout the survey period the weather conditions were stable These conditions are considered suitable for obtaining representative measurement results.

Measurements were taken continuously of the A-weighted (dBA) L_{90}, L_{eq} and L_{max} sound pressure levels over 15 minute and 5 minute periods.

6.2 Measurement Positions

The noise level measurements were undertaken at 2 positions as described in the table below.

Position No	Type	Description
1	Unattended	To the south of the site, overlooking Peter Street. Microphone in free-field conditions approx. 15m above ground. Sound level meter was mounted to a pole and suspended over balcony edge. Sound level meter was secured in locked security box.
2	Unattended	To the north of the site, overlooking Bootle Street. Microphone in free-field conditions approx. 15m above ground. Sound level meter was mounted to a pole and suspended over balcony edge. Sound level meter was secured in locked security box.



Plan Showing Measurement Positions (Map Data ©2021 Google)

6.3 Instrumentation

The instrumentation used during the survey is presented in the Table below:

Position	Description	Manufacturer	Type	Serial Number	Calibration
1	Type 1 Data Logging Sound Level Meter	Larson Davis	824	5111	15/07/2021
2	Type 1 Data Logging Sound Level Meter	Larson Davis	824	5104	15/07/2021
All	Type 1 Calibrator	Larson Davis	CAL200	3083	06/05/2021

Each sound level meter, including the extension cable, was calibrated prior to and on completion of the surveys. No significant changes were found to have occurred (no more than 0.3 dB).

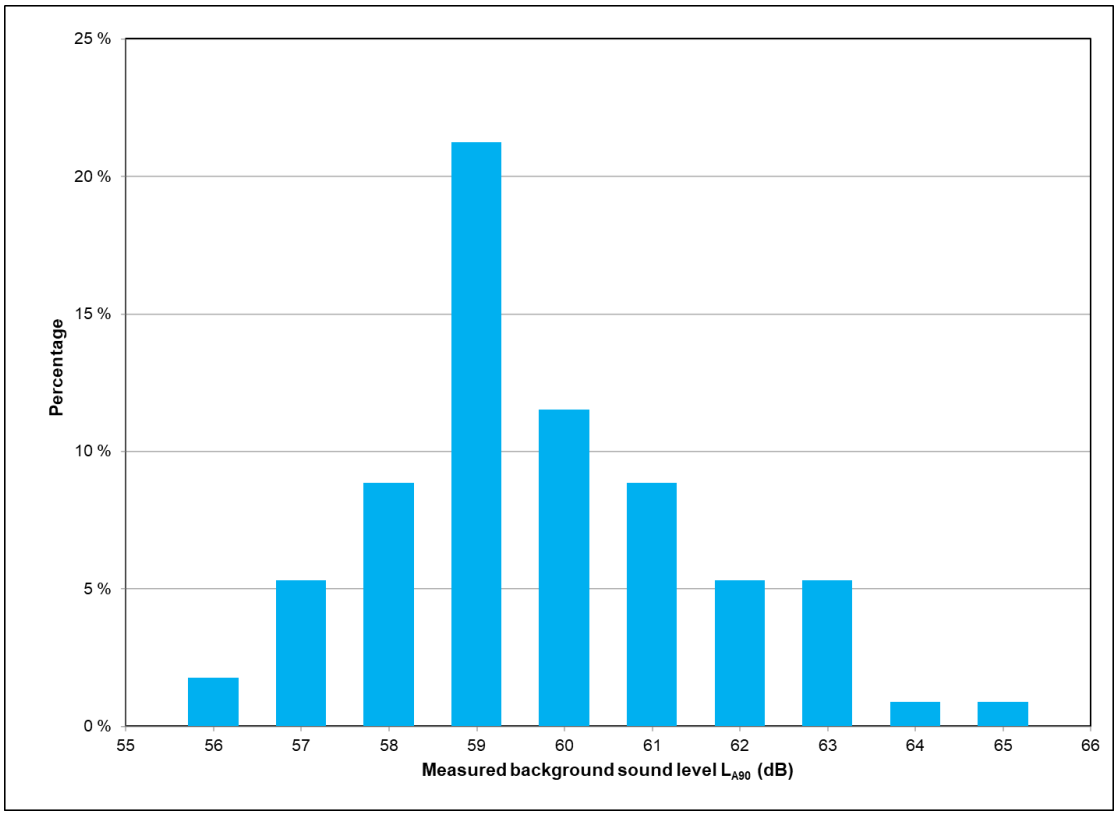
Each sound level meter was located in an environmental case with the microphone connected to the sound level meter via an extension cable.

Each microphone was fitted with a windshield.

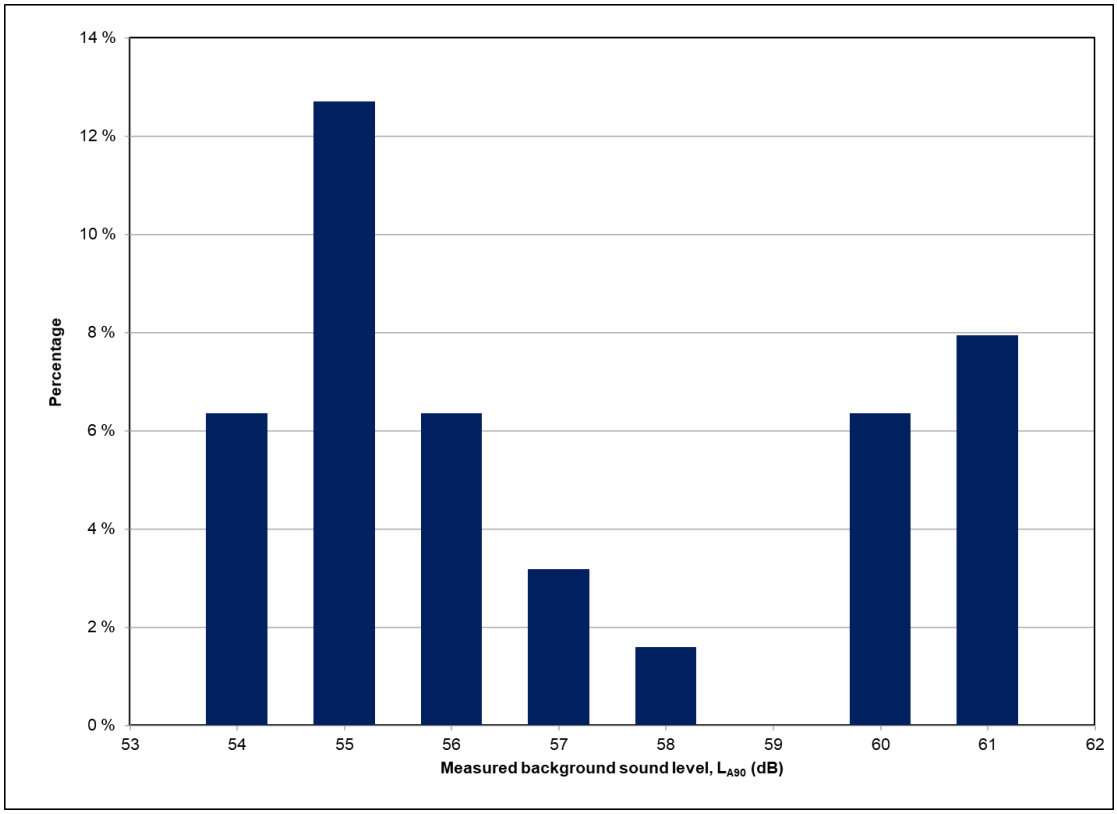
7.0 Results

The results of the unattended survey have been plotted on Time History Graphs TH1 and TH2 enclosed. These graphs present the 15 minute A-weighted (dBA) L_{90}, L_{eq} and L_{max} levels at Position 1 and 2 throughout the duration of the survey.

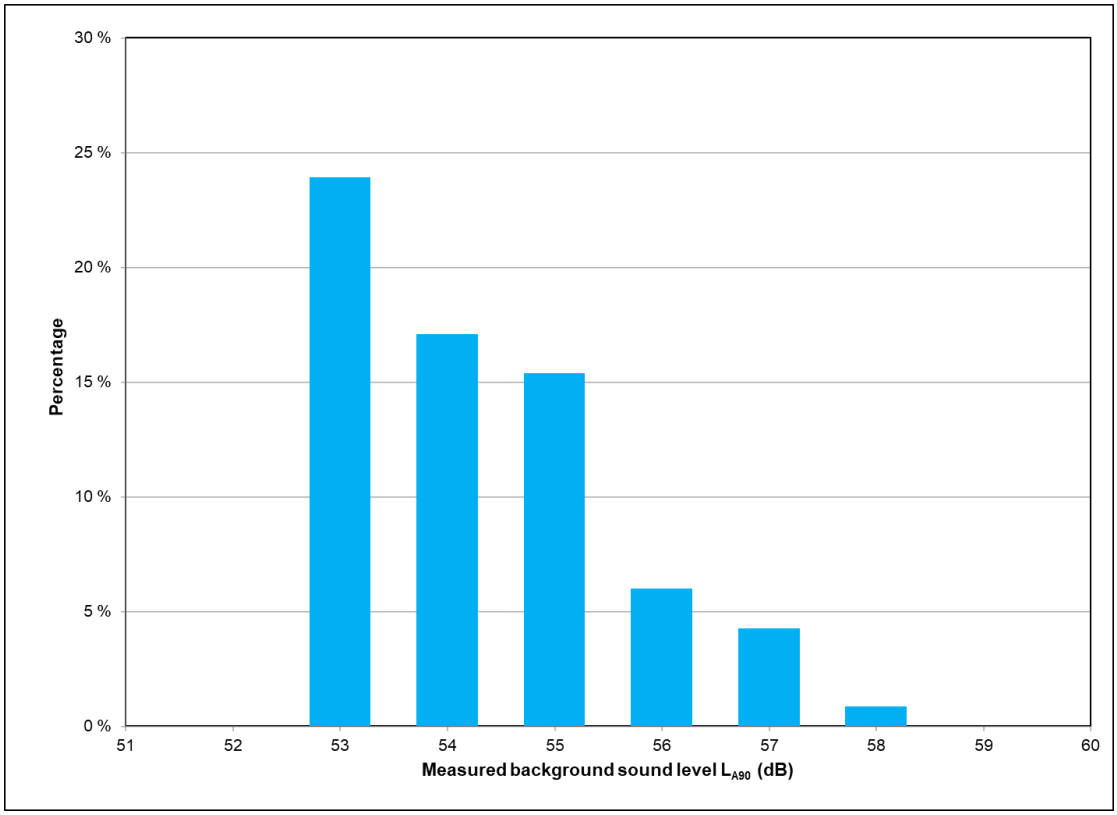
A summary of the results, as used to inform subsequent assessments against current guidelines, is presented in the table below. The L_{A90} values presented are the 'representative lowest' levels determined through statistical analysis of the 15-minute readings, in line with BS4142. L_{Afmax} values are the 10th highest 5-minute value. All results are free-field levels.



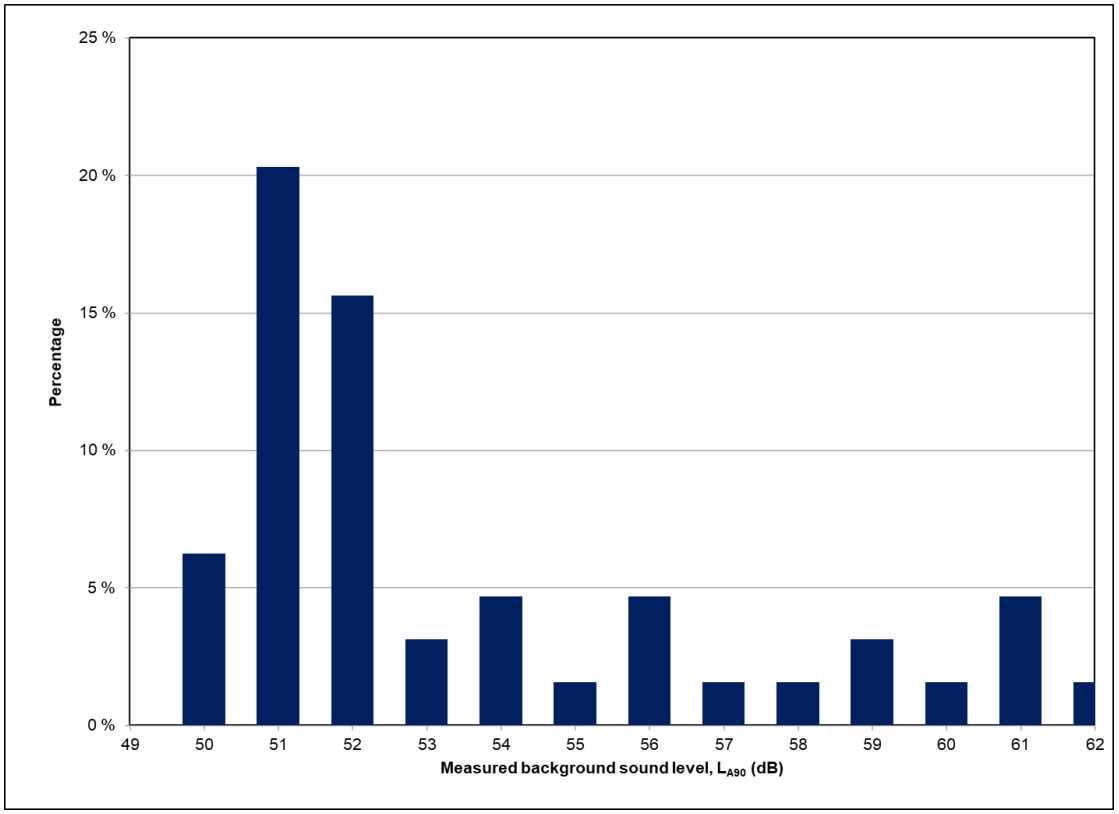
[MP1] Statistical Analysis of Daytime Background Noise Levels (07:00-23:00)



[MP1] Statistical Analysis of Night-time Background Noise Levels (23:00-07:00)



[MP2] Statistical Analysis of Daytime Background Noise Levels (07:00-23:00)



[MP2] Statistical Analysis of Night-time Background Noise Levels (23:00-07:00)

Position	Daytime (07:00 – 23:00 hrs)		Night-time (23:00 – 07:00 hrs)		
	$L_{Aeq,16hr}$	L_{A90}	$L_{Aeq,8hr}$	L_{A90}	L_{Amax}
1	66	59	64	55	81
2	56	53	54	51	70

8.0 Discussion Of Noise Climate

Due to the nature of the survey, i.e. unattended, it is not possible to accurately describe the dominant noise sources, or specific noise events throughout the entire survey period. However, at the beginning and end of the survey period the noise climate was noted to be dominated by road traffic noise emitted by Peter Street. This road remains busy until the early hours of the morning due to the bars and restaurants located in close proximity to site. Peter Street facilitates a busy taxi rank with people regularly picked up and dropped off. During the periods that were surveyed, the bars closed at 1am but later into the week and over the weekend extended hours of operation are noted.

Bootle Street is a small backstreet where a minor amount of traffic flow can be observed. The dominant noise source is still noted to be Peter Street at the rear of the site.

Plant can be observed in the site plan on top of the adjacent buildings. During our time on-site this was determined to be inaudible when compared with the levels emitted by traffic flow on Peter Street.

9.0 Noise Impact Assessments (Overview)

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

- **Bar Operational Noise Transfer via Floor**: The sound insulation performance of the floor will be used to establish the maximum permissible noise level in the drinking establishment based only on noise transfer via the floor to offices above.
- **Plant Noise Emissions**: Setting limits for new items of fixed plant against MCC guidance.

To inform our assessment of the commercial units, we have drawn upon previously measured noise levels for a typical drinking establishment, as set out below, to be considered as typical highest 1-hour noise levels during reasonable operation.

Description	Reverberant Noise Level (dB $L_{eq,1hr}$) at Octave Band Centre Frequency (Hz)							dBA
	63	125	250	500	1k	2k	4k	
Drinking Establishment *Typical busy bar with moderate background music*	89	88	81	80	77	72	70	82

With reference to the above, it is not possible to account for every possible scenario within each use class, however the above is intended to provide a reasonable baseline against which the general use can be assessed for feasibility with regards to planning permission. There is of course a wide range of noise levels that could be produced by any particular operation and it would be sensible for future tenants that may have the capacity to introduce high levels of noise to review their anticipated noise levels against the relevant noise emission criteria. MCC may wish to secure this through a suitably worded condition of planning.

10.0 Bar Operational Noise Assessment

10.1 Operational Noise Transfer via Floor

10.1.1 Criteria

In the absence of specific MCC criteria for noise transfer from commercial spaces to office spaces, it is recommended that to prevent loss of amenity to the offices/meeting rooms directly above, the aim should be to achieve maintain an internal noise level 10 dB below the standard BS 8233:2014 internal ambient noise level criteria.

Based on the above, and with consideration to (a) the need for spectral noise control in octave bands between 63 Hz and 4 kHz, and (b) the fact that the offices will generally not be occupied when the bar is in full 'high noise' operation, we would propose that reverberant noise levels from the commercial unit within the office spaces above should be controlled so as to not exceed NR 30 $L_{eq,T}$ in upper floor offices and ground floor retail/reception.

10.1.2 Internal Building Fabric

The bar will be located in the lower ground floor, above which will be a ground floor retail unit and office reception. The floor is understood to comprise a minimum 250mm concrete slab. Previous tests of this floor build up by Hann Tucker indicate the following expected sound level difference between shell .

Element	Anticipated Sound Level Difference, *D* (dB) at Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
Floor	31	36	44	52	55	55	57

10.1.3 Assessment

The above sound reduction performance of the existing separating floor is considered representative of the future separating floor construction without additional treatment, such as a suspended ceiling.

We have assessed noise transfer based on the criteria set out above to establish the internal sound level limit within retail unit based on noise transfer via the floor.

Description	Octave Band Centre Frequency (Hz)						
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**
Criteria in Office/Retail/Reception (NR 30)	59	48	40	34	30	27	25
Room to Room Level difference (dB *D*)	31	36	44	52	55	55	57
Internal noise level limit in retail unit (dB L_{eq})	**90**	**84**	**84**	**86**	**85**	**82**	**82**

In comparison with typical $L_{eq,1hr}$ noise levels inside a busy bar with moderate background music, the above limits are comparable and thus the shell construction may be sufficient for some prospective bar tenants.

For noisier tenants, enhancements to the shell construction may be required (e.g. acoustic ceiling). Either way, it will be necessary to include a suitable form of acoustic wording into lease agreements or tenants handbooks that makes the tenant responsible for controlling noise from their operations and any enhanced fit-out constructions that may be required to do so.

Noise transfer to the outside via any frontage or door openings must also be considered. Lobbied doors would be sensible to control music noise spill when people are entering/exiting.

High noise tenants (music bars) should implement a noise management plan, confirming how they intended to prevent noise levels becoming excessive through the evening. The implementation of an electronic noise limiter on the PA system would be sensible. Staff and managers should be made aware of noise restrictions so they can continuously monitor activity and music noise levels, and implement noise reduction measures as required.

Anti-social behaviour must not be tolerated. Patrons should be asked to leave quietly in consideration of nearby residents. A sign on the door to this effect would be sensible too.

11.0 Project Proposals

11.1 Proposed Plant

Hann Tucker and been provided with an indicative selection of plant as the project is currently at Stage 2. The results provided by this assessment will be used to inform future selections during stage 3 and 4 of the project.

11.2 Operating Hours

At the time of writing we have not received confirmation of the operating hours of the proposed plant units, therefore we have assessed to night-time limits to ensure compliance is met in a worst case scenario.

11.3 Drawings

Our acoustic analyses is based on the following drawings provided by Hannan Associates MEP Design Solutions.

Reference	Title	Date
3882-HAN-ZZ-BL-DR-PS-01 01 (211119)	Basement Level MEP Plant & Riser Space	19/11/2021
3882-HAN-ZZ-GF-DR-PS-01 3 (211119)	Ground Floor MEP Plant & Riser Space	19/11/2021
3882-HAN-ZZ-LG-DR-PS-01 02 (211119)	Lower Ground Floor MEP Plant & Riser Space	19/11/2021
3882-HAN-ZZ-RL-DR-PS-01 05 (211119)	Roof Level MEP Plant & Riser Space	19/11/2021
3882-HAN-ZZ-XX-DR-PS-01 04b (211119)	Typical Floor MEP Plant & Riser Space 2-Way Tenancy Split Option 2	19/11/2021

12.0 Plant Noise Emission Criteria

Hann Tucker Associates have undertaken an assessment of atmospheric plant noise emissions of the proposed condenser systems based on manufacturer noise level data with a view to calculating the noise level at the surrounding receptors.

The calculations take into account distance propagation losses, any screening provided by the site geometry, as well as any noise mitigation measures included within the installation.

As noted in Section 3.2, the worst affected noise sensitive receptor is considered to be The Edwardian Hotel for the plant on the roof, and for the ground floor installation the most noise sensitive receptor are the offices located on the opposite side of Bootle Street..

Based on the typical background sound pressure determined is section 7.0, the following plant noise emission limits are considered applicable for the consented development. These limits are presented as free-field limits.

Description	Cumulative Plant Rating Level, $L_{Ar,Tr}$ (dBA)
Daytime 07:00-23:00 hrs	48
Night-time 23:00-07:00 hrs	46

The above criteria are to be achieved with all of the proposed plant operating simultaneously.

It should be noted that the above are subject to the final approval of the Manchester City Council.

13.0 Plant Noise Impact Assessment

We understand the proposed plant comprises of the following units shown below.

Plant Description	Location	Qty	Plant Make	Model Number
M4	High level at ground floor	1	Ecovent	EVX549-3
M7	Roof level	1	Mitsubishi	PURY-EP600YSNW-A1
M8	Roof level	1	FlaktGroup	AHU01
Water Pump	Roof Level	1	Mitsubishi	QAHV-N560YA-HPB

13.1 Plant Noise Data

We understand the manufacturer's noise data for the equipment to be as follows:

13.1.1 Roof units

Plant Description	Sound Pressure Level (dB re $2x10^{-5}$ Pa) at 1 metre at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
M7	-	-	-	-	-	-	-	-	70
Water Pump	71	58	59	56	52	48	44	39	56

Note: No octave band data supplied for Mitsubishi unit

Plant Description	Sound Power Level at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
M8 – Fresh air connection	77	77	74	68	62	58	53	54	70
M8 - Extract Connection	79	77	74	69	63	59	54	55	71
M8 – To surroundings (noise breakout)	71	71	63	50	46	45	41	34	59

Note: Data supplied as sound power level (Lw)

13.1.2 Upper Ground to Bootle Street

Plant Description	Sound Power Level at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
M4 – 100% Fan Voltage (Worst case)	75	79	80	77	72	67	61	58	78

Note: Data supplied as sound power level (Lw)

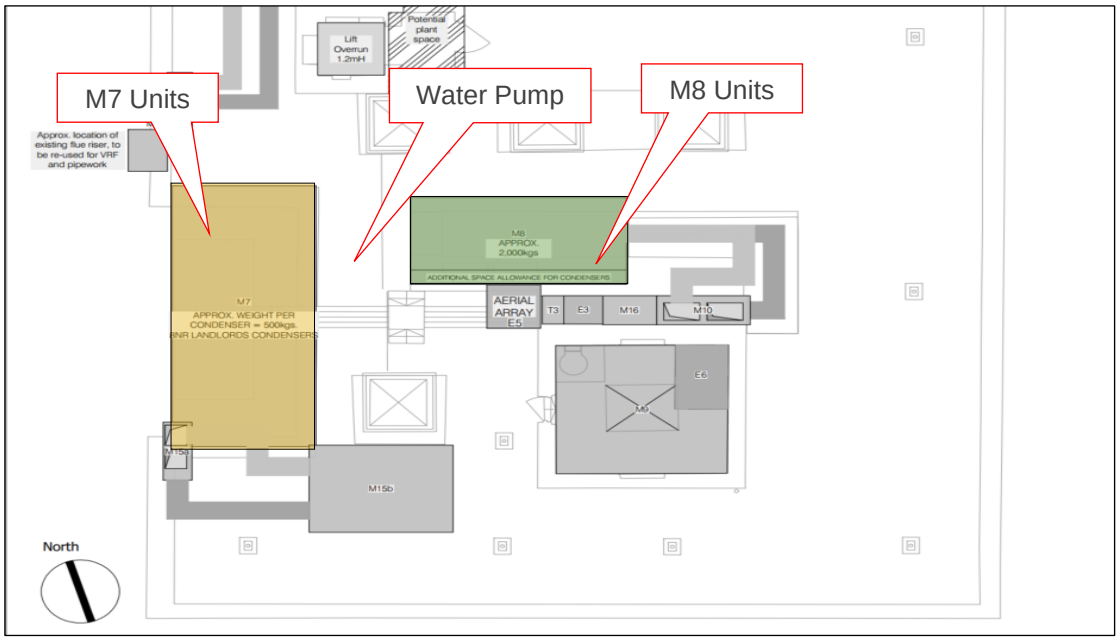
Plant Description	Sound Pressure Level (dB re $2x10^{-5}$ Pa) at 1 metre at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
M4 - Case noise breakout	-	-	-	-	-	-	-	-	52

Note: No octave band data supplied for Mitsubishi unit

13.2 Location of Plant

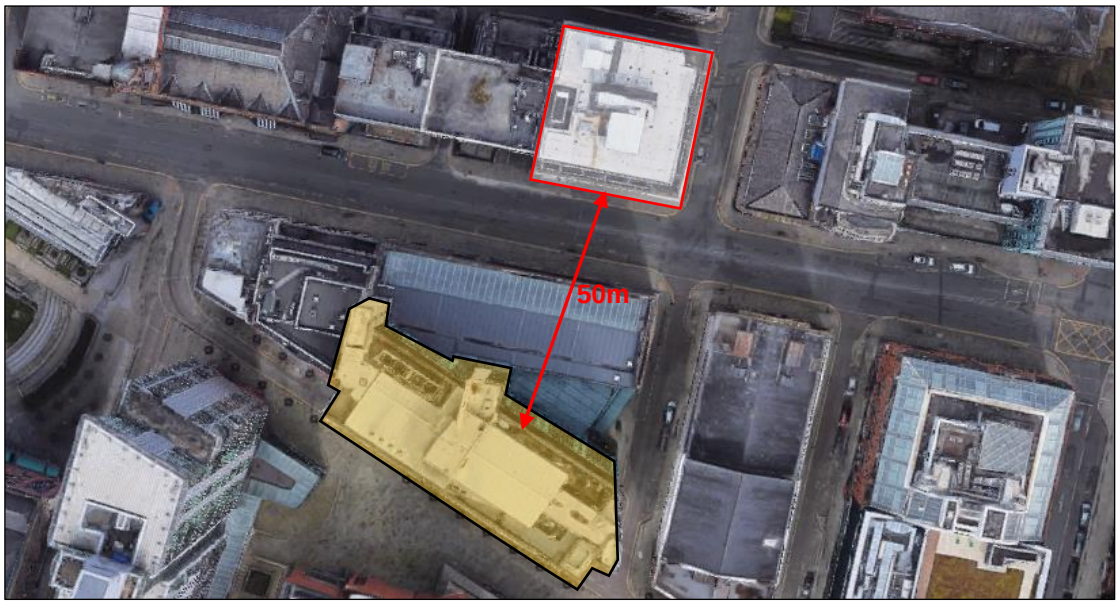
13.2.1 Roof Level

The plan below highlights the roof area where the proposed units will be installed.



Proposed plant location on roof

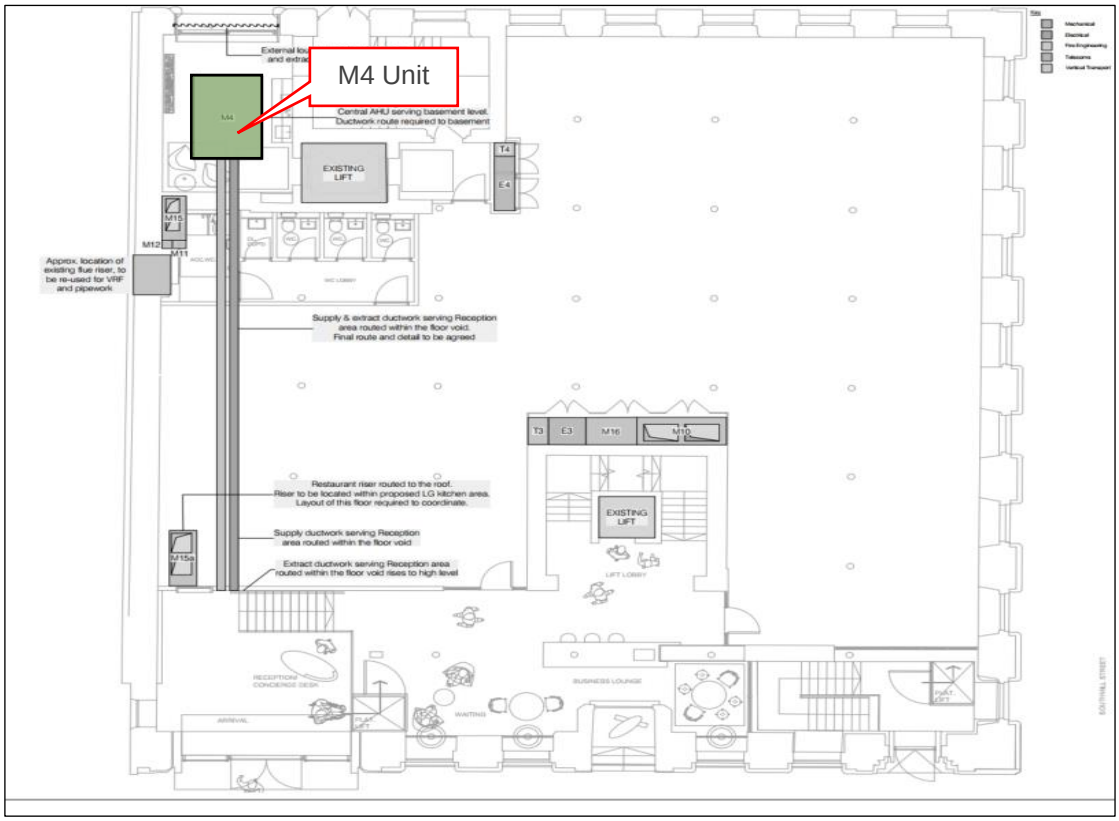
The nearest noise sensitive receptor are the guest rooms of the The Edwardian Hotel, located approximately 50 m from the Freetrade Exchange roof edge. This is detailed in the plan below. 50 m has been taken as a worst case estimate for the purpose of this assessment in the event of the proposed plant locations being rearranged at later stages of the project.



Nearest noise sensitive receptor for roof level plant

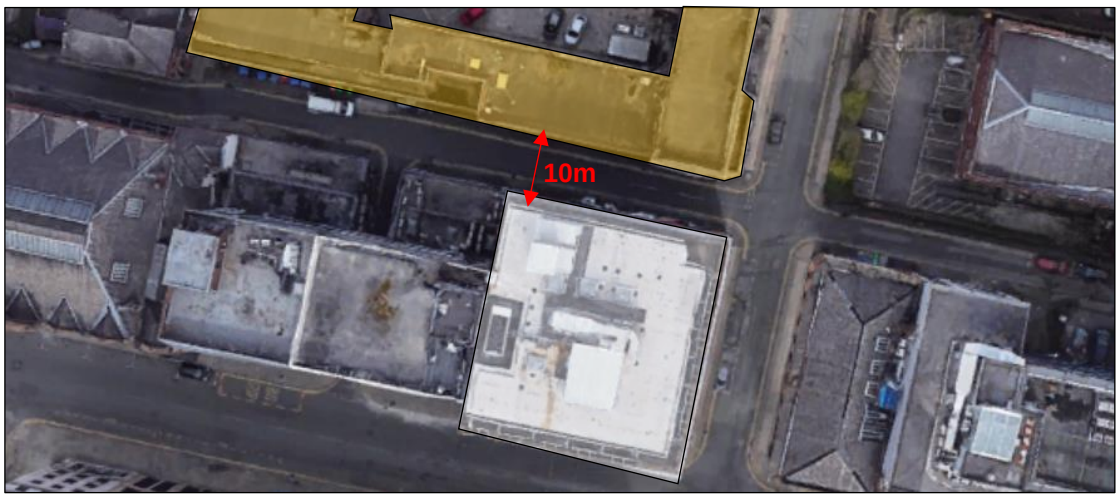
13.2.2 Ground Level Assessment

The plan below highlights the ground level area where the proposed units will be installed.



Proposed plant location on ground level

The nearest noise sensitive receptor for this unit of plant are the office windows on Bootle Street, approximately 10 m away. See plan below.



Nearest noise sensitive receptor for ground floor plant

13.3 Plant Noise Impact Assessment

We understand that the proposed units will be operational during daytime hours.

It should be noted that the proposed plant is not anticipated to exhibit any tonal or impulsive characteristics provided it is well maintained. All proposed external plant will be inverter driven and, therefore, will gently ramp up and down depending on the demands on the various systems. In order to be robust, however, a +3dB feature correction as advised in BS 4142:2014 has been applied for the possible present of *"… characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment …."*.

The following tables summarise our predictions of atmospheric noise emissions from the proposed plant locations to the nearest noise sensitive receptors as detailed in section 13.2 above.

13.3.1 Roof Assessment

	Sound Pressure Level (dBA)	
	Daytime (07:00 – 23:00 hours)	**Night-time (23:00 – 07:00 hours)**
Sound Pressure Level PURY-EP600YSNW-A1	70 @ 1m	
Distance Correction to **50 m** (Conformal Area)	-30	
Correction for 1No Unit	0	
Intermittency Correction (ref BS4142)	+3	
Tonality Correction (ref BS4142)	0	
Impulsivity Correction (ref BS4142)	0	
Calculated Noise Level at Receptor	**43**	
Sound Power Level AHU eQ Prime (Fresh Air Intake)	70	
Distance Correction to **50 m** (Rathe Method)	-42	
Correction for 1No Units	0	
Intermittency Correction (ref BS4142)	+3	
Tonality Correction (ref BS4142)	0	
Impulsivity Correction (ref BS4142)	0	
Calculated Noise Level at Receptor (Converted to SPL)	**31**	
Sound Power Level AHU eQ Prime (Exhaust)	57	
Distance Correction to **50 m** (Rathe Method)	-42	
Correction for 1No Units	0	
Intermittency Correction (ref BS4142)	0	
Tonality Correction (ref BS4142)	+3	
Impulsivity Correction (ref BS4142)	0	
Calculated Noise Level at Receptor (Converted to SPL)	**31**	
Sound Power Level AHU eQ Prime (Breakout)	59	
Distance Correction to **50 m** (Rathe Method)	-42	
Correction for 1No Units	0	
Intermittency Correction (ref BS4142)	+3	
Tonality Correction (ref BS4142)	0	
Impulsivity Correction (ref BS4142)	0	
Calculated Noise Level at Receptor	**20**	

	Sound Pressure Level (dBA)	
	Daytime (07:00 – 23:00 hours)	**Night-time (23:00 – 07:00 hours)**
Sound Pressure Level Water Pump (QAHV-N560YA-HPB)	56 @ 1m	
Distance Correction to **50 m** (Conformal Area)	-30	
Correction for 1No Units	0	
Intermittency Correction (ref BS4142)	+3	
Tonality Correction (ref BS4142)	0	
Impulsivity Correction (ref BS4142)	0	
Calculated Noise Level at Receptor	**29**	
Cumulative Calculated Noise Level at Receptor	**44**	
Criteria	**48**	**46**
Exceedance	**-4**	**-2**

13.3.2 Ground Level Assessment

	Sound Pressure Level (dBA)	
	Daytime (07:00 – 23:00 hours)	**Night-time (23:00 – 07:00 hours)**
Sound Pressure Level (Breakout)	52 @ 1m	
Distance Correction to **11 m** (Conformal Area)	-17	
Correction for 1No Unit	0	
Intermittency Correction (ref BS4142)	+0	
Tonality Correction (ref BS4142)	0	
Impulsivity Correction (ref BS4142)	0	
Calculated Noise Level at Receptor	**35**	
Sound Power Level AHU eQ Prime (Fresh Air Intake)	78	
Distance Correction to **11 m** (Conformal Area)	-32	
Correction for 1No Units	0	
Intermittency Correction (ref BS4142)	0	
Tonality Correction (ref BS4142)	0	
Impulsivity Correction (ref BS4142)	0	
Calculated Noise Level at Receptor (Converted to SPL)	**46**	

	Sound Pressure Level (dBA)	
	Daytime (07:00 – 23:00 hours)	Night-time (23:00 – 07:00 hours)
Cumulative Calculated Noise Level at Receptor	46	
Criteria	48	46
Exceedance	-2	0

Our calculations indicate that the proposed plant in both locations should be capable of achieving the requirements limits set out in this report based on previous experience with projects in Manchester City Centre. This is subject to approval by Manchester City Council.

14.0 Conclusions

An environmental noise survey has been undertaken in order to establish the currently prevailing noise levels.

Plant noise emission criteria have been recommended based on the results of the noise survey and with reference to the Local Authority's policy on other projects in the area.

An assessment has been carried out to determine the plant noise emissions at the nearest noise sensitive receptor for both the roof level and ground level plant proposals.

The assessment indicates that the proposed plant should be capable of achieving the proposed environmental noise criteria at the nearest noise sensitive receptors for both cases assessed in this report.

Appendix A

The acoustic terms used in this report are defined as follows:

dB — Decibel - Used as a measurement of sound level. Decibels are not an absolute unit of measurement but an expression of ratio between two quantities expressed in logarithmic form. The relationships between Decibel levels do not work in the same way that non-logarithmic (linear) numbers work (e.g. 30dB + 30dB = 33dB, not 60dB).

dBA — The human ear is more susceptible to mid-frequency noise than the high and low frequencies. The 'A'-weighting scale approximates this response and allows sound levels to be expressed as an overall single figure value in dBA. The $_A$ subscript is applied to an acoustical parameter to indicate the stated noise level is A-weighted

It should be noted that levels in dBA do not have a linear relationship to each other; for similar noises, a change in noise level of 10dBA represents a doubling or halving of subjective loudness. A change of 3dBA is just perceptible.

$L_{90,T}$ — L_{90} is the noise level exceeded for 90% of the period *T* (i.e. the quietest 10% of the measurement) and is often used to describe the background noise level.

$L_{eq,T}$ — $L_{eq,T}$ is the equivalent continuous sound pressure level. It is an average of the total sound energy measured over a specified time period, *T*.

L_{max} — L_{max} is the maximum sound pressure level recorded over the period stated. L_{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L_{eq} noise level.

Sound Pressure Level (L_p) is the sound pressure relative to a standard reference pressure of 2×10^{-5} Pa. This level varies for a given source according to a number of factors (including but not limited to: distance from the source; positioning; screening and meteorological effects).

Sound Power Level (SWL or L_w) is the total amount of sound energy inherent in a particular sound source, independent of its environment. It is a logarithmic measure of the sound power in comparison to a specified reference level (usually 10^{-12} W).

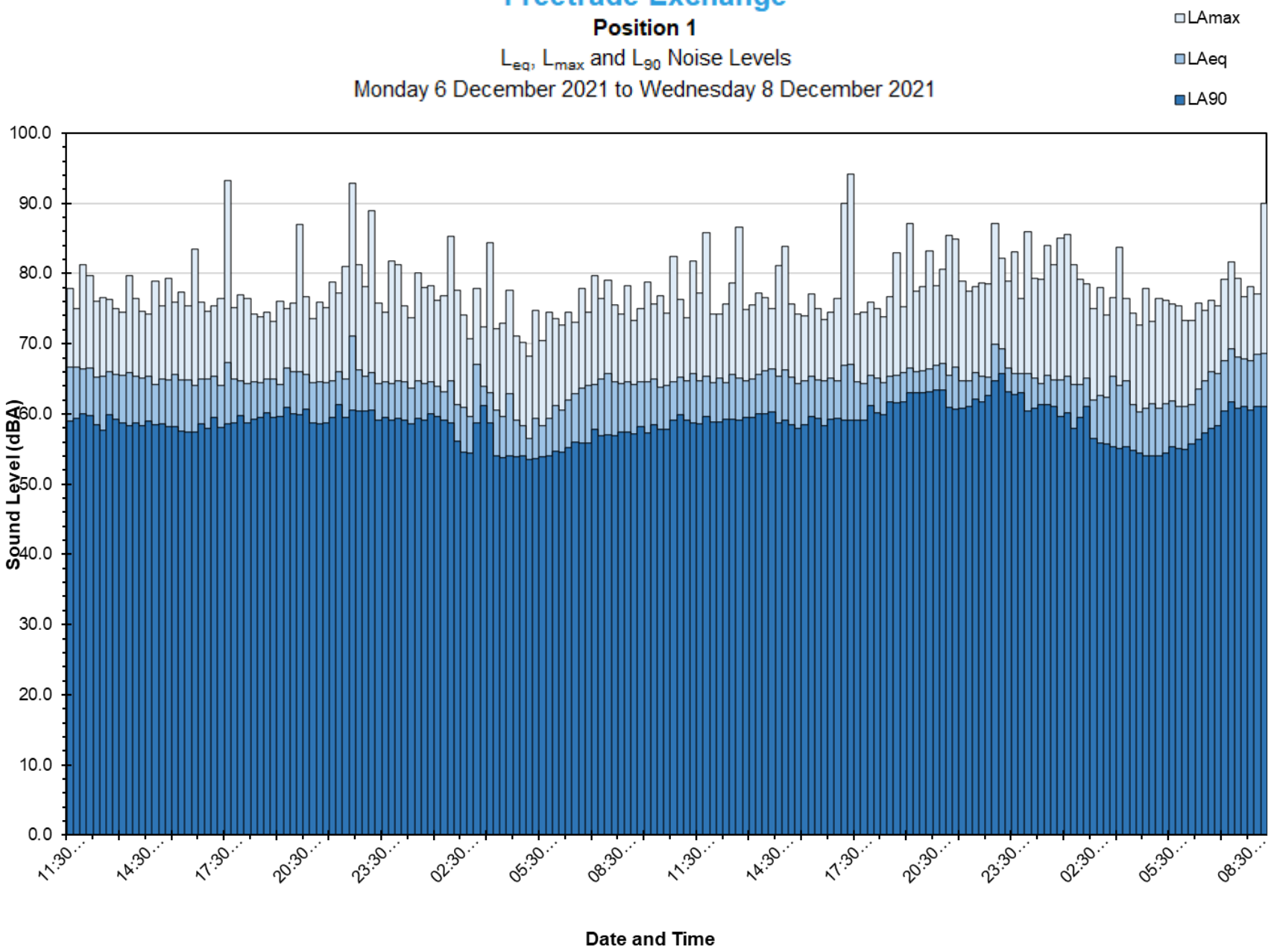
Appendix B – Time History Graphs

Freetrade Exchange

Position 1

L_{eq}, L_{max} and L_{90} Noise Levels

Monday 6 December 2021 to Wednesday 8 December 2021



Freetrade Exchange

Position 2

L_{eq}, L_{max} and L_{90} Noise Levels

Monday 6 December 2021 to Wednesday 8 December 2021

