EGG LIMITED

PROPOSED AC UNITS INSTALLATION

2 HARDMAN STREET, MANCHESTER M3 3HF

NOISE IMPACT ASSESSMENT

R2218-REP01-SJW

18 August 2023

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REPORT DETAILS

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Document Reference	R2218-REP01-SJW
Date Issued	18 August 2023
Revision	Initial Version
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SUMMARY

Red Acoustics has been commissioned by Egg Ltd to provide an assessment of noise impact from the proposed installation of 2no. AC units at 2 Hardman Street, Manchester.

The existing noise climate has been assessed at a position representative of the nearest noise sensitive spaces and target noise levels set in line with published guidance and Manchester City Council criteria.

This report presents the results of noise propagation modelling predictions at the proposed location based on manufacturer supplied plant noise data.

Compliance with the recommended target criteria is expected without the need for additional noise mitigation.

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CONTENTS

1.0 INTRODUCTION 1

2.0 DETAILS OF THE PROPOSED DEVELOPMENT 2

Figure 2.1: Site Location in Relation to Surroundings 2

Figure 2.2: Location of the Proposed AC Units 3

Table 2.1: Proposed Plant Items - Sound Level Data 4

3.0 PLANNING POLICY & DESIGN TARGETS 6

Table 3.1: Explanation of Noise Exposure Hierarchy - PPG 8

4.0 ENVIRONMENTAL NOISE SURVEY 11

Figure 4.1: Noise Survey Measurement Location 11

Figure 4.2: Broadband Noise Survey Data - Daytime 12

Figure 4.3: Broadband Noise Survey Data - Night-time 13

Figure 4.3: Histogram - Daytime LA90 Background Sound Pressure Levels 14

Figure 4.4: Histogram - Daytime LA90 Background Sound Pressure Levels 14

Table 4.1: Plant Noise Limits at Nearest Noise Sensitive Facade 15

5.0 CADNAA NOISE PROPAGATION MODELLING 16

Figure 5.1: Predicted Specific Sound Level (dBA) 17

6.0 BS4142 PLANT NOISE IMPACT ASSESSMENT 18

Table 6.1: BS4142 Assessment Table - NSP Typical Daytime Period 18

Table 6.2: BS4142 Assessment Table - NSP Typical Night-time Period 19

7.0 CONCLUSIONS 20

APPENDIX A: NOISE MEASUREMENT DETAILS 21

Table A1: List of Instrumentation Used 22

1.0 INTRODUCTION

Red Acoustics has been commissioned by Egg Ltd to provide an assessment of noise impact from the proposed installation of 2no. AC units at 2 Hardman Street, Manchester M3 3HF.

Red Acoustics has been commissioned by Egg Ltd to conduct the following assessments:

- Assess the existing background noise climate at a position representative of nearby noise sensitive receptors.
- Based on the measured existing background sound levels, determine target noise limits for the proposed externally mounted mechanical plant items.
- Prepare a 3D computer noise propagation model to predict the impact of environmental noise from the proposed mechanical plant items.
- Advise as necessary on the level of mitigation required to achieve target limits to enable approval to be sought from the Local Planning Authority for installation of the proposed mechanical plant items.

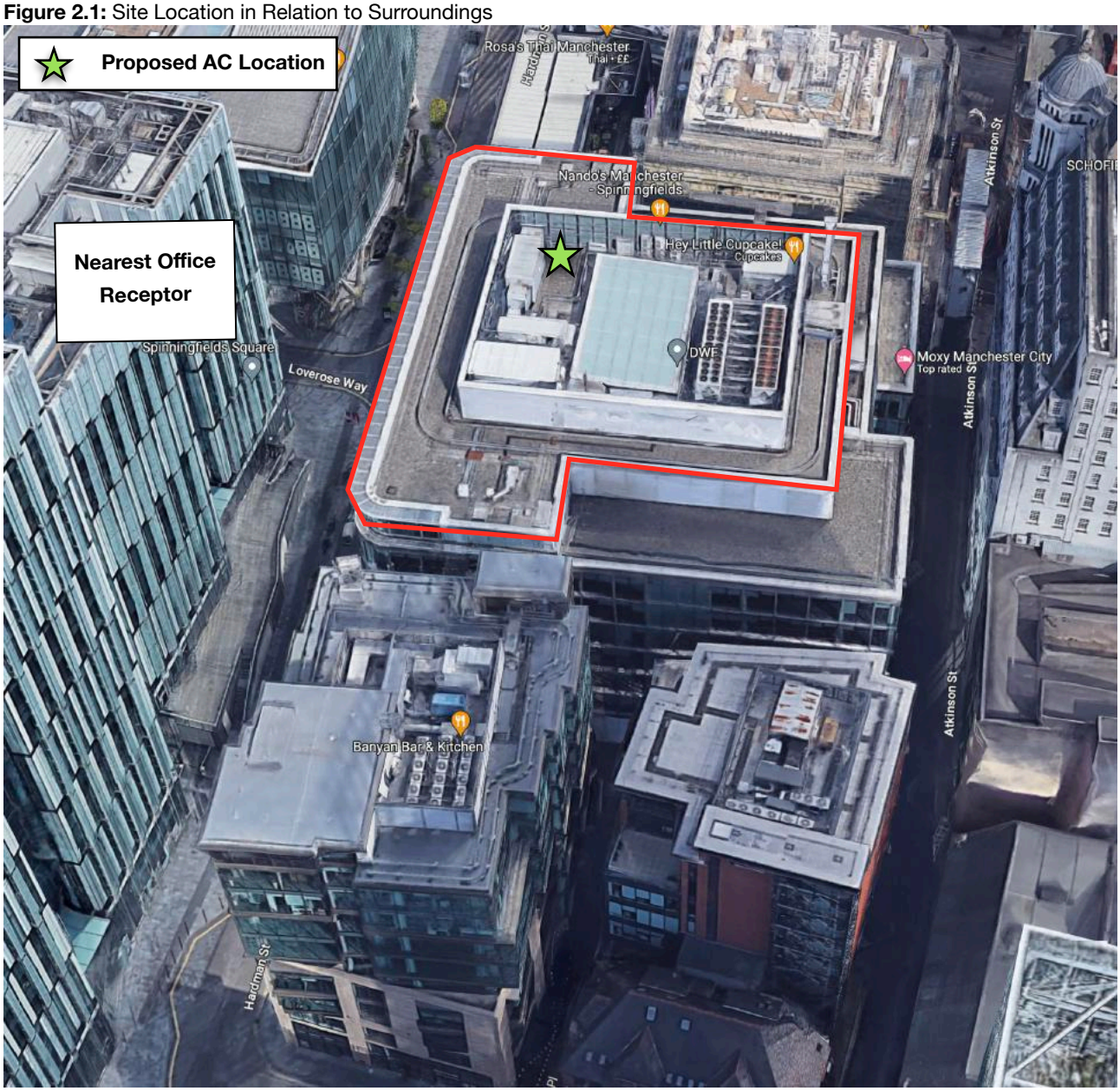
This report presents the results of an environmental noise survey and details an assessment of environmental noise impact from the proposed installation.

2.0 DETAILS OF THE PROPOSED DEVELOPMENT

The development site at 2 Hardman Street, Manchester M3 3HF comprises an existing 7 storey office development fronting onto Hardman Street Manchester. The proposed plant installation is to be located within an existing plant area at roof level.

The roof plant area at 2 Hardman Street (outlined in red) and proposed AC Unit location is shown in Figure 2.1 below.

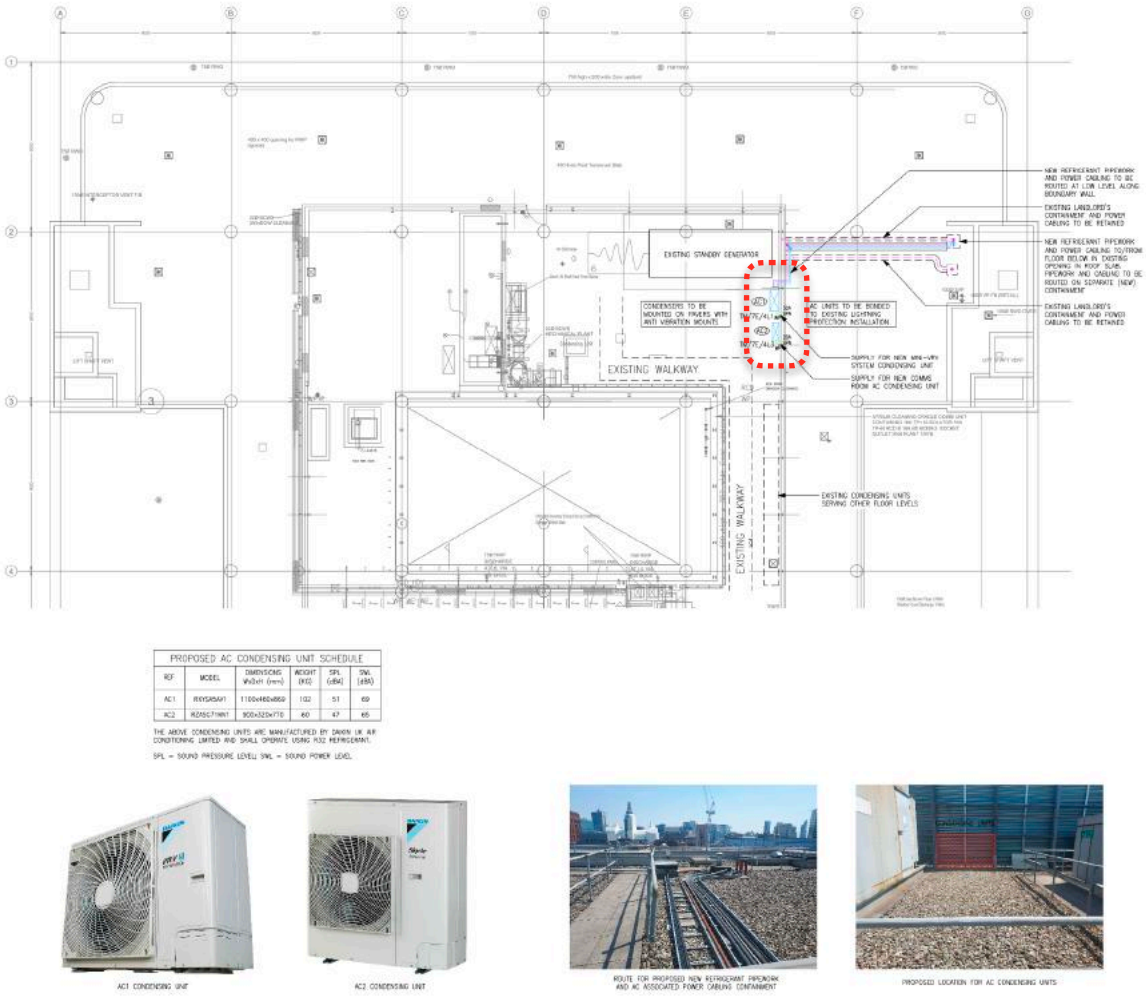
Figure 2.1: Site Location in Relation to Surroundings



The location for the proposed installation of 2 no. AC Units is shown in Figure 2.1 above. The proposal is to locate the units within the boundary of the existing plant roof space which is set with a steel boundary screen. The nearest noise sensitive properties are located to the North on the opposite side of Hardman Street. The location of the nearest noise sensitive properties are also shown in Figure 2.1 above.

Figure 2.2 below shows drawn information provided by the client, detailing the location of the proposed AC units.

Figure 2.2: Location of the Proposed AC Units



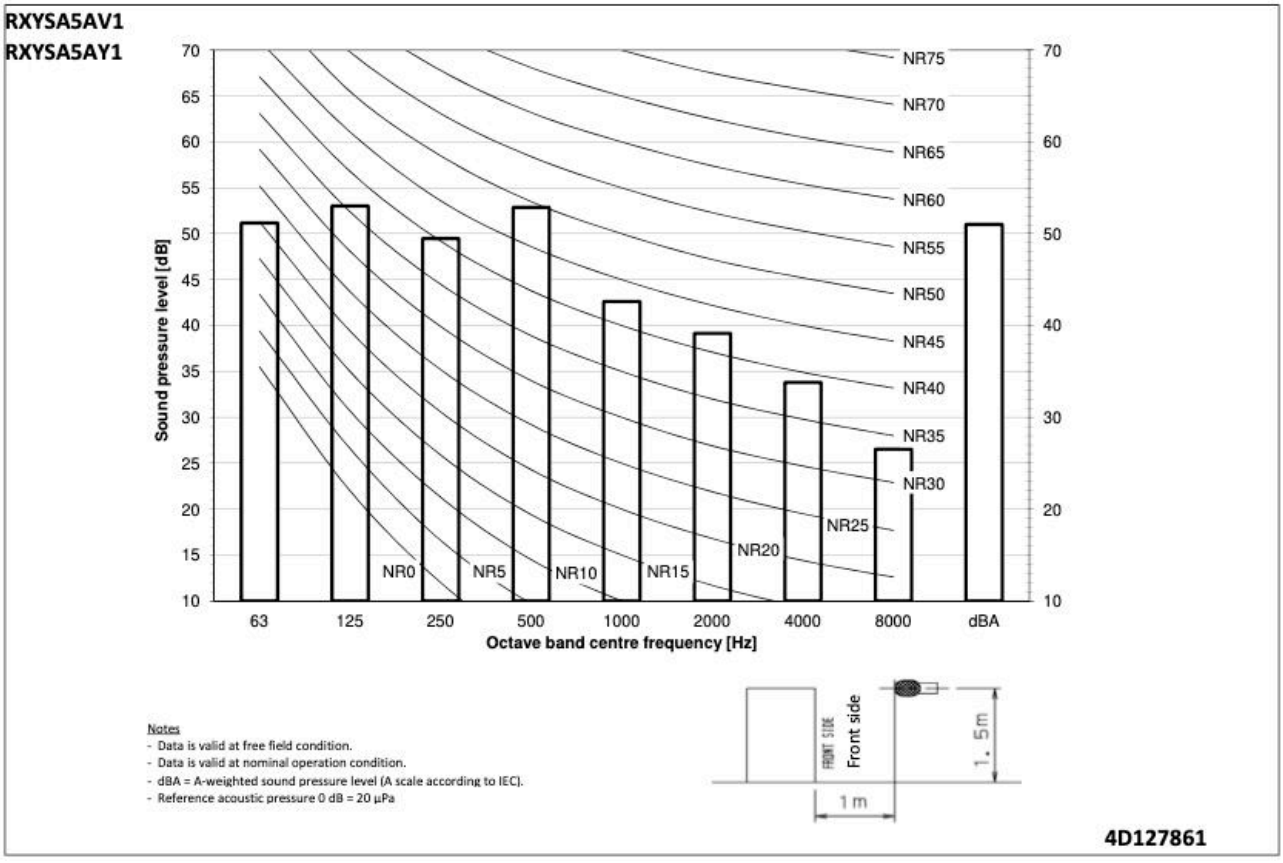
Proposed AC Units

The proposal is to install 2no. free standing AC Units.

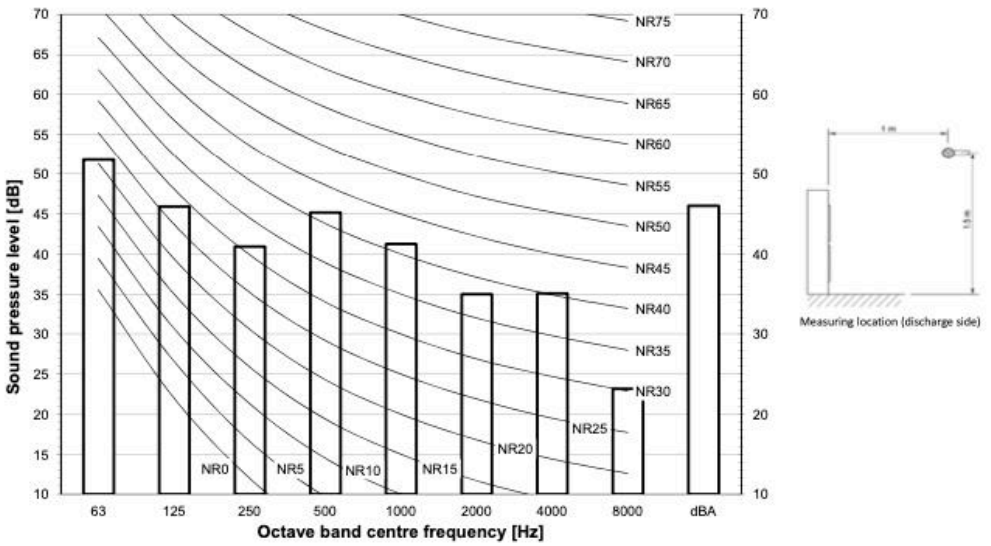
In order to assess the potential for noise impact to the surrounding environment, manufacturer supplied Octave Band Sound Level data has been used. Table 2.1 below presents the supplied data for all proposed plant items.

Table 2.1: Proposed Plant Items - Sound Level Data

			Octave Band Noise Data dB								
Unit Ref	**Plant Item**	**Noise Parameter**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**dBA**
AC1	Daikin RXYSA5AV1	Lp	51	52	49	53	43	39	34	27	51 @1m
AC2	Daikin RZASG71MV1	Lp	52	46	41	45	41	35	35	24	47 @1m



AZAS71MV1
RZASG71MV1



Notes
- Data is valid at free field condition.
- Data is valid at nominal operation condition.
- dBA = A-weighted sound pressure level (A scale according to IEC).
- Reference acoustic pressure 0 dB = 20 µPa

3D110049

Typical AC Unit Hours of Operation

As the proposed plant items serve a public building which opens during daytime periods, it is anticipated that the proposed plant items will operate broadly in line with the opening hours for the building served. The assessment below includes an assessment for the daytime and night-time periods for completeness.

Specific plant operational hours have not yet been confirmed by the project M&E engineer however, daytime and night time period target noise levels have been determined through environmental noise measurements for the purpose of the assessment.

3.0 PLANNING POLICY & DESIGN TARGETS

Planning Policy

National Planning Policy Framework

The National Planning Policy Framework (NPPF[1]) was updated in 2021 and sets out the Government's planning policies for England and how these should be applied. Where issues of noise impact are relevant the NPPF provides guidance. In paragraph 174 it states that planning policies and decisions should contribute to and enhance the natural and local environment by:

'preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of noise pollution'.

Paragraph 185 also advises:

'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: 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 quality of life'.

The NPPF also refers to the 2010 DEFRA publication, the Noise Policy Statement for England (NSPE) which reinforces and supplements the NPPF guidance.

Noise Policy Statement for England

The Noise Policy Statement for England[2] (NPSE) sets out the long term vision of promoting good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development. This vision is supported by the following aims:

- Avoid Significant adverse impacts on health and quality of life.
- Mitigate and minimise adverse impacts on health and quality of life.
- Where possible, contribute to the improvement of health and quality of life.

The NPSE describes the following levels at which noise impacts may be identified:

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[1] National Planning Policy Framework. Ministry of Housing, Communities & Local Government (2021)

[2] Noise Policy Statement for England - Department for Environment, Food & Rural Affairs (2010)

- 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.
- LOAEL - Lowest Observed 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.

According to the explanatory notes in the statement, where a noise level falls between LOAEL and a level which represents SOAEL then:

'all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur'.

Planning Practice Guidance on Noise

Planning Practice Guidance (PPG) - Noise[3] is an online www.gov.uk resource (last updated 2019) to provide additional guidance on the NPPF. It discusses:

- *whether or not a significant adverse effect is occurring or likely to occur;*
- *whether or not an adverse effect is occurring or likely to occur and;*
- *whether or not a good standard of amenity can be achieved.*

In line with the Explanatory Note of the NPSE, the PPG references the LOAEL and SOAEL in relation to noise impact. It also provides examples of outcomes that could be expected for a given perception level of noise, plus actions that may be required to bring about a desired outcome. However, inline with the NPSE, no objective noise levels are provided although the PPG states that:

'the subjective nature of noise means that there is not a simple relationship between noise levels and impact on those effected. This will depend on how various factors combine in any particular situation'

Table 3.1 below summarises the PGG noise expose hierarchy.

[3] Planning Practice Guidance on Noise (https://www.gov.uk/guidance/noise--2). Ministry of Housing, Communities & Local Government

Table 3.1: Explanation of Noise Exposure Hierarchy - PPG

Perception	Examples of Outcomes	Increasing Effect Levels	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; closing windows for some of the time because of the noise. Potential for non-awakening sleep 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	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. having to keep windows closed most of the time, avoiding certain activities during periods of intrusion. 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 harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

British Standard 4142

BS 4142:2014+A1:2019[4] presents methods for rating and assessing the potential impact of commercial and industrial sound upon noise sensitive receptors. In order to assess impact using BS 4142, the Rating Level of the new sound source is compared with the existing contextual Background Sound Level.

- Typically, the greater this difference, the greater the magnitude of the impact.
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB 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 Rating Level is determined by assessing the Ambient Sound Level, distinguishing the Specific Sound Level from the Residual Sound Level and applying any sound specific penalties for acoustic features that would subjectively cause the sound to be perceived differently.

The Specific Sound Level of the commercial / industrial sound source is determined by either; measurement or calculation with regard to the appropriate reference time interval (for daytime or night-time periods). The standard requires separate analysis for daytime and night-time periods, evaluating the Rating Level over an appropriate reference time interval (T_r) of: 1hr for daytime (07:00 - 23:00 hrs) and 15min for night time (23:00 - 07:00 hrs). The Specific Sound Level is defined as equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, *T* (determined either by calculation or deducting the measured Residual Sound Level from the measured Ambient Sound Level).

'Ambient sound' is defined as the totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far (The ambient sound comprises the residual sound and the specific sound when present).

'Residual sound' is defined as the ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.

[4] BS4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound

Where appropriate, a rating penalty can be applied to the specific sound level to account for the character of the sound, namely: tonality, impulsivity and intermittency. Such acoustic feature corrections can be added together linearly.

Tonality can be determined objectively (using adjacent third octave band analysis or the Joint Nordic method) or subjectively as described below:

- +2dB penalty: Just perceptible
- +4dB penalty: Clearly perceptible
- +6dB penalty: Highly perceptible

Impulsivity can be determined objectively (using Fast Fourier Transform analysis) or subjectively as described below:

- +3dB penalty: Just perceptible
- +6dB penalty: Clearly perceptible
- +9dB penalty: Highly perceptible

Where intermittency is present, a +3dB penalty can be applied. Where the acoustic feature characteristics are neither tonal nor impulsive, but are clearly distinguishable against the residual sound, a +3dB penalty can be applied.

Manchester City Council Guidance

Manchester City Council has published comprehensive guidance in relation to noise impact due to new development. The MCC Planning and Noise Technical Guidance document was updated in October 2022 and discusses the assessment of environmental noise from new development of plant items in the vicinity of nearby noise sensitive uses. The published guidance forms the basis for the decision making process when assessing planning applications within the Council's boundaries and provides design targets. With regard to fixed plant items the guidance states:

'Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location'.

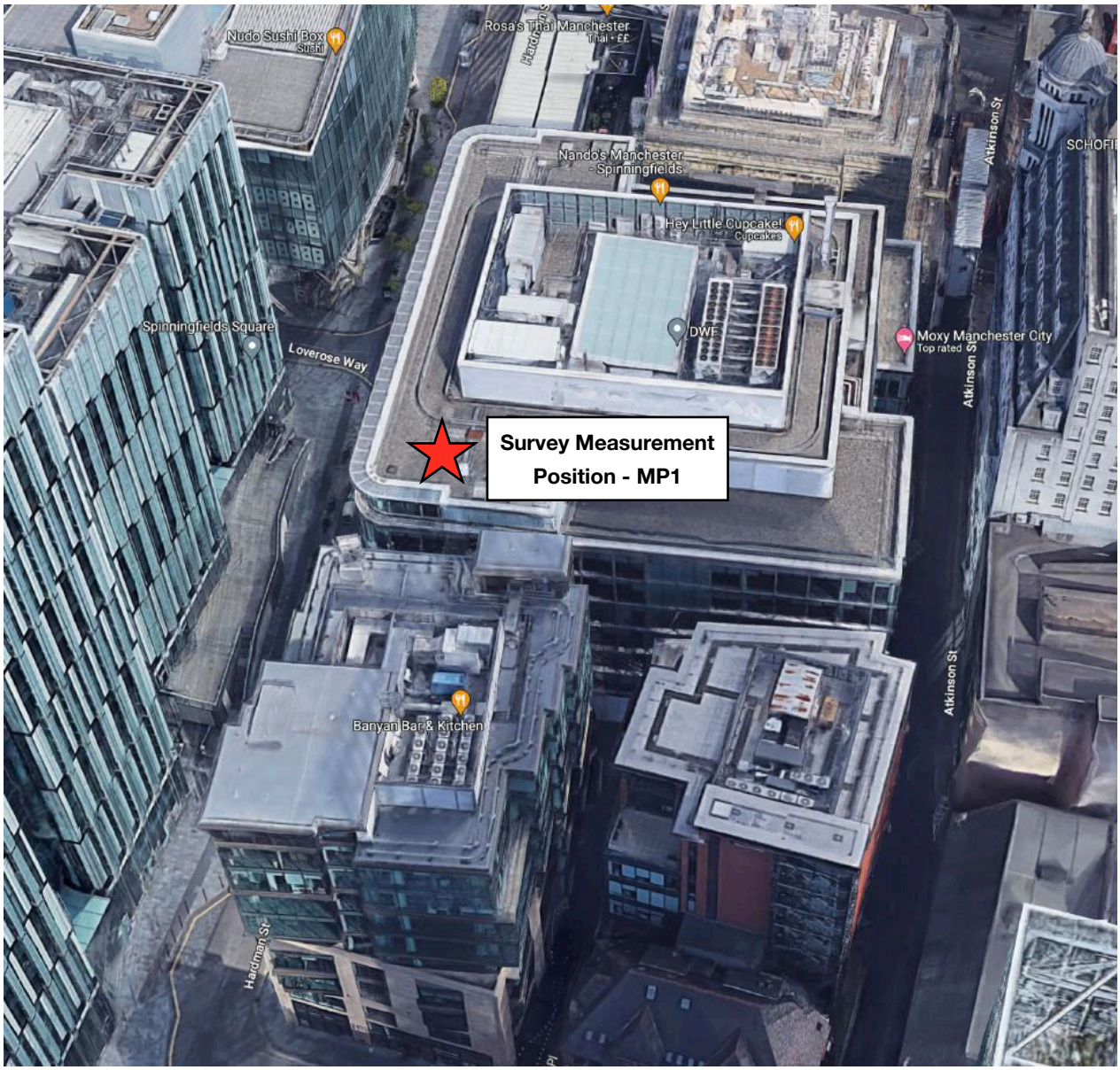
The guidance further states that the assessment of impact from fixed plant items should be undertaken in accordance with the guidance in BS4142:2014+A12019 and the assessment advice within the MCC guidance document.

4.0 ENVIRONMENTAL NOISE SURVEY

Environmental Noise Survey

In order to determine the prevailing environmental noise levels at the site, unmanned measurements were taken between 9th-11th August 2023. The measurement location used during the survey is shown in Figure 4.1 below. This roof position was selected to provide a measurement at a position which is representative of background noise levels for the nearest noise sensitive receptors.

Figure 4.1: Noise Survey Measurement Location



During the measurement periods, the noise climate for the site was driven by road traffic and residual plant noise from nearby buildings. The measured data shown has been used to determine the typical background sound level during relevant periods.

Figures 4.2 and 4.3 show the broadband noise survey data for daytime and nighttime periods respectively.

Figure 4.2: Broadband Noise Survey Data - Daytime

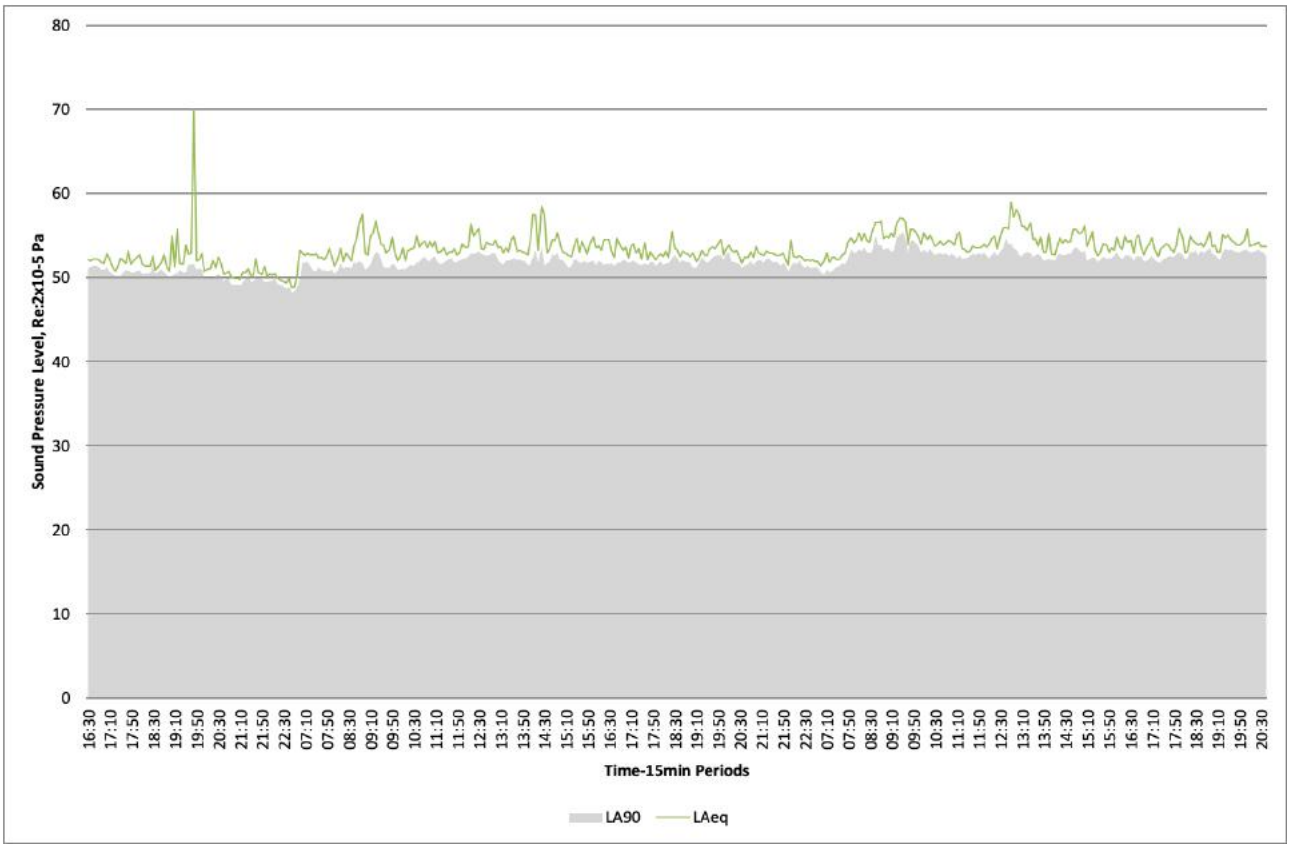
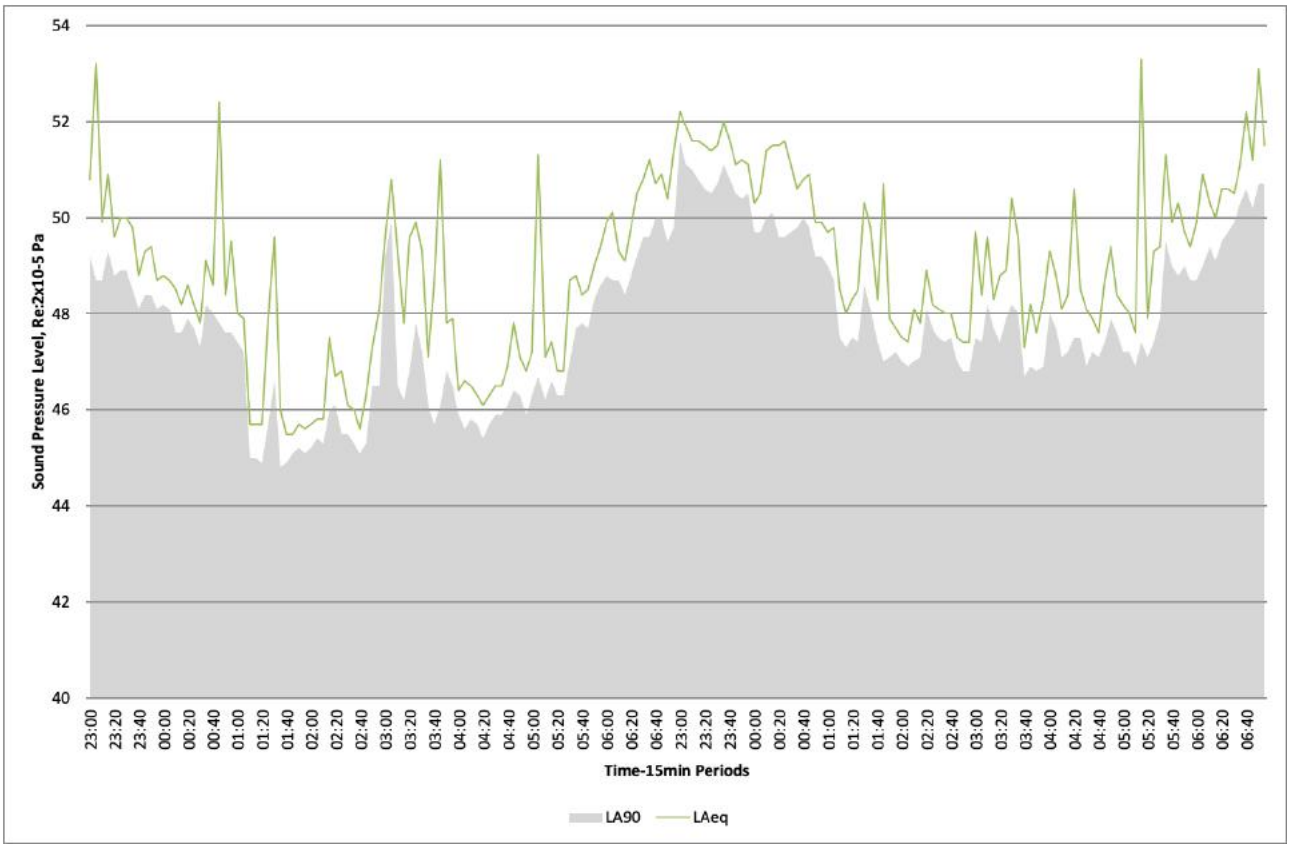


Figure 4.3: Broadband Noise Survey Data - Night-time



To establish the typical daytime and night-time background sound levels, statistical analysis has been undertaken. Figures 4.4 and 4.5 below detail the histogram for both the daytime and night-time periods based on the data presented above.

Figure 4.3: Histogram - Daytime LA90 Background Sound Pressure Levels

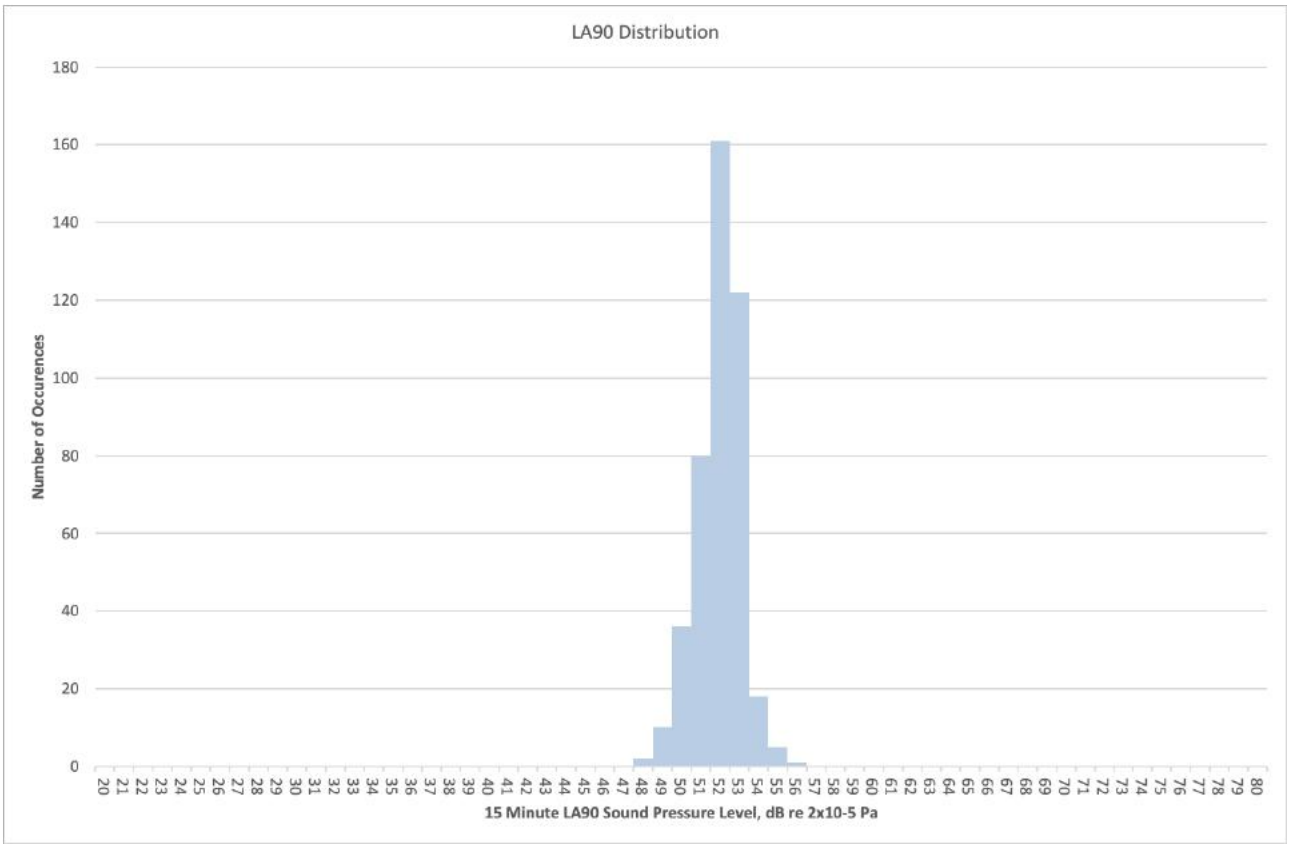
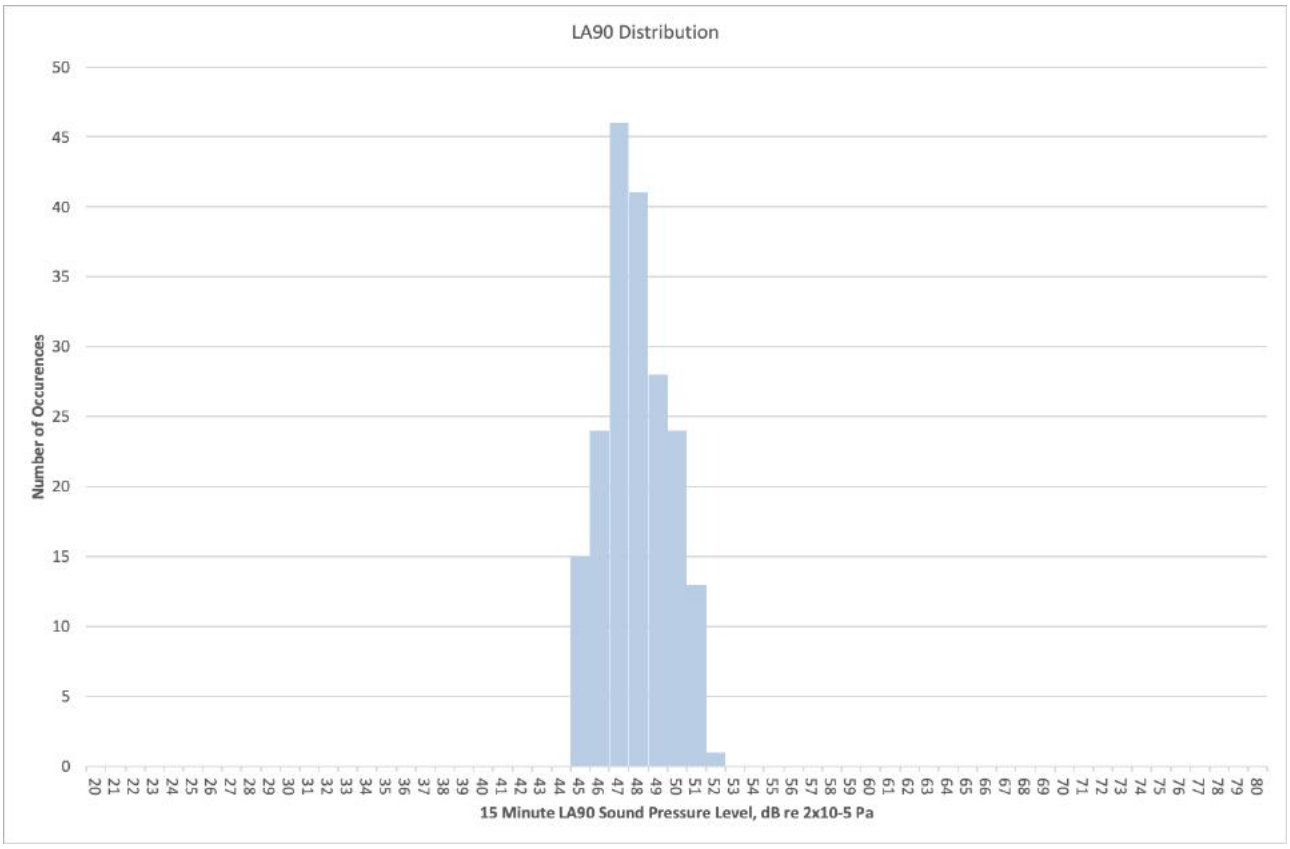


Figure 4.4: Histogram - Daytime LA90 Background Sound Pressure Levels



Based on the measured survey data, Table 4.1 below identifies the recommended L_{Aeq} plant noise limits for the proposed installation at the nearest noise sensitive receptors. The assessments are based on the typical measured $L_{A90,15min}$ during the relevant periods and Manchester City Council guidance.

Table 4.1: Plant Noise Limits at Nearest Noise Sensitive Facade

	Measured Noise Levels & Target Noise Limits			
	Day Time (07:00 - 23:00)		Night-time (23:00 - 07:00)	
Location	Typical Measured L_{A90}, dB	Target Noise Limit, dB L_{Aeq}	Typical Measured L_{A90}, dB	Target Noise Limit, dB L_{Aeq}
Nearest Noise Sensitive Facade	52	≤ 47	47	≤ 42

5.0 CADNAA NOISE PROPAGATION MODELLING

To predict noise levels from the Proposed ac units Installation to the surrounding environment and the nearest noise sensitive receptors, the latest version of CadnaA 3D noise propagation modelling software has been used, which implements the calculation procedure specified within ISO9613-2. CadnaA is considered to be the industry leading standard in noise propagation modelling software.

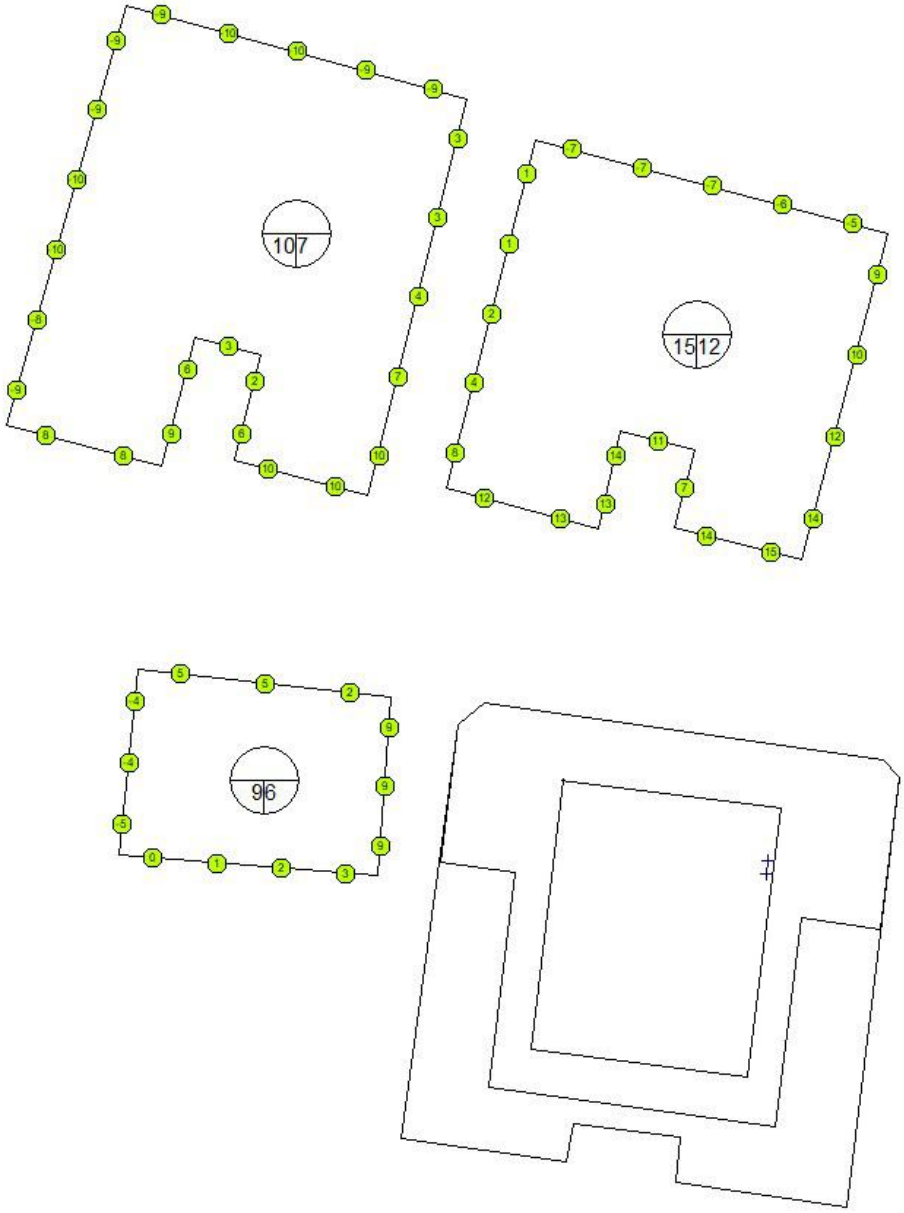
The model has been generated using the manufacturer supplied noise source sound power data presented in Section 2.0. The modelling of the surrounding environment was undertaken by modelling the existing buildings and the surroundings using Google Earth imagery and site inspection notes with ground heights set using 1m digital terrain height data obtained from the DEFRA data services platform.

Noise propagation is predicted from the proposed location of the AC Unit installation with ground set to fully reflective to represent hard ground and 4 orders of reflection set within the model. Noise impact is predicted to all facades of the nearby noise sensitive uses with the highest predicted facade level used for the purpose of the assessment.

The results of the noise propagation modelling are presented below. Figure 5.1 below shows the prediction at ground floor level and the highest predicted facade levels for the nearest noise sensitive facades.

The predicted level represents the Specific Sound Level in terms of BS4142:2014+A1:2019. It can be seen in Figure 5.1 below that the highest predicted Specific Sound Level at the nearest residential facade is XXdBA with both AC units operating simultaneously.

Figure 5.1: Predicted Specific Sound Level (dBA)



6.0 BS4142 PLANT NOISE IMPACT ASSESSMENT

To undertake an impact assessment on the proposed development in accordance with BS4142:2014+A1:2019, measured data at the proposed development site has been employed to determine the existing Background Sound Level. The manufacturer supplied broadband sound power level as discussed in Section 2.0 above has been used within the CadnaA noise propagation model to predict the impact of the Specific Sound Level to the nearest NSPs. Tables 6.1 & 6.2 below present the BS4142 assessment for the residential facades during the daytime and night time periods. The Rating Level has been rated against the typical measured $L_{A90,15min}$ Background Sound Level during both periods for a worst case assessment.

Table 6.1: BS4142 Assessment Table - NSP Typical Daytime Period

	Period (23:00 - 07:00)	Commentary
Ambient Sound Level	NA	Prediction method to be used.
Residual Sound Level	NA	
Specific Sound Level (predicted from plant sound power data)	15 dBA	Typical predicted facade level.
Corrections	0 dBA	No penalty corrections as impact is not expected to be readily distinguishable in context.
Rating Level dB	15 dBA	
Typical Existing Background $L_{A90,t}$	52 dBA	
Difference	-37 dBA	
Target	-5 dBA	
Comments	No further mitigation proposed	Rating level is below target.
Conclusion	Low Impact	

Table 6.2: BS4142 Assessment Table - NSP Typical Night-time Period

	Period (23:00 - 07:00)	Commentary
Ambient Sound Level	NA	Prediction method to be used.
Residual Sound Level	NA	
Specific Sound Level (predicted from plant sound power data)	15 dBA	Typical predicted facade level.
Corrections	0 dBA	No penalty corrections as impact is not expected to be readily distinguishable in context.
Rating Level dB	15 dBA	
Typical Existing Background $L_{A90,t}$	47 dBA	
Difference	-32 dBA	
Target	-5 dBA	
Comments	No further mitigation proposed	Rating level is below target.
Conclusion	Low Impact	

7.0 CONCLUSIONS

An assessment of noise impact due to the proposed installation of 2 no. AC units at 2 Hardman Street, Manchester has been undertaken to determine the likely impact to the nearest residential receptors.

Based on sound power data provided by the equipment manufacturer and an environmental noise survey to determine the typical background sound climate during the relevant operational period, a CandaA noise propagation model has been used to assess potential noise impact.

Based on the current proposal, impact is predicted to be low and no further mitigation measures are proposed.

APPENDIX A:
NOISE MEASUREMENT DETAILS

Location

2 Hardman Street

Manchester

M3 3HF

Survey Date

9-11 August 2023

Weather during the relevant survey period was noted to be dry with wind speeds below 5m/s

Survey Conducted By

Simon Webster, BEng (Hons) MIOA

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Full Members of the Association of Noise Consultants

Accredited Test Organisation Number 180

Instrumentation

Table A1: List of Instrumentation Used

Equipment Description	Type Number	Manufacturer	Serial Number	Date of Last Calibration	Calibration Certificate Number
Sound Level Meter	Type 140 Type 1	Norsonic	1402968	21/07/2023	44907
Preamplifier	Nor 1209	Norsonic	12551	21/07/2023	44906
Microphone Capsule	GRAS 4AF	GRAS	179632	21/07/2023	44906
Sound Calibrator	Type 1251 IEC 60942-2003 Class 1	Norsonic	33007	17-Jul-23	44878

Methodology

Before and after the measurements the sound level meter was check calibrated to an accuracy of ±0.3dB using the sound calibrator. The calibrator produces a sound pressure level of 114 dB re 2x10-5 Pa @ 1kHz.