EGG LIMITED

2 HARDMAN STREET, MANCHESTER M3 3HF

AC UNITS NOISE IMPACT VERIFICATION REPORT

R2218-REP02-PC

5 February 2024

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REPORT DETAILS

Project	AC Units Noise Impact Verification Report 2 Hardman Street Manchester M3 3HF
Client	Egg Green Park House, 15 Stratton Street, Mayfair, London, W1J 8LQ
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Signed	

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SUMMARY

Red Acoustics has been commissioned by Egg Ltd to provide a verification report for the installation of 2no. Air conditioning condenser units (AC units) in the existing rooftop plant compound at 2 Hardman Street, Manchester.

The purpose of the validation report is to demonstrate compliance with Planning Condition 3 and to enable the planning condition to be discharged. A previous noise impact assessment report has been prepared and submitted in relation to the installation of the AC Units: Ref R2218-REP01-SJW dated 18 August 2023 which details the completed noise surveys and subsequent plant noise limits.

The installation of the 2no. AC units is now complete and Red Acoustics have undertaken a verification measurement of the operational units. The verification measurement has been used to assess impact to the nearest noise sensitive receptors.

Compliance with the target criteria has been met and no further mitigation is proposed.

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1.0 INTRODUCTION

Red Acoustics has been commissioned by Egg Ltd to provide a verification report for the installation of 2no. AC units in the existing rooftop plant compound at 2 Hardman Street, Manchester. A previous noise impact assessment report has been prepared and submitted in relation to the installation of the AC Units: Ref R2218-REP01-SJW dated 18 August 2023 which details the completed noise surveys and subsequent plant noise limits.

The purpose of this report is to confirm compliance with Planning Condition 3 of consent no. 137905/FO/2023 which is repeated below for clarity:

3) a) Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with the scheme outlined in the document Red Acoustics plant noise assessment dated 18th August 2023 reference R2218-REP01SJW in order to secure a reduction in the level of noise emanating from the site. The scheme shall be implemented in full before the equipment is brought into use.

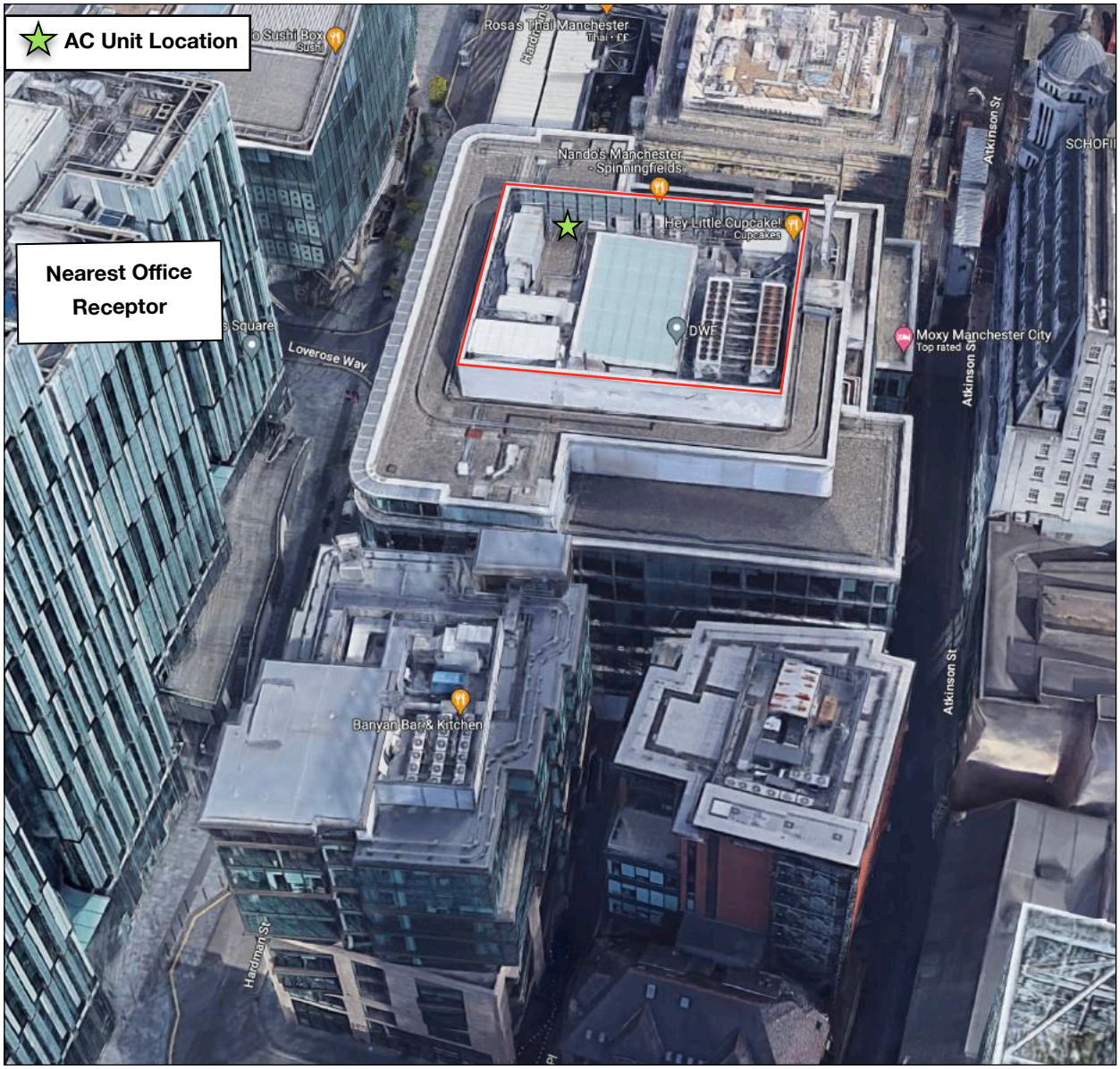
b) Prior to the first use of the equipment a verification report shall be submitted to and approved in writing by the City Council as local planning authority to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic report. The report shall also undertake post completion testing to confirm that the noise criteria have been met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria.

This report presents the result of a post completion commissioning measurement of the installed AC units and confirmation that the noise criteria have been met through assessment of noise propagation to the nearest noise sensitive receptors based on the measured data.

2.0 AC UNITS LOCATION

The 2no. AC units have now been installed within the existing rooftop plant compound which is located oat 2 Hardman Street, Manchester. Figure 2.1 below shows the installed location of the AC units with the rooftop plant compound outlined in red, in relation to the nearest noise sensitive properties (NSPs) which are located on Hardman Street.

Figure 2.1: Location of Installed AC Units



3.0 PLANNING POLICY & GUIDANCE

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:

- 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.

[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)

- 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'

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

Table 3.1 below summarises the PGG noise exposure hierarchy.

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 COMMISSIONING MEASUREMENT

Red Acoustics visited the completed development on 30th January 2024 to undertake a commissioning measurement with the AC units operating. The AC units are located within the large rooftop mounted plant compound. While the new AC units could be heard to be operating immediately adjacent to the front of the units, existing plant noise was completely dominant over the sound produced. A measurement was therefore taken at 1m directly in front of both units in free field conditions. The units were running on full demand when the measurement was taken over a 5min period, albeit the measured level was still dominated by existing plant noise within the compound.

As the plant has been selected to achieve a target noise level below the typical existing background sound level at the nearest noise sensitive property, it is necessary, in line with the guidance in BS4142:2014+A1:2019 to measure the operational plant items adjacent to the plant and demonstrate by calculation that the target criteria have been met. This is necessary as by definition the plant cannot be accurately measured at the nearest noise sensitive property, where the existing noise climate is above that of the plant items.

Table 4.1 below shows the measured data taken by Red Acoustics adjacent to the AC units with the units operating at the highest observed operational load.

Table 4.1: AC Units Noise Commissioning Measurement

Measurement	$L_{Aeq,5min}$	Sound Pressure Level, dB (re 2x10-5 Pa) Octave Band Centre Frequency							
		63 Hz	125 Hz	250 Hz	500 Hz	1.0 kHz	2.0 kHz	4.0 kHz	8.0 kHz
AC Plant @ 1m	58.1	64.8	64.5	60.9	53.0	52.1	49.2	43.8	37.3

Table 4.2 below shows the target noise limits provided within the approved noise impact assessment based on an environmental noise survey to determine the typical noise climate at the nearest noise sensitive property.

Table 4.2: 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

To confirm that the operational AC units comply with the recommendations within the approved noise impact assessment the measured data taken for the completed AC installation has been inputted into a 3D computer noise model to calculate noise propagation to the nearest noise sensitive properties which are located approximately 40m from the installation.

Section 5.0 below presents the results of the noise propagation model based on the measured commissioning data and Section 6.0 presents the assessment of the completed plant in accordance with the guidance in BS4142:2014+A1:2019.

5.0 CADNAA NOISE PROPAGATION MODELLING

To calculate noise levels from the completed plant 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.

The model has been generated using the measured data taken following completion of plant installation during the commissioning visit and this is presented in Section 4.0 above.

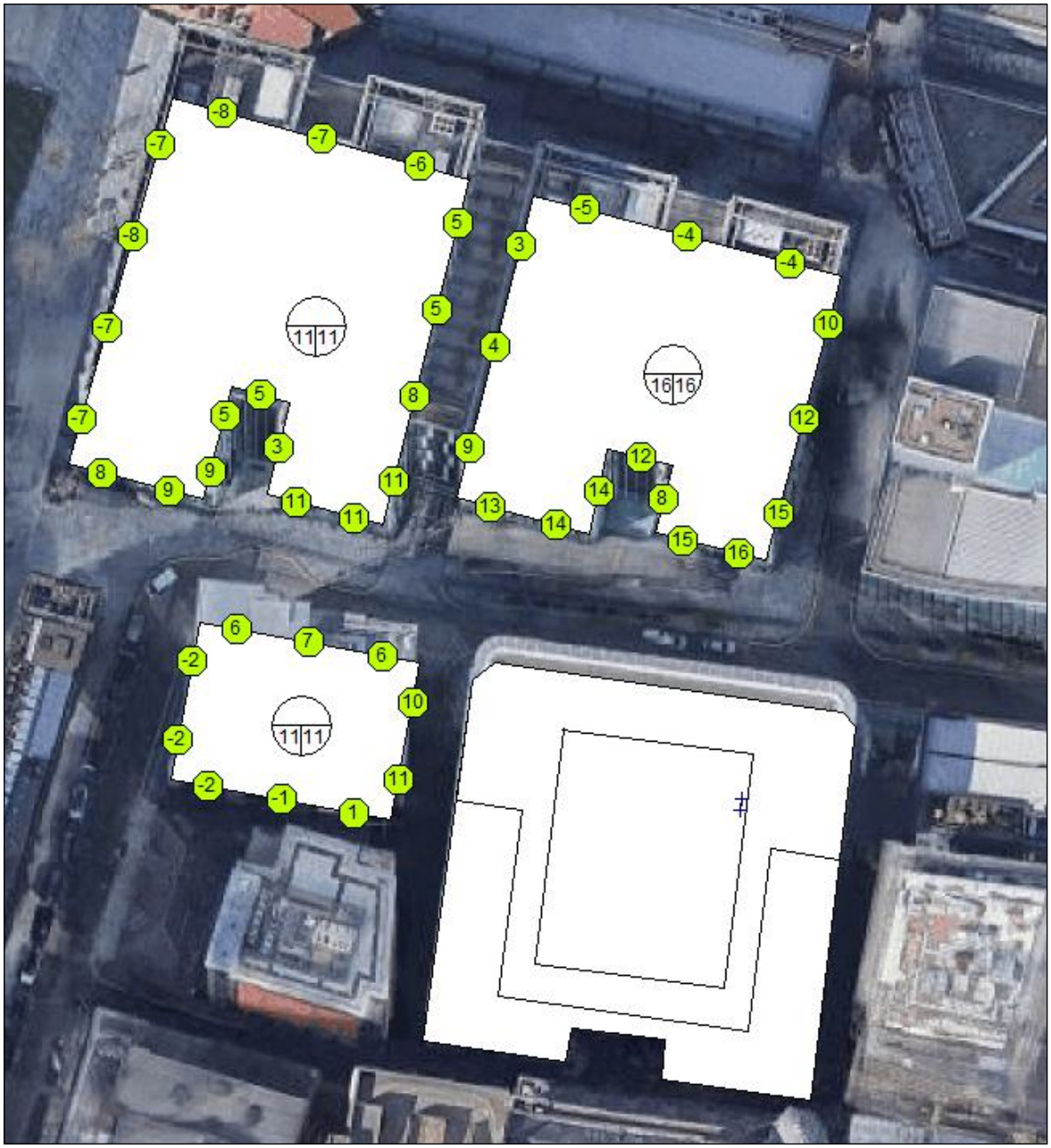
The modelling of the surrounding environment was undertaken by modelling the existing buildings and the surroundings using Google Earth imagery and site inspection notes with ground heights set using 1m digital terrain height data obtained from the DEFRA data services platform.

Noise propagation is calculated from the installed location of the plant items with default ground set to 80% reflective to represent mixed hard/soft ground and 2 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 shown and used for the purpose of the assessment.

The results of the noise propagation modelling are presented below. Figure 5.1 below shows the calculation result, with the highest predicted facade levels for the nearest noise sensitive properties.

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 16dBA.

Figure 5.1: Calculated Sound Level (dBA) Based on Measured Data with Both AC Units Fully Operational



6.0 BS4142 PLANT NOISE IMPACT ASSESSMENT

To undertake the impact assessment in accordance with BS4142:2014+A1:2019, measured data at the completed development site has been used to calculate the sound level to the nearest noise sensitive premises, along with measured data taken for the existing Background Sound Level. Table 6.1 below presents the BS4142 assessment for the nearest noise sensitive facades during the night-time period which is the driving factor at these receptor locations. Table 6.2 below presents the BS4142 daytime assessment. The Rating Level has been rated against the typical measured $L_{A90,15min}$ Background Sound Level for a worst case assessment.

Table 6.1: BS4142 Assessment Table - NSP Worst Case Facade (Night-time period)

	Period (23:00 - 07:00)	Commentary
Ambient Sound Level	NA	Calculation method to be used to all NSPs from commissioning measurement.
Residual Sound Level	NA	
Specific Sound Level (Calculated from commissioning measurement)	16 dBA	Highest calculated facade level at NSPs.
Corrections	0 dBA	No specific noise features are expected at the receptor
Rating Level dB	16 dBA	
Typical Existing Background $L_{A90,t}$	47 dBA	
Difference	-31 dBA	
Target	-5 dBA	
Conclusion	Low Impact	

Table 6.2: BS4142 Assessment Table - NSP Worst Case Facade Space (Daytime period)

	Period (07:00 - 23:00)	Commentary
Ambient Sound Level	NA	Calculation method to be used to all NSPs from commissioning measurement.
Residual Sound Level	NA	
Specific Sound Level (Calculated from commissioning measurement)	16 dBA	Highest calculated facade level at NSPs.
Corrections	0 dBA	No specific noise features are expected at the receptor
Rating Level dB	16 dBA	
Typical Existing Background $L_{A90,t}$	52 dBA	
Difference	-36 dBA	
Target	-5 dBA	
Conclusion	Low Impact	

7.0 CONCLUSIONS

Red Acoustics have undertaken a post completion verification visit to the completed plant installation at 2 Hardman Street, Manchester. A commissioning measurement of the newly installed fully operational AC units has been undertaken and the impact calculated to the nearest noise sensitive properties in accordance with the guidance in BS4142:2014+A1:2019.

The validation exercise has been undertaken to enable the discharge of the relevant planning condition in relation to noise. The assessment concludes that the target noise criteria have been met in line with the agreed targets and on this basis it is anticipated that the condition can now be discharged.

APPENDIX A:
NOISE MEASUREMENT DETAILS

Location

2 Hardman Street, Manchester M3 3HF

Commissioning Measurement Date

30th January 2024

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

Survey Conducted By

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Instrumentation

Table A1: List of Instrumentation Used

Equipment Description	Type Number	Manufacturer	Serial Number	Date of Last Calibration	Calibration Certificate Number	Calibration Due
Sound Level Meter	Type 118 IEC 60651 Type 1	Norsonic	30560	28/03/2022	1502069-5	27-Mar-24
Sound Calibrator	Type 1251 IEC 60942-2003 Class 1	Norsonic	33007	17-Jul-23	44878	16-Jul-24

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.