
Royal Northern College of Music (RNCM)

Plant Atmospheric Noise Assessment Report

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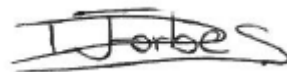


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1 Introduction

BDP Acoustics has been commissioned by RNCM to assess proposed noise levels emanating from new mechanical plant equipment (1no. reversible heat pump, and 1no chiller) being installed at RNCM, Manchester (referred to as “the site” throughout this report) in order to accompany the Planning application for the project.

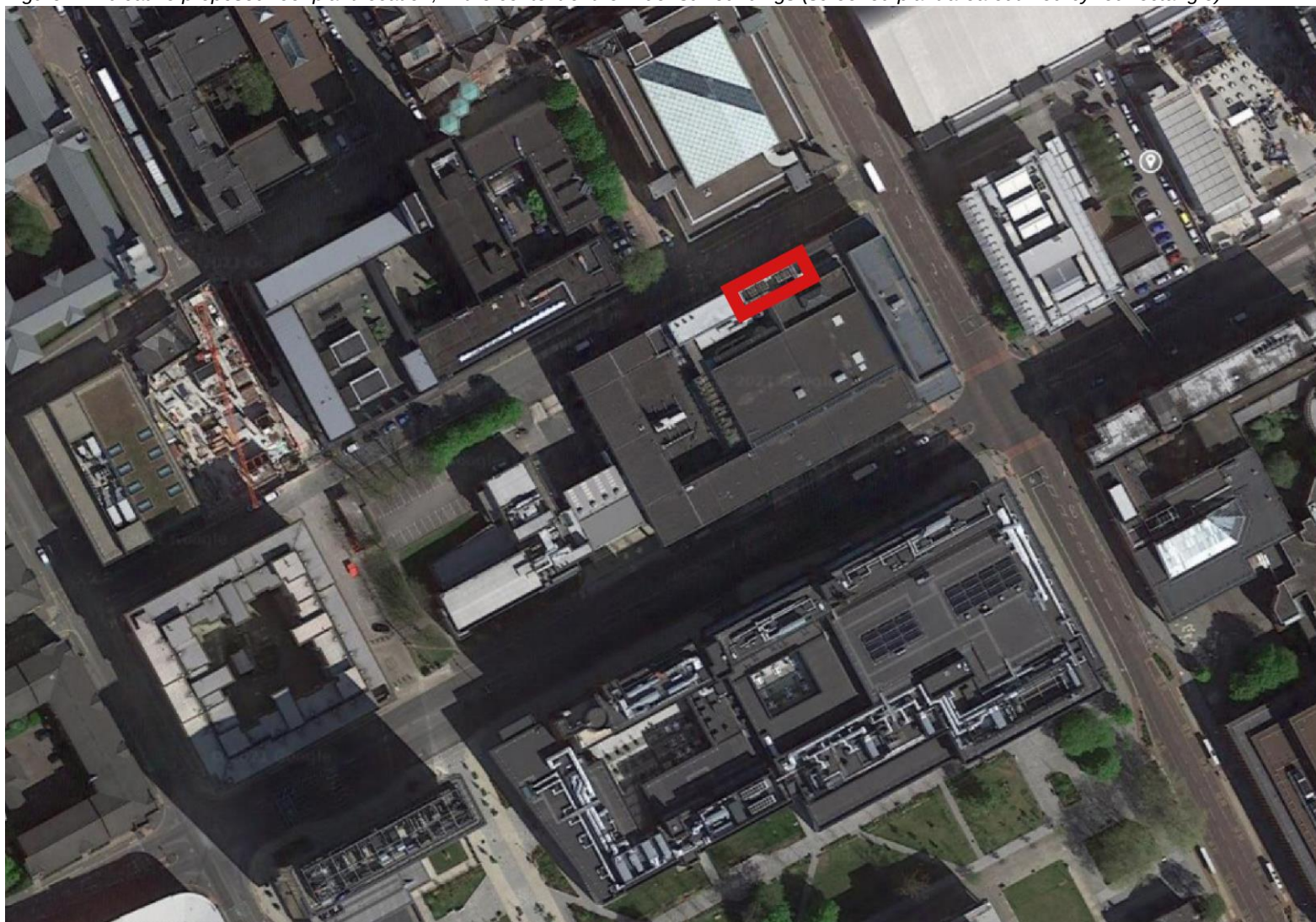
Based on information provided to BDP Acoustics by the design team, we understand that it is proposed for the 2 units to be located within an existing screened external plant area at roof level of the RNCM building, following the removal of 2 no. existing chiller units in the same location - refer Figure 1.

This report details the acoustic assessment undertaken, and in summary includes the following:

- Review of the Local Planning Authority requirements alongside other relevant guidance and acoustic standards;
- A summary of the environmental noise surveys undertaken;
- Proposed acoustic design criteria for noise relating to the proposed new equipment;
- Determination of the noise levels generated, compared to the proposed criteria;
- Confirmation of compliance with relevant criteria.

A glossary of acoustic terms is presented in Appendix I – Glossary of Acoustic Terms.

Figure 1: Indicative proposed roof plant location, in the context of the wider surroundings (screened plant area outlined by red rectangle).



2 Relevant Guidance and Standards

2.1 Noise Policy Statement for England

The NPSE provides guidance on the management of noise from sustainable development. The statement sets out three key aims in paragraph 1.7:

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

- *Avoid significant adverse impact 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.”*

2.2 National Planning Policy Framework

The NPPF sets out the Government’s planning policies for England and how these are expected to be applied. It provides a framework within which locally-prepared plans for housing and other development can be produced.

It advises that planning decisions should prevent new and existing developments from being put at unacceptable risks from, amongst other things, noise pollution. It goes on to advise that new development should be appropriate to its location and should mitigate and reduce to a minimum potential adverse impacts resulting from noise new development and avoid noise giving rise to significant adverse effects on health and quality of life.

2.3 BS4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound

BS 4142:2014+A1:2019 (BS 4142) provides a method for rating industrial and commercial sound and a method for assessing resulting impacts upon people. The impact assessment procedure described in BS 4142 is based on the comparison of rating sound level with the background sound level prevailing at the assessment locations.

2.4 Local Planning Authority (LPA)

Advice has been sought from Manchester City Council in regards to suitable noise level criteria and assessment methodology for noise egress from the proposed new equipment on the site. The following requirements are provided within Manchester City Council’s Planning & Noise Technical Guidance:

- *“The noise assessment should be based on BS 4142: 2014 and any application for fixed plant, equipment or machinery must demonstrate that: ‘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 (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location’.”*

3 Environmental Noise Survey

3.1 Introduction

Environmental noise surveys have been undertaken on 21/07/2021 at the nearest / most exposed noise sensitive receptor (NSR) properties to the proposed new equipment location.

The data obtained has been used in order to assist in the following:

- Establishing the existing background noise climate at NSR properties;
- Establishing external noise limit criteria.

3.2 Survey Methodology

A series of manned short-term measurements were undertaken by BDP Acoustics at locations considered to be representative of the nearest / most exposed NSR properties to the proposed new equipment location at the site.

The approximate measurement positions are presented in Figure 2 and were selected in order to encompass 'worst-case', i.e. quietest, night-time (0630 – 0700 hours) and daytime (1000 – 1200 hours) background noise levels, during typical periods of operation of the proposed equipment (0630 – 2200 hours, as advised by the design team), at the nearest / most exposed NSR properties for the purposes of determination of plant noise emission limits, in line with LPA requirements. Note, Position 1b was deemed on-site to have an equivalent daytime background noise climate to Position 1a and was chosen due to atypical circumstances (nearby construction works) affecting measurements at Position 1a during the daytime measurement period.

Weather conditions during the night-time survey period were dry with northerly wind speeds varying below 1.5 m/s, temperatures varying around 20°C and no cloud cover.

Weather conditions during the daytime survey period were dry with northerly wind speeds varying below 1.5 m/s, temperatures varying around 24°C and no cloud cover.

The instrumentation used for measurements consisted of 1no. Rion NA28 sound level meter, which was calibrated before and after the survey, with no significant drift in sensitivity observed. The sound level meter and calibrator used on site had been calibrated to traceable standards and calibration certificates can be provided upon request. At all positions octave band and A-weighted fast response levels were recorded for a comprehensive suite of noise level metrics. All readings were taken at a height of 1.5m above local ground level in free-field conditions. Measurements were carried out by Dan Forbes AMIOA.

3.3 Results

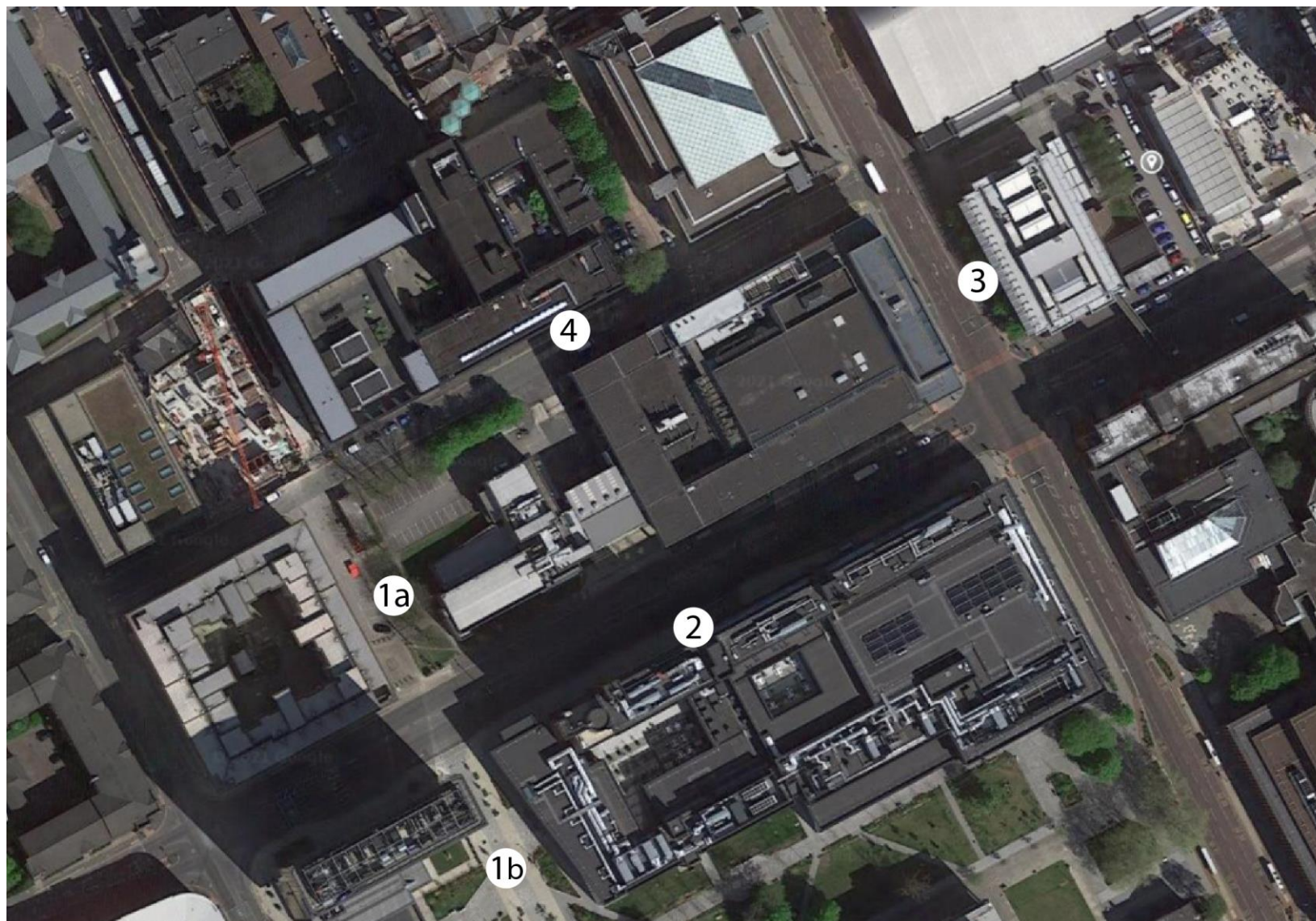
The background noise climate at the NSR properties was dominated by road traffic noise. Existing mechanical plant equipment located on the roof of the RNCM building was also faintly audible at Position 1a between 0630 – 0700 hours and at Position 2 between 1000 – 1200 hours, however noise from this equipment did not dominate the background or ambient noise climate at either position.

A summary of the measured results from the survey are presented in Table 1 below. Full measured results are available upon request.

Table 1: Summary of noise measurement results

Measurement Position	Start Time (hh:mm)	$L_{A90,5mins}$ Range (dB)	$L_{Aeq,5mins}$ Range (dB)	$L_{AFmax,5mins}$ Range (dB)
1a	06:25	45 - 48	55 - 56	66 - 70
1b	11:43	49 - 50	55 - 56	68 - 70
2	10:00	54 - 60	68 - 70	79 - 83
3	10:22	52 - 59	64 - 67	74 - 85
4	11:02	48 - 49	55 - 56	71 - 74

Figure 2: Approximate survey measurement positions



4 Assessment

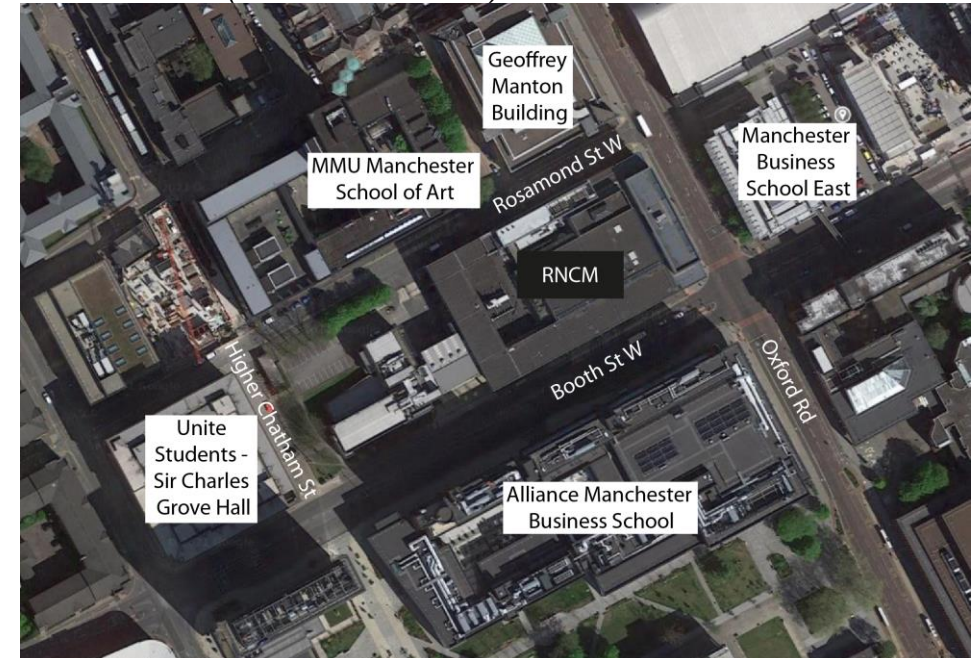
The following section provides an assessment of noise levels from the proposed new equipment at the nearest / most exposed NSR properties against proposed noise level criteria, based on LPA requirements.

4.1 Noise Sensitive Receptor Properties

The nearest / most exposed NSR properties to the proposed equipment location at the site are identified in the list below and presented in Figure 3:

- Unite Students – Sir Charles Grove Hall building off Higher Chatham St, to the west/south-west of the proposed new equipment location;
- Geoffrey Manton Building (Manchester Metropolitan University (MMU) Graduate School) off Rosamond Street West, to the north/north-west of the proposed new equipment location;
- MMU Manchester School of Art off Rosamond St W, to the west/north-west of the proposed new equipment location;
- Manchester Business School East off Oxford Rd, to the east/north-east of the proposed new equipment location ;
- Alliance Manchester Business School off Booth St W , to the south of the proposed new equipment location.

Figure 3: Identified nearest / most exposed NSR properties to the proposed new equipment location on the site (indicated in white boxes)



4.2 Proposed Assessment Criteria

LPA criteria relating to the proposed new equipment states that the following requirements must be achieved:

- *“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 (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location”.*

Based on the above requirements and guidance documents referenced in Section 2, Table 2 presents the proposed external noise limit criteria for noise from the new equipment at the NSR properties identified in Section 4.1.

4.3 Noise Level Assessment at NSR Properties

Manufacturer acoustic data and unit location details for the proposed new equipment at the site have been provided to BDP Acoustics by the design team.

The acoustic data provided indicates that the proposed:

- Reversible heat pump unit selection (TRANE Sintesis Balance CMAF 180 HE XLN EC) is expected to have a maximum sound power level of 89 dBA.
- Chiller unit selection (TRANE Sintesis Model GVAF 5 G e) is expected to have a maximum sound power level of 90 dBA.

The project mechanical engineer (DSSR) has advised that the two new units will never operate simultaneously, and as such the noise emissions can be assessed separately, rather than cumulatively.

Based on the information provided, BS4142 Rating Noise Levels due to the proposed new equipment at the identified NSR properties have been calculated. These noise levels have

been presented and compared against the proposed external noise limit criteria at each NSR property within Table 2 and Table 3 below.

As can be seen from the results tables, the calculated Rating Noise Levels at the nearest / most exposed noise sensitive receptor properties do not exceed the proposed noise level criteria. This assessment therefore indicates that the proposals relating to both the new reversible heat pump and chiller units at the site will comply with LPA requirements.

Table 2: Comparison of the calculated BS4142 Rating Noise Levels at the nearest / most exposed noise sensitive receptor (NSR) properties due to the proposed new Chiller unit against the proposed external noise limit criteria based on LPA requirements

Identified NSR properties	Period of operation	Lowest "worst-case" measured existing background noise level at NSR (dB L _{A90,5min})	Proposed external noise limit criteria at the NSR façade location for the proposed new Chiller unit (dB L _{A,T,r})	Calculated Rating Noise Level at the NSR façade location due to the proposed new Chiller unit (dB L _{A,T,r})	Difference between Rating Level and proposed external noise limit criteria at NSR
Unite Students - Sir Charles Grove Hall off Higher Chatham St	Night-time (0630 - 0700 hours)	45	40	25	-15
	Daytime (0700 - 2200 hours)	49	44	25	-19
Geoffrey Manton Building off Rosamond St West	Daytime (0700 - 2200 hours)	48	43	41	-2
MMU Manchester School of Art off Rosamond St West	Daytime (0700 - 2200 hours)	48	43	38	-5
Manchester Business School East off Oxford Rd	Daytime (0700 - 2200 hours)	52	47	34	-13
Alliance Manchester Business School off Booth St West	Daytime (0700 - 2200 hours)	54	49	31	-18

Table 3: Comparison of the calculated BS4142 Rating Noise Levels at the nearest / most exposed noise sensitive receptor (NSR) properties due to the proposed new reversible heat pump unit against the proposed external noise limit criteria based on LPA requirements

Identified NSR properties	Period of operation	Lowest "worst-case" measured existing background noise level at NSR (dB L _{A90,5min})	Proposed external noise limit criteria at the NSR façade location for the proposed new heat pump unit (dB L _{Ar,Tr})	Calculated Rating Noise Level at the NSR façade location due to the proposed new heat pump unit (dB L _{Ar,Tr})	Difference between Rating Level and proposed external noise limit criteria at NSR
Unite Students - Sir Charles Grove Hall off Higher Chatham St	Night-time (0630 - 0700 hours)	45	40	24	-16
	Daytime (0700 - 2200 hours)	49	44	24	-20
Geoffrey Manton Building off Rosamond St West	Daytime (0700 - 2200 hours)	48	43	40	-3
MMU Manchester School of Art off Rosamond St West	Daytime (0700 - 2200 hours)	48	43	37	-6
Manchester Business School East off Oxford Rd	Daytime (0700 - 2200 hours)	52	47	33	-14
Alliance Manchester Business School off Booth St West	Daytime (0700 - 2200 hours)	54	49	30	-19

5 Summary

- BDP Acoustics has been commissioned by RNCM to assess proposed noise levels emanating from new mechanical plant equipment (1no. Reversible Heat Pump unit, and 1no. Chiller unit) being installed at RNCM, Manchester to accompany the Planning application for the project.
- Environmental noise measurements have been completed at the nearest / most exposed noise sensitive receptor properties to the proposed new equipment's location on the site in order to encompass 'worst-case', i.e. quietest, night-time (0630 – 0700 hours) and daytime (1000 – 1200 hours) background noise levels, during typical periods of operation of the proposed equipment (0630 – 2200 hours), at the nearest / most exposed NSR properties, for the purposes of determination of plant noise emission limits, in line with LPA requirements.
- Based on information provided to BDP Acoustics, calculated noise levels at the nearest / most exposed noise sensitive receptor properties due to the proposed new equipment at the site have been found to achieve the proposed external noise limit criteria for the project. This assessment therefore indicates that the proposals relating to the new equipment will comply with Local Planning Authority requirements from an acoustic perspective.

Appendix I – Glossary of Acoustic Terms

A-Weighting

Normal hearing covers the frequency range from approximately 20Hz to 20kHz but sensitivity is greatest between about 500Hz and 8kHz. The "A-Weighting" is an electronic filters network incorporated in sound level meters which approximately corresponds to the frequency response of the ear. The unit of measurement of A-weighted sound level is dBA or dB(A).

Break-in

Noise transmission into a structure from the outside.

Break-out

Noise transmission from inside a structure to the outside.

Decibel, dB

This is a relative unit of measurement which in acoustics is the unit to measure sound. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro-Pascals to 100 Pascals). The dB is a logarithmic unit used to describe a ratio between the measured level and a reference or threshold level of 0dB (re. 20 micro-Pascals). We therefore use a logarithmic scale to describe sound pressure level, intensities and sound power levels. Subjectively, an increase of 10dB corresponds to a doubling in the perceived loudness of sound.

Equivalent Continuous Sound Level, L_{eq} or L_{Aeq}

The equivalent continuous sound level, L_{eq} is a notional sound level. It is the sound level, which, if maintained for a given length of time, would produce the same acoustic energy as a fluctuating noise over the same time period. (The formula for the above is implemented electronically in all good sound level meters and it is customary to measure rather than calculate the equivalent continuous sound level.) L_{Aeq} (A-weighted L_{eq}) is widely used to measure any environmental noise which varies considerably with time.

Façade Position

A measurement position located 1m away from a reflecting surface, typically a building façade. At a façade position, the sound level is recognised to be +3dB higher than a measurement taken at the same position without the presence of a reflecting surface.

Free Field

A sound field region with no adjacent reflecting surfaces.

Octave and Third Octave Bands

The human ear is sensitive to sound over a range of approximately 20Hz to 20kHz, and is generally more sensitive to medium and high frequencies than to low frequencies. In order to define the frequency content of a noise, the spectrum is divided into frequency bands (continuous range of frequencies between two limiting frequencies), and the sound pressure level is measured in each band. The most commonly used frequency bands are octave bands, in which the mid-frequency of each band is twice that of the band below it. (For instance the octave bands above and below the 500Hz octave band are 1kHz and 250Hz respectively). For finer analysis, each octave band may be split into three one-third octave bands or in some cases, fine frequency bands.

Rating Level, L_{Ar,T_r}

The specific sound level plus any adjustment for the characteristic features of the sound, as described in BS 4142:2014+A1:2019.

Sound Insulation

Airborne sound insulation refers to the process of separating, by a physical barrier, a space to be protected from a noise source or space containing a noise source.

Specific Sound Level, L_s or L_{Aeq,T_r}

The equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r .

Statistical Level: L_{90} or L_{A90}

Sound pressure level that is exceeded for 90% of the measurement time. Consequently it is indicative of the general background noise level in the absence of any higher level short duration events that occur during the period.

Statistical Level: $L_{max,T}$ or L_{Amax}

A noise level index defined as the maximum RMS sound pressure level measured during the measurement period, T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.

Time Weighting

One of the standard averaging times (Fast (F), Slow (S)) used for the measurement of RMS sound pressure level in sound level meters, specified in BS 5969.

Z-Weighting

Z-weighting or "zero weighting" is where no frequency weighting has been applied to the measured values.