
North City Family & Fitness Centre, Manchester

Plant Noise Assessment Report

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1 Introduction

BDP Acoustics has been commissioned by Ameresco to assess proposed noise levels emanating from new mechanical plant equipment (3no. ground source heat pumps) proposed to be installed at North City Family & Fitness Centre, Manchester (referred to as “the site” throughout this report) to accompany the planning submission for the project.

Based on equipment location details provided to BDP Acoustics by Ameresco on 03/08/2021, we understand that it is proposed for the GSHP units to be located within a plant enclosure, at Ground Floor level, at the south-west corner of the North City Family & Fitness Centre building.

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

- Review of the Local Planning Authority (LPA) requirements alongside other relevant guidance and acoustic standards;
- A summary of the environmental noise survey undertaken;
- Proposed acoustic design criteria for noise relating to the proposed new equipment, based on LPA requirements;
- Determination of the noise levels generated by the proposed equipment, compared with the proposed criteria;

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

Figure 1: Image of approximate proposed equipment location, (equipment enclosure indicated in red).



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

An environmental noise survey has been undertaken on 24/01/2022 at a position representative of the nearest / most exposed noise sensitive receptor (NSR) properties to the proposed plant equipment location on the site.

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 plant equipment location at the site.

The approximate measurement position at the site is presented in Figure 2 and was selected in order to encompass worst-case, i.e. quietest, night-time (0200 – 0400 hours) background noise levels at the nearest / most exposed NSR properties for the purposes of determination of plant noise emission limits, in line with LPA requirements.

A measurement position to the south of the closest NSR properties, approximately 100m from the proposed plant equipment location, was chosen as plant noise from Harpurhey Police Station to the north of the closest NSRs was noted to dominate the background noise levels at the closest NSR properties. The background noise levels measured at position 1 are expected to be representative of the background noise levels experienced at NSR properties in the absence of plant noise contributions from the Police Station.

Weather conditions during the survey were dry with no wind, temperatures varying around 7°C and 10% cloud cover.

The instrumentation used for measurements consisted of 1no. Bruel & Kjaer 2260 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. 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 Gavin Stevenson MIOA.

3.3 Results

The background noise climate at the NSR properties was dominated by noise from existing general mechanical plant noise. The ambient noise climate was dominated by local road traffic noise, when present.

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

Table 1: Summary of noise measurement results

Measurement Position	Start Time (hh:mm)	Duration (mm:ss)	$L_{A90,5mins}$ Range (dB)	$L_{Aeq,5mins}$ Range (dB)	$L_{AFmax,5mins}$ Range (dB)
1	02:04	15:00	39-41	41 - 55	54 - 75

Figure 2: Approximate survey measurement position



4 Assessment

The following section details the proposed noise limit criteria at the nearest noise sensitive receptor properties to the equipment proposed to be installed at the site, based on LPA requirements.

4.1 Noise Sensitive Receptor (NSR) Properties

The nearest / most exposed NSR properties to the proposed equipment location at the site are identified to be residential properties facing onto Upper Conran Street approximately 69 metres to the east / south-east of the equipment location.

4.2 Proposed Assessment Criteria

LPA criteria relating to the proposed 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, as well as the existing background noise levels at NSR properties, proposed external noise limit criteria for noise from the proposed equipment at the NSR properties identified in Section 4.1 are presented within Table 2.

It is understood by BDP Acoustics that the proposed equipment has the potential to operate during the night-time. Therefore, the proposed criteria presented below has been based on the night-time background noise level.

Table 2: Proposed noise limit criteria at the nearest noise sensitive receptor properties for the proposed equipment, based on LPA requirements

Identified NSR properties	Existing night-time background noise level at the nearest NSR properties ($dB L_{A90,T}$)	Proposed external noise limit criteria at the NSR façades location ($dB L_{A,T,r}$)
Residential properties on Upper Conran Street	39	34

4.3 Noise level assessment at NSR properties

The following section provides an assessment of noise levels from the proposed new equipment at the nearest / most exposed NSR properties against the proposed noise level criteria detailed in Section 3.

Manufacturer's acoustic data, unit location details and attenuation measures for the 3no. proposed GSHP units at the site have been provided to BDP Acoustics by Ameresco on 06/07/2021 and 03/08/2021.

This information identifies that the GSHP units are proposed to be enclosed within a plant enclosure with louvres on the north-east side of the enclosure which are not exposed to the NSR position. The acoustic data provided identifies that a maximum sound power level of 72 dBA is expected from each GSHP unit within the enclosure.

Based on the information provided and a simple noise propagation calculation, it is predicted that the cumulative noise level due to the operation of the proposed GSHP's, at the identified NSR properties, would be 22 dBA. It is worth noting that a conservative 10dB screening correction has been applied within these calculations to account for the enclosure. In reality, the proposed enclosure would be likely to achieve a greater level of reduction than this.

Based on the information provided a BS4142 Rating Noise Level due to the proposed equipment at the identified NSR properties has been calculated. These noise levels have been presented and compared against the proposed external noise limit criteria at the NSR properties within Table 3.

Table 3: Comparison of the calculated BS4142 Rating Noise Level at the nearest / most exposed NSR properties due to the proposed equipment against the proposed external noise limit criteria based on Local Planning Authority (LPA) requirements

Identified NSR properties	Existing night-time background noise level at the nearest NSR properties (dB $L_{A90,T}$)	Proposed external noise limit criteria at the NSR façades location (dB $L_{A,T}$)	Calculated Rating Noise Level at the NSR façade location (dB $L_{A,T}$)	Difference between Rating Level and proposed external noise limit criteria at NSR
Residential facades on Upper Conran Street	39	34	22	-12

As can be seen from Table 3, the calculated rating noise levels at the nearest / most exposed noise sensitive receptor properties due to the proposed equipment achieve the proposed noise level criteria. This assessment therefore indicates that the proposals relating to the proposed equipment at the site will comply with Local Planning Authority requirements.

5 Summary

- BDP Acoustics has been commissioned by Ameresco to assess proposed noise levels emanating from new mechanical plant equipment (3no. GSHP) being installed within an enclosure at North City Family & Fitness Centre, Manchester.
- A summary of the environmental noise survey undertaken is provided, and the data presented for the purposes of determination of plant noise emission criteria in line with LPA requirements.
- Manufacturer noise data, unit location, and enclosure information have been provided to BDP Acoustics by Ameresco and form the basis of noise propagation calculations undertaken.
- Based on information provided to BDP Acoustics the calculated noise level at the nearest / most exposed noise sensitive receptor properties due to the proposed equipment have been found to achieve the proposed noise level criteria. This assessment therefore indicates that the proposals relating to the proposed equipment at the site will comply with Local Planning Authority requirements.

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.

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, $L_{Ar,Tr}$

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.

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 $L_{A\max}$

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.