

Manchester University Hospitals Oxford Road Campus.

Emergency Generators Noise Impact Assessment.

Planning application no. 143111/FO/2025.

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1. Introduction

BDP have been commissioned by Sodexo Limited (Sodexo) to complete a noise impact assessment relating to the installation of 2no. emergency generators at the Manchester University Hospitals Oxford Road Campus.

In June 2025, Manchester City Council (MCC) approved Planning Application 143111/FO/2025, relating to the installation of 2no. new stand-by emergency generators. Attached to the decision notice were a number of planning conditions, including condition no. 7 which relates to the control of noise emissions associated with the scheme.

The following report presents a noise impact assessment with reference to the methodologies of BS4142:2014+A1:2019. The purpose of this assessment is to support the partial discharge of planning condition no. 7 as detailed in section 3 of this report.

All advice within is given from an acoustics perspective only.

A glossary of acoustic terms is included in Appendix I.

2. Development proposals

2.1. Site location and setting

The proposed site for the emergency generators is located within the Manchester University Hospitals Oxford Road Campus in Manchester. The campus is located approximately 1.5 miles southeast of Manchester City Centre and includes several hospitals including Manchester Royal Infirmary, Royal Manchester Children's Hospital, and others.

2.2. Development proposals

The development proposals include the following:

- Provision of 2no. new standby generators within acoustic housing units.

The generators will be located within the hospital's existing waste management enclosure. The proposed location and layout of the generators is shown on Sodexo drawing no. 00-DR-A-00-100-A. *Proposed Waste Yard Plan*. A copy of this drawing is provided in Figure 1. This location for the 2no. proposed emergency generators is bounded by Manchester Children's Hospital buildings to the north and west, Upper Brook Street to the east, and Hathersage Road to the south.

The generators will provide emergency back-up for critical operations in the hospital. It has been confirmed by Sodexo that maintenance testing will be carried out either on each generator at full load independently, or both generators simultaneously at half load. It is understood that Sodexo are to provide a schedule of time and days that the plant will be tested.

2.3. Noise-sensitive receptors

The nearest, or most exposed, noise sensitive receptors (NSRs) of relevance to this assessment have been identified as follows:

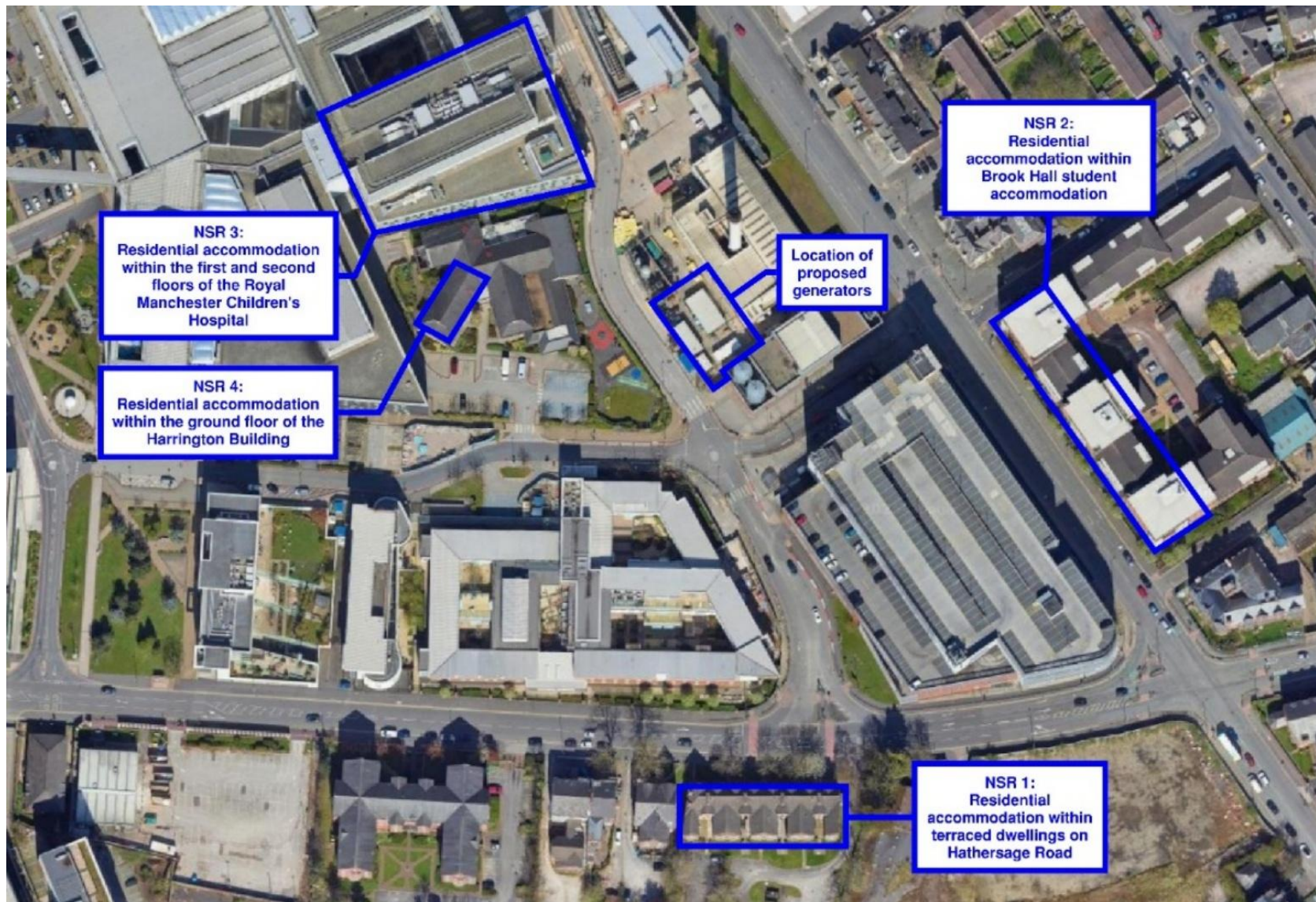
1. Residential properties on Hathersage Road.
2. Brook Hall student accommodation on Upper Brook Street.
3. Residential accommodation within levels 1 and 2 of the Royal Manchester Children's Hospital.
4. Residential accommodation on the ground floor within a wing of the Harrington Building.

The location of each of these NSRs is indicated on Figure 2.

Residential accommodation of relevance within the hospital site have been identified to BDP by Sodexo.



Figure 2: Satellite image of the proposed site and surrounding area, with markup indicating the locations of noise-sensitive receptors of relevance to this assessment



3. Assessment criteria

The following section outlines the assessment criteria for sound emissions from the new emergency generator installation.

3.1. Planning application 143111/FO/2025 decision notice

The decision notice associated with the development states the following:

'7) a) Prior to any above ground works, either a scheme that demonstrates that any plant equipment will achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level in each octave band at the nearest noise sensitive location, or a scheme showing a method to acoustically treat/insulate any plant equipment so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level in each octave band at the nearest noise sensitive location, shall be submitted to and approved in writing by the Local Planning Authority. The development shall then be carried out in accordance with the approved details.

b) Prior to the first use of the generators, a verification report, which will include post-completion testing, shall be submitted to and approved in writing by the Local Planning Authority to validate that the plant equipment achieves a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level in each octave band at the nearest noise sensitive location.

c) In the event of non-conformity with a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level in each octave band, then any measures/changes required to achieve conformity shall be carried out. Any required measures/changes and verification shall continue until conformity has been achieved and agreed in writing by the Local Planning Authority, before the use can commence.'

Later in the document, the following paragraph gives additional guidance relating to the setting of assessment criteria:

'The applicant should aim to achieve the above criteria but there is provision to allow emergency generators to achieve not more than 10dB above the existing typical background at the nearest noise sensitive location. This can be discussed between the applicant and MCC's Environmental Health team. In addition, the applicant will need to agree, with Environmental Health, a schedule of time and days that the plant will be tested.'

As advised therefore, contact was made with MCC to discuss assessment criteria further. A summary of the discussion is provided in section 3.2.

3.2. Local authority consultation

Contact was made with Jack Naven, Career Graded Planning Officer at MCC, with the purpose of discussing and agreeing suitable assessment criteria and methodologies for the scheme on 25/11/2025. A summary of this discussion is as follows:

- **Criterion:** As the proposed generators are for emergency use, it was agreed that, to comply with the requirements of planning condition no. 7, the cumulative noise emissions of the 2no. generators should not exceed a rating level of 10 dB above the background sound level, when measured at the relevant noise-sensitive receptors (identified in section 2.3).
- **Methodology:** It was agreed BDP would attend site to measure the background sound climate at what's expected to be the worst-case, i.e. quietest, periods of the day and night, taking 15-minute attended measurements. To facilitate assessment, CadnaA 3D acoustic propagation modelling will be undertaken to predict emergency plant noise emissions at the relevant noise-sensitive receptors.

- The noise impact assessment should be made with reference to BS4142:2014+A1:2019 - Methods for rating and assessing industrial and commercial sound.

3.3. BS4142:2014+A1:2019 - Methods for rating and assessing industrial and commercial sound (BS4142)

As noted in the section above, the plant noise assessment should make reference to BS4142:2014+A1:2019.

BS4142 provides a method for rating and assessing sound of an industrial and commercial nature. The method uses outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident. The impact assessment procedure described in BS4142 is based on the comparison of rating sound level with the background sound level prevailing at the assessment locations.

This edition of BS4142 was prepared under the direction of the Health and Environment Sector Board. The general basis for the standard is derived from the application of previous editions, together with accumulated experience. Some aspects, including guidance on character corrections, are based upon research which has been reported since publication of the previous edition of this standard.

4. Environmental noise surveys

This section of the report describes the specifics of the site surveys completed within the scope of the assessment.

4.1. Overview

2no. external noise surveys have been undertaken around the site, as follows:

- 1no. attended background sound survey undertaken on Tuesday 02/12/25 between 14:00 and 16:00 to measure the background sound level representative of the daytime period at the noise-sensitive receptors.
- 1no. attended background sound survey undertaken on Thursday 04/12/25 between 01:00 and 02:30 to measure the background sound level representative of the night-time period at the noise-sensitive receptors.

4.2. Equipment

The equipment listed in Table 1 was used to conduct the noise surveys.

Table 1: BDP environmental noise survey equipment

Equipment Description	Manufacturer	Type Number
Sound level meter	O1dB	Fusion
Calibrator	Rion	Model NC-74

The sound level meters were field calibrated prior to commencing the surveys and upon completion; 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.

4.3. Methodology

This section contains a description of the methodologies used on site for each survey, alongside observations recorded on-site regarding the prevailing sound climate.

- Measurement locations are indicated on Figure 3:
 - Measurement location 1 was deemed to be representative of the background sound level at noise-sensitive receptors within the Manchester Royal Infirmary site.
 - Measurement location 2 was deemed to be representative of the background sound level at the noise-sensitive residential terrace on Hathersage Road.
 - Measurement location 3 was deemed to be representative of the background sound level at the noise-sensitive Brook Hall student accommodation on Upper Brook Street.
- Daytime measurements were carried out by Thomas Jenkins MIOA, while night-time measurements were carried out by Gavin Stevenson MIOA.
- Attended measurements were taken in the free field at approximately 1.2 metres above ground level using a O1dB Fusion sound level meter.
- The duration of each measurement was 15 minutes.
- At each measurement position, the octave band and A-weighted fast-response levels were recorded for a comprehensive suite of noise level metrics.

- Weather conditions during the daytime survey were dry, temperatures around 9°C, with wind speeds < 8 mph. During the night-time survey, weather conditions were dry, temperatures around 7°C, with wind speeds < 5 mph.

4.4. Observations

The background sound climate in each of the following measurement locations was observed as follows in Table 2.

Table 2: Background sound survey observations

Measurement location (refer to Figure 3)	Period	Survey observations
1	Daytime	Background sound climate (L_{A90}) dominated by road traffic noise from vehicles using North Road, with contributions from hospital rooftop plant equipment, passing aeroplanes, and pedestrians.
	Night-time	Background sound climate (L_{A90}) dominated by noise from hospital rooftop plant equipment.
2	Daytime	Background sound climate (L_{A90}) dominated by road traffic noise from vehicles using Hathersage Road.
	Night-time	Background sound climate (L_{A90}) dominated by road traffic noise from vehicles using Hathersage Road and, in the absence of local traffic, noise from Hospital rooftop plant equipment.
3	Daytime	Background sound climate (L_{A90}) dominated by road traffic noise from vehicles using Upper Brook Street.
	Night-time	Background sound climate (L_{A90}) dominated by road traffic noise from vehicles using Upper Brook Street and, in the absence of local traffic, noise from hospital rooftop plant equipment.

Figure 3: Survey measurement positions (G represents the location of the proposed generators)



4.5. Survey results

Table 3 presents a summary of sound levels measured during the attended surveys. Full measured data, including octave band frequency levels, is available upon request.

Table 3: Summary of measured background sound levels

Measurement location (refer to Figure 3)	Start time (dd/mm hh:mm)	Duration, T (mm:ss)	L _{A90,T} (dB)	L _{Aeq,T} (dB)	L _{Amax,F} (dB)
1	02/12 14:00	15:00	53	57	68
1	02/12 14:56	15:00	53	58	82
1	04/12 02:04	15:00	47	50	69
2	02/12 14:18	15:00	58	67	89
2	02/12 15:14	15:00	57	65	80
2	04/12 01:15	15:00	47	59	79
3	02/12 14:38	15:00	61	72	85
3	02/12 15:48	15:00	61	72	91
3	04/12 01:36	15:00	53	69	84

5. Noise propagation modelling

Proprietary noise propagation modelling software, CadnaA, has been used to predict the levels of sound resulting at the relevant noise-sensitive receptors from the 2no. new emergency generators proposed. This section of the report details the calculation methodologies used, along with the assumptions used within the noise model.

5.1. Information referenced

The modelling is based upon the following information provided to BDP by Sodexo:

- 00-DR-A-00-001-A. Site location plan, which includes the location of hospital buildings and noise-sensitive receptors.
- 00-DR-A-00-102-A. Proposed Elevation & Section showing the location of the proposed generators and their surroundings in section and elevation.
- 00-DR-A-00-100-A. Proposed Waste Yard Plan showing the location of the proposed generators and their surroundings in plan.
- TSP25-002_00-DOC-A-00-100-P5. Design & Access Statement for the scheme, which includes various drawings relating to the proposed generators.
- EC9411-100-100. Plan, sections, elevations, and 3D renders of the proposed generators, from which the geometry of the proposed generators was modelled.
- Manufacturers sound emission data for the proposed units as presented in document reference “EC9411 r2 - Acoustic Calculations”. It is noted that the attenuation measures associated with the units have been designed to control overall sound emissions from each individual unit to a SPL of 80dBA

at 1m. Individual inlet, outlet, casing-radiated, and exhaust sound power level data for each individual unit operating at full load as provided by the manufacturer is summarised in Table 4.

Table 4: Summary of received acoustic information relating to the proposed generators

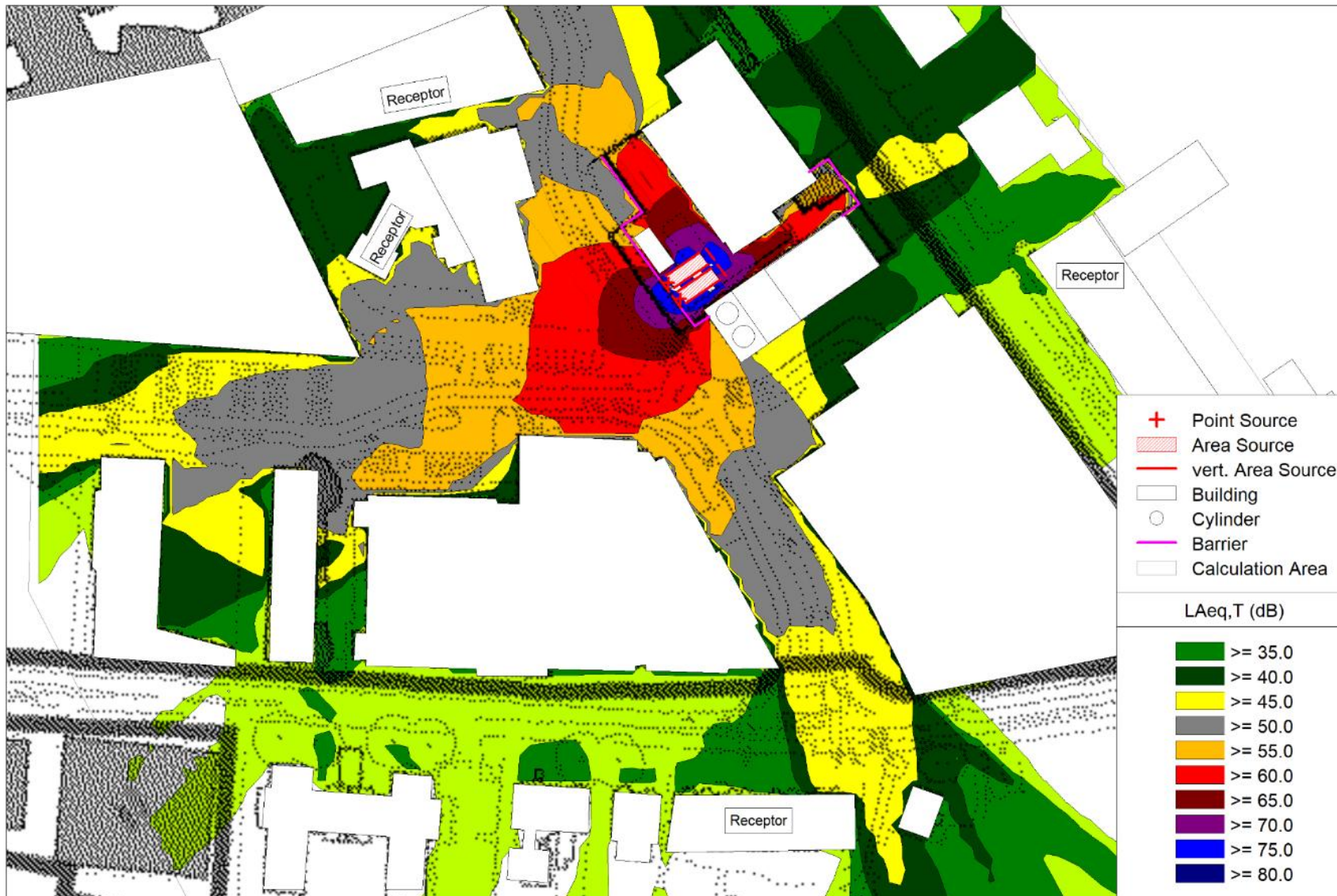
Plant element	Manufacturer stated sound power levels per unit after attenuation, full load (dBA)
Inlet	SWL 84
Outlet	SWL 85
Casing-radiated ¹	SWL 97
Exhaust	SWL 89
Table notes: ¹ The casing-radiated contribution is 'attenuated' only by the casing.	

5.2. Assessment methodology and assumptions

- The noise model was constructed within the commercially available DataKustik proprietary noise mapping software, CadnaA 2025.
- Noise source and geometric information used within the model references the information described in section 5.1 of this report.
- Noise levels are predicted for each generator running in isolation, with the highest prediction at each receptor from each generator used to inform the subsequent assessment.
- The stated sound power level for the casing-radiated contribution is subdivided across the 3no. solid sides of the enclosure.

- The ground cover in the area has been assumed to be hard ground with a ground factor $G = 0.00$.
- The existing brick wall has been included in the model, along the pink lines shown in Figure 4, to the heights provided to BDP by Sodexo within the elevation/section drawings described in section 5.1 of this report.
- 2no. reflections are accounted for in the model.
- Acoustic propagation calculated using CadnaA with reference to ISO 9613-2:2024 "Acoustics - Attenuation of sound during propagation outdoors".
- A screenshot from the CadnaA model showing $L_{Aeq,T}$ noise contours at 1.5 metres above ground is provided in Figure 4.

Figure 4: CadnaA noise propagation model noise contours - expressed in terms of $L_{Aeq,T}$ dB at 1.5 metres above ground, both generators running at full load



6. Assessment of noise impacts

This section derives assessment criteria and provides an assessment through comparison of these with the noise predictions made using the propagation model described in section 5 of this report.

6.1. Assessment criteria

Table 5 sets out the assessment criteria, derived with reference to the background sound levels captured during the environmental noise surveys described in section 4, and to the 'existing background +10dB' approach agreed with MCC as discussed in section 3.2 of this report.

6.2. Acoustic character

Certain acoustic characteristics can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such characteristics are readily distinguishable at the assessment location, a 'character correction' should be added to the specific sound level to obtain the rating level.

BS4142 describes acoustic character in terms of tonality, impulsivity, and intermittency. These are described and related to the context of this scheme as follows:

- Tonality relates to the frequency spectrum of a source, with corrections applying when specific frequencies are readily distinguishable as being dominant at the receptor. In the context of this scheme, the octave band sound power level spectra provided by the manufacturer of the proposed generators' acoustic housing do not show any dominant tonality therefore a character correction for tonality was not deemed necessary.

- Impulsivity considers the rapidity of change and overall change in sound level when a source becomes active or inactive. In the context of this scheme, no such impulsivity is expected due to the constant nature of the generators, i.e. no mechanical 'banging' or 'clanking' is expected.
- Intermittency is relevant when a source has repeated identifiable on/off conditions which are readily distinctive against the residual acoustic environment. The proposed generators are not expected to repeatedly turn on and off, meaning no distinctive effect is expected to be readily distinguishable at the receptors.

As justified above, no BS4142 character corrections have been applied in this assessment.

6.3. Results

Table 6 provides a summary of predicted plant noise rating levels at each noise-sensitive receptor; these are compared against the relevant cumulative emergency plant noise rating level limits, with the difference between the two presented in the final column.

Table 6 demonstrates, by way of comparison of predicted noise rating levels and cumulative plant noise rating level limits at each noise-sensitive receptor, that the noise impact of the proposed 2no. emergency generators, in their proposed attenuated configuration, is expected to comply with the assessment criteria derived in consultation with MCC, i.e. 'existing background +10dB', therefore fulfilling part 'a' of Manchester City Council's planning condition no. 7, associated with approved Planning Application 143111/FO/2025.

6.4. Next steps

In order to discharge planning condition no. 7 in its entirety, a verification report including the results of post-completion testing to be carried out shall be written for submission to the Local Planning Authority to validate that the installed 2no. emergency generators achieve the criteria described within this report.

Table 5: Emergency plant noise emission limits at nearest noise sensitive receptors

Time period ¹	Receptor location (refer section 2.3)	Representative background sound level at receptor location, L _{A90,T} dB	Emergency plant noise BS4142 rating level limit L _{A,r,T,r} dB
Daytime (07:00 – 23:00)	1: Residential properties on Hathersage Road	57	67
Night-time (23:00 – 07:00)		47	57
Daytime (07:00 – 23:00)	2: Brook Hall student accommodation on Upper Brook Street	61	71
Night-time (23:00 – 07:00)		53	63
Daytime (07:00 – 23:00)	3: Residential accommodation within levels 1 and 2 of the Royal Manchester Children’s Hospital	53	63
Night-time (23:00 – 07:00)		47	57
Daytime (07:00 – 23:00)	4: Residential accommodation within the ground floor of the Harrington Building	53	63
Night-time (23:00 – 07:00)		47	57
Table notes:			
1. Note that, due to the measurement duration used during the daytime environmental noise surveys described in section 4 of this report, the lowest 15-minute measurement made at each noise-sensitive receptor has been chosen to represent the background sound level for the daytime assessment.			

Table 6: Summary of initial BS4142 assessment predictions

Time period	Noise sensitive receptor ¹	Cumulative plant noise rating level limit, L _{A,r,Tr} (dB)	Predicted emergency plant noise rating level, L _{A,r,Tr} (dB) ²	Difference (dB)
Daytime (07:00 – 23:00)	1: Residential properties on Hathersage Road	67	43	-24
Night-time (23:00 – 07:00)		57	43	-14
Daytime (07:00 – 23:00)	2: Brook Hall student accommodation on Upper Brook Street	71	38	-33
Night-time (23:00 – 07:00)		63	38	-25
Daytime (07:00 – 23:00)	3: Residential accommodation within levels 1 and 2 of the Royal Manchester Children’s Hospital	63	52	-11
Night-time (23:00 – 07:00)		57	52	-5
Daytime (07:00 – 23:00)	4: Residential accommodation within the ground floor of the Harrington Building	63	47	-16
Night-time (23:00 – 07:00)		57	47	-10
Table notes:				
1. Where a ‘noise-sensitive receptor’ table row refers to multiple receptor locations, e.g. multiple windows in a façade, the worst result is shown, i.e. most onerous situation or worst-case scenario.				
2. Noise levels are predicted for each generator running in isolation, with the highest prediction at each receptor from each generator presented.				

7. Summary

BDP have been commissioned by Sodexo Limited to complete a noise impact assessment relating to the installation of 2no. emergency generators, with the purpose of fulfilling part 'a' of planning condition no. 7, associated with the planning application for the scheme. In summary:

- The location of 2no. new emergency generators have been identified and a pack of information received from Sodexo has been reviewed with regards to noise source levels.
- Manchester City Council have been consulted to agree suitable assessment criteria, noise-sensitive receptors, and methodologies for the scheme.
- 2no. environmental noise surveys have been carried out to measure the background sound climate at each noise-sensitive receptor during both the acoustic daytime and night-time periods.
- Noise source levels from the generators at the nearest noise sensitive receptors have been predicted via a 3D noise propagation model.
- Noise levels measured during the environmental surveys were used to inform cumulative plant noise rating level limits at each noise-sensitive receptors for both the acoustic daytime and night-time periods.
- Assessment of the predicted levels at the sensitive receptors has been completed with reference to the methodologies of BS4142, the results of which indicated compliance with the assessment criteria during both the daytime and night-time periods.
- Next steps have been defined towards discharge of planning condition no. 7.

Appendix I – Glossary of acoustic terms.

A-Weighting

Normal hearing covers the frequency range from about 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.

Decibel, dB

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

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

The continuous equivalent sound level, L_{Aeq} 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 period. (This metric is embedded electronically in all good sound level meters, and it is customary to measure rather than calculate the equivalent continuous sound level). L_{Aeq} is often used to describe any environmental noise which varies considerably with time.

L_{max} or L_{Amax}

This is the maximum RMS sound pressure level occurring within a specified time period; the time weighting, e.g. fast or slow, is usually specified.

Octave and One-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 sound, the spectrum is divided into frequency bands, 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.

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 .

Rating Level, L_{A,r,T_r}

The specific sound level plus any adjustment for the characteristic features of the sound.

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.

Time Weighting

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