0208 488 5731
www.esacoustics.com
info@esacoustics.com

Plant Noise Impact Assessment Report for Planning

37 Endell Street, Covent Garden, London, WC2H 9EE

Report Reference 20338.PNIA-RPT.01

ES Acoustics Limited Registered in England Company No. 14373293
ES Acoustics is part of Environmental Sensors (Registered in England Company No. 12699902)

Project Address	37 Endell Street, Covent Garden, London, WC2H 9EE
Report Title	Plant Noise Impact Assessment Report for Planning
Prepared For	Capezio
Report Reference Number	20338.PNIA-RPT.01
Principle Author	Daniel J. Green MIOA

Document Revision History		
Revision Reference	**Issue Date**	**Purpose and/or Description of Revision**
First Issue	15th March 2023	Noise impact assessment report in support of planning application for the installation of 1 no. external air condenser unit and 1 no. externally extracted ventilation unit
Rev A	26th April 2023	Further to feedback from the Local Authority, the report has been updated to include mitigation to obtain a rating level at least 10dB below background

Principle Author Contact Details		
Name	**Telephone No.**	**Email Address**
Daniel J. Green MIOA	0208 488 5731	daniel.green@esacoustics.com

EXECUTIVE SUMMARY

External building services plant is proposed to be installed at 37 Endell Street, Covent Garden, London, WC2H 9EE.

An environmental noise survey has been undertaken to establish background sound levels representative of the closest noise sensitive receptor locations relative to the proposed plant locations. A summary of the measurement results is presented in the table below for daytime, night-time, as well as the store operating hours when the plant would be in use:

Period	**Residual Sound Level** $L_{Aeq,\ T}$ **(dB)**	**Representative Background Sound Level** L_{A90} **(dB)**
Daytime 07:00-23:00	54	53
Night-time 23:00-07:00	46	33
Operating hours 10:00-18:00	55	53

Manufacturer's noise data of the proposed external building services plant have been used to calculate expected noise levels at the closest noise sensitive receptor in accordance with BS 4142:2014+A1:2019.

The table below compares the Rating Level calculated at the closest receptor against the background sound level during the proposed operating hours of the units:

Time	**Residual Sound Level** **dB** $L_r = L_{Aeq,\ T}$	**Representative Background Sound Level** **dB** $L_{A90,\ T}$	**Calculated Specific Sound Level at 1m from Receptor Façade** **dB** $L_s = L_{Aeq,\ Tr}$	**Calculated Rating Level at 1m from Receptor Façade** **dB** $L_{Ar,\ Tr}$	**+/- compared against background** **dB**
Operating hours 10:00-18:00	55	53	39	41	-12

The resultant Rating Level established above considers that additional mitigation would be required to obtain a level sufficiently below background in the form of an acoustic barrier with absorbent internal lining. The proposed mitigation measures are detailed in Section 5.3.

Contextual considerations have also been considered, as required by BS 4142:2014+A1:2019, to assess the impact of the proposal.

It has been concluded noise emissions from the proposed plant would be sufficiently below the background sound level to be considered as a low likelihood of adverse impact in accordance with BS 4142:2014+A1:2019.

CONTENTS

LIST OF ATTACHMENTS

1 INTRODUCTION

ES Acoustics Ltd has been commissioned by Capezio to undertake an environmental noise survey and noise impact assessment for the proposed installation of new external building services plant at 37 Endell Street, Covent Garden, London, WC2H 9EE.

The purpose of this report is to;

- Review relevant national and local planning policy and guidance;
- Undertake an environmental noise survey on site to determine background noise levels at nearby noise sensitive receptor locations;
- Set noise emission limits for the proposed installation of new external building services plant at nearby receptors;
- Undertake a noise impact assessment and where appropriate provide outline mitigation advice to ensure the set noise emission limit is met.

2 RELEVANT PLANNING POLICY AND GUIDANCE

This section of the report presents the key guidance and legislation relevant to the assessment of noise emissions from proposed installation of new external building services plant.

2.1 National Policy

2.1.1 National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) superseded and replaced Planning Policy Guidance Note 24 (PPG24), which previously covered issues relating to noise and planning in England.

The paragraphs relating to noise state:

174. Planning policies and decisions should contribute to and enhance the natural and local environment by; […]

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans

185. 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:

a) 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 the quality of life;

b) Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; […]

187. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

2.1.2 Noise Policy Statement for England (NPSE)

The Noise Policy Statement for England (NPSE) was developed by DEFRA and published in March 2010. The long-term vision of the Government noise policy is to '*Promote good health and good quality of life through the effective management of noise within the context of Government policy on sustainable development*.'

The NPSE vision noted above is supported by the following aims:

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

- *Avoid significant adverse impacts 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*

The NPSE outlines observed effect levels relating to the above, as follows:

- *No observed effect level (NOEL): this is the level of noise exposure below which no effect at all on health or quality of life can be detected;*
- *Lowest observed adverse effect level (LOAEL): this is the level of noise exposure above which adverse effects on health and quality of life can be detected;*
- *Significant observed adverse effect level (SOAEL): This is the level of noise exposure above which significant adverse effects on health and quality of life occur;*

Noise effect levels are not set at absolute noise level targets, but instead vary depending on the context and character of the noise and site-specific factors which may impact on the severity of the effect. The NPSE states:

'It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.'

2.1.3 National Planning Practice Guidance (NPPG)

The NPPG provides practical guidance on how the NPPF should be applied as well as and guidance on the factors influencing whether noise may be a concern at the planning stage and how adverse effects can be mitigated. The table below summarises the effect levels presented within the NPSE, as follows:

Response	Examples of Outcomes	Increasing Effect Level	Action
Not present	No Effect	No Observed Effect	No specific measures required
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific Measures required
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate & reduce to a minimum
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. 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
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Table 1 Noise exposure hierachy

2.2 Local Policy

2.2.1 London Borough of Camden

The site falls within the jurisdiction of the London Borough of Camden.

The Camden Local Plan is the key strategic document in Camden's development plan, which was adopted on 3 July 2017. It has replaced the Core Strategy and Camden Development Policies documents. It is now the basis for planning decisions and future development in Camden.

Policy A4 Noise and Vibration '*seeks to ensure that noise and vibration is appropriately considered at the design stage and that noise sensitive uses are not negatively impacted by noise and vibration or that existing uses (such as music venues, theatres and some employment uses) are not unduly restricted through the introduction of nearby noise sensitive uses'.* The Policy and relevant wording is outlined below:

Policy A4 Noise and vibration

The Council will seek to ensure that noise and vibration is controlled and managed. Development should have regard to Camden's Noise and Vibration Thresholds (Appendix 3). We will not grant planning permission for:

a. *development likely to generate unacceptable noise and vibration impacts; or*

b. *development sensitive to noise in locations which experience high levels of noise, unless appropriate attenuation measures can be provided and will not harm the continued operation of existing uses.*

We will only grant permission for noise generating development, including any plant and machinery, if it can be operated without causing harm to amenity. We will also seek to minimise the impact on local amenity from deliveries and from the demolition and construction phases of development.

With regards to noise from fixed plant and machinery, paragraph 6.99 of the Local Plan states:

6.99 Planning conditions will be imposed to require that plant and equipment which may be a source of noise is kept working efficiently and within the required noise limits and time restrictions. Air conditioning will only be permitted where it is demonstrated that there is a clear need for it after other measures have been considered (Policy CC2 Adapting to climate change). Conditions may also be imposed to ensure that attenuation measures are kept in place and are effective throughout the life of the development.

Appendix 3 of the Local Plan presents noise thresholds for various scenarios. The introduction of the section states:

The significance of noise impact varies dependent on the different noise sources, receptors and times of operation presented for consideration within a planning application. Therefore, Camden's thresholds for noise and vibration evaluate noise impact in terms of various 'effect levels' described in the National Planning Policy Framework and Planning Practice Guidance:

- *NOEL – No Observed Effect Level*
- *LOAEL – Lowest Observed Adverse Effect Level*
- *SOAEL – Significant Observed Adverse Effect Level*

Three basic design criteria have been set for proposed developments, these being aimed at guiding applicants as to the degree of detailed consideration needed to be given to noise in any planning application. The design criteria outlined below are defined in the corresponding noise tables. The values will vary depending on the context, type of noise and sensitivity of the receptor:

- *Green – where noise is considered to be at an acceptable level.*
- *Amber – where noise is observed to have an adverse effect level, but which may be considered acceptable when assessed in the context of other merits of the development.*
- *Red – where noise is observed to have a significant adverse effect.*

With regards to 'industrial and commercial noise sources', Appendix 3 states:

A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is

expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion).

Table C *'Noise levels applicable to proposed industrial and commercial developments (including plant and machinery)'* has been reproduced below:

Existing Noise Sensitive Receptor	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOEL (Red)
Dwellings**	Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)	Day	'Rating level' 10dB* below background	'Rating level' between 9dB below and 5dB above background	'Rating level' greater than 5dB above background
Dwellings**	Outside bedroom window (façade)	Night	'Rating level' 10dB* below background and no events exceeding 57dB L_{Amax}	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dB L_{Amax}	'Rating level' greater than 5dB above background and/or events exceeding 88dB L_{Amax}

Table 2 Camden Local Plan guidance with regards to noise from plant and machinery

10dB should be increased to 15dB if the noise contains audible tonal elements. (day and night). However, if it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required. In addition, a frequency analysis (to include, the use of Noise Rating (NR) curves or other criteria curves) for the assessment of tonal or low frequency noise may be required.

****levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises.***

The periods in Table C correspond to 0700 hours to 2300 hours for the day and 2300 hours to 0700 hours for the night. The Council will take into account the likely times of occupation for types of development and will be amended according to the times of operation of the establishment under consideration.

There are certain smaller pieces of equipment on commercial premises, such as extract ventilation, air conditioning units and condensers, where achievement of the rating levels (ordinarily determined by a BS:4142 assessment) may not afford the necessary protection. In these cases, the Council will generally also require a NR curve specification of NR35 or below, dependant on the room (based upon measured or predicted $L_{eq,5mins}$ noise levels in octave bands) 1 metre from the façade of affected premises, where the noise sensitive premise is located in a quiet background area.

2.3 Best Practice and Guidance

2.3.1 BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'

BS 4142:2014+A1:2019 provides a methodology for rating and assessing the impacts of industrial and commercial sound at noise sensitive receptors.

The methodology involves comparing the Rating Noise Level due to the sound source/s under assessment with the existing background noise level (L_{A90}) when the noise source is not operating to estimate the initial impact, as follows (Typically, the greater this difference, the greater the magnitude of the impact):

a) *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context*

b) *A difference of around +5 dB could be an indication of an adverse impact, depending on the context*

c) *The lower the rating level is relative to the measured background sound level, the less likely it is that there will be an adverse impact or significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound having a low impact, depending on the context*

The standard notes that a noise source under assessment will have a 'low impact' when the 'rating level' of a noise source is less than the existing background noise. It is also important to note that any quantitative assessment results are assessed considering the context in which the sound occurs.

The standard notes three types of context within Clause 11, which are:

1) *The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.*

   Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

   Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

2) *The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous*

sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it.

3) *The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:*

   i. facade insulation treatment;

   ii. ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and

   iii. acoustic screening.

The definitions noted above are described below:

- ***Specific sound*** *– sound source being assessed ($L_s = L_{Aeq, Tr}$)*
- ***Residual sound*** *– 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 ($L_r = L_{Aeq, T}$)*
- ***Ambient sound*** *– totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far ($L_a = L_{Aeq, T}$)*
- ***Background level*** *– sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval ($L_{A90, T}$)*
- ***Rating level*** *– specific sound level plus any adjustment for the characteristic features of the sound ($L_{Ar,Tr}$)*

With regards to background noise levels, BS 4142:2014+A1:2019 notes:

"In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods."

With regards to the 'rating level', the adjustments for the characteristic features of the sound are outlined below:

- *Tonality – +2 dB for a tone which is 'just perceptible' at the noise receptor, +4 dB where it is 'clearly perceptible', and +6 dB where it is 'highly perceptible'*
- *Impulsivity – +3 dB for a tone which is 'just perceptible' at the noise receptor, +6 dB where it is 'clearly perceptible', and +9 dB where it is 'highly perceptible'*

- *Intermittency – +3 dB if the intermittency is readily distinctive against the residual acoustic environment*
- *Other sound characteristics – where the specific sound features characteristics that are neither tonal nor impulsive, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied.*

It must be noted that as the rating level is determined at the closest noise sensitive receptor, the acoustic feature corrections should be applied based on the level at receptor location, not at source. This is particularly relevant when noise propagation characteristics cause differences in sound reduction at various frequency bands.

Note that the assessment reference periods that should be considered for daytime and night-time, as defined within the standard, are:

- *One hour period for a sound source operating during daytime hours (07:00-23:00 hours)*
- *Fifteen-minute period for a sound source operating during the night-time (23:00-07:00 hours)*

ES Acoustics Notes regarding Context:

The notes presented below are informed by the BS 4142:2014+A1:2019 Technical Note prepared by the Association of Noise Consultant Good Practice Working Group. Assessment context is often misunderstood or applied incorrectly, and the notes are therefore presented to provide a clear picture on what aspects of context should be considered when assessing the overall impact of a particular scenario:

Subclause 11(1)

The second paragraph notes that absolute levels may be as, or more, important than relative outcomes where background and rating levels are low. It is important to note that both background and rating levels would need to be low for this particular caveat to apply.

BS 4142 does not indicate how the initial estimate of impact should be adjusted when background and rating levels are low, only that the absolute levels may be more important than the difference between the two values. It is likely that where the background and rating levels are low, the absolute levels might suggest a more acceptable outcome than would otherwise be suggested by the difference between the values. For example, a situation might be considered acceptable where a rating level of 30dB is 10dB above a background sound level of 20dB, i.e. an initial estimate of a significant adverse impact is modified by the low rating and background sound levels. However, there may be situations where the opposite is true, and it is for the assessor to justify any modifications to the initial estimate of impact.

BS 4142 does not define 'low' in the context of background sound levels nor rating levels. The note to the Scope of the 1997 version of BS 4142 defined very low background sound levels as being less than about 30 dB L_{A90}, and low rating levels as being less than about 35 dB $L_{Ar,Tr}$. We would consider that similar values would not be unreasonable in the context of the current edition of BS 4142.

The third paragraph states that "where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts".

In the ordinary application of BS 4142 the residual sound level is not compared with the background sound level to determine the level of impact. The third paragraph is therefore taken to mean that the level of impact caused by the residual level has been determined by professional judgement or with reference to another document, such as the Noise Insulation Regulations 1975 (as amended 1988). Where professional judgement is used, it should be appropriately justified.

Where the residual sound levels are very high, a significant adverse impact might be declared in a situation where the rating level exceeds the background sound level by, say, 4dB, i.e. since the residual sound levels are already considered to cause a significant impact, any worsening of the situation would be considered a significant adverse impact, even if the difference between the rating level and background sound level would not suggest this to be the case.

Subclause 11(2)

The second aspect of context described in BS 4142 relates to the character and level of the specific sound. In essence, whether or not the character of the sound is distinguishable from the character of the ambient or residual acoustic environment or is incongruous.

BS 4142 does not provide instruction as to how to treat the assessment outcomes in these circumstances, nor does it explain how to distinguish between this contextual consideration and the process for applying rating penalties. The latter is itself informed by the distinctive characteristics of the specific sound in the context of the residual sound environment.

Where character-based contextual matters are taken into account, the assessor should make it clear how these matters are distinct from those that informed the rating level corrections, and what the implications of these further character assessments should be. For example; new deliveries on an estate entailing rating penalties for reversing alarms and impulsive noise but these types of noise are already present at other existing premises, so contextually the impact is reduced. Conversely, where the residual level is largely comprised of natural sounds, such as the sea or birdsong, so the impact from the specific source might be increased.

Subclause 11(3)

The third contextual matter described in Clause 11 relates to the receptor itself. It is important to note that the reference at the start of this section of BS 4142 to 'the sensitivity of the receptor' refers to a generic receptor type, i.e. a dwelling, and not to the particular attitudes or responses of a particular person (although if the residential receptor type is specific it may have a bearing e.g. student accommodation).

The ANC working group notes that this part of BS 4142 allows the internal noise environment to be considered, despite BS 4142 excluding such matters from its Scope (Subclauses 1.1, 1.2 and 1.3). The working group considers that the consideration of the internal noise environment is only valid in a BS 4142 assessment where it relates to the contextual elements of the assessment.

3 SITE CONTEXT AND BACKGROUND INFORMATION

3.1 Site Description

37 Endell Street is situated within the Covent Garden area of central London.

The property is bounded by Endell Street to the east, and other commercial/residential properties to the north, south and west (note that the property configuration is typically commercial on ground floor with residential uppers).

An indicative site plan is shown in the figure below, which shows the site application area in red:

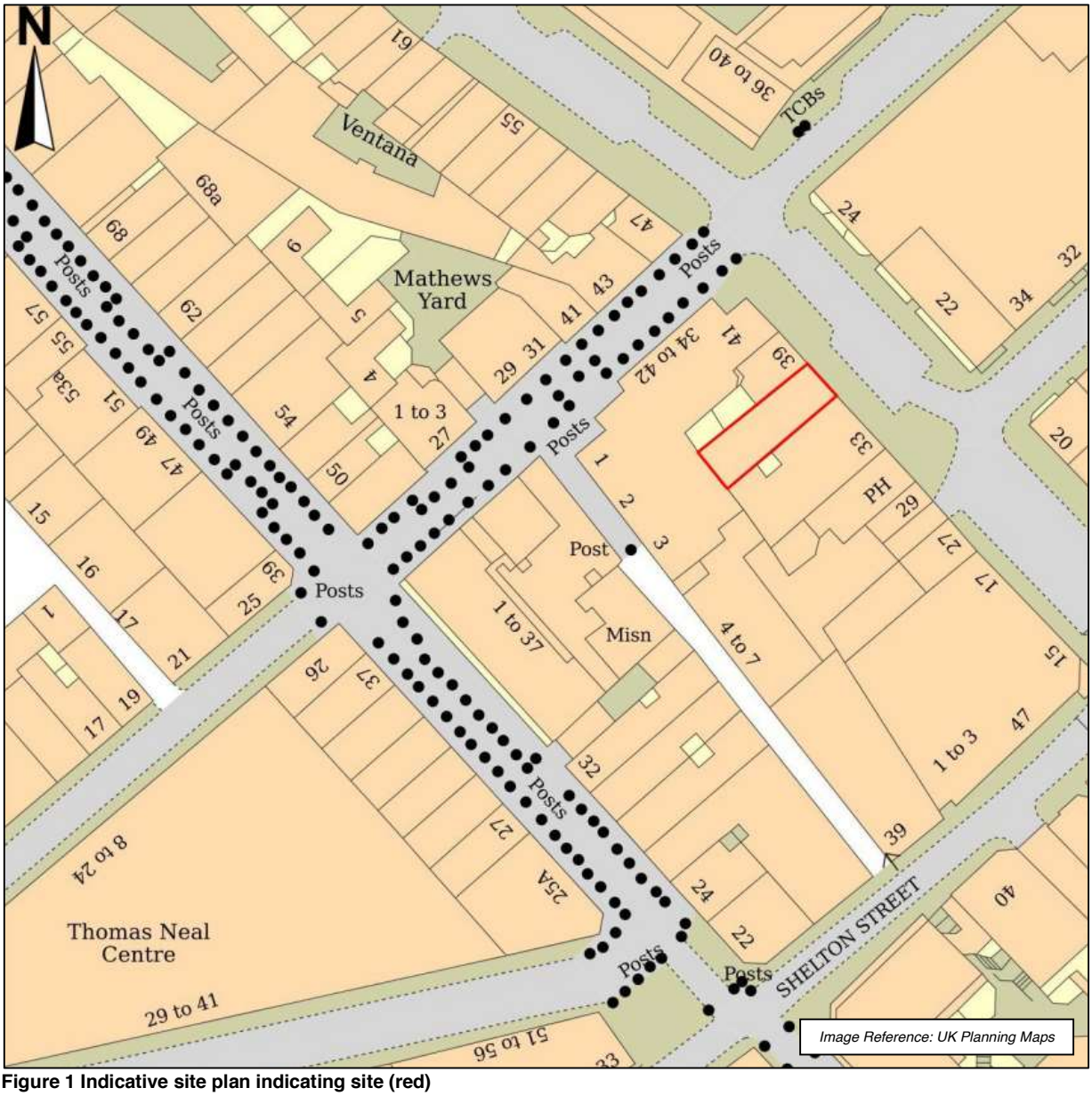


Figure 1 Indicative site plan indicating site (red)

3.2 Proposal

The proposal involves the installation of 1 no. Mitsubishi PUZ-M140VAR1 external condenser unit and 1 no. Mitsubishi LGH-100RVX-E ventilation unit. The external condenser is to be installed within a

lightwell area to the rear of the property, as indicated in the figure below. While the ventilation unit would be installed internally, intake and extract ducts would also terminate to the lightwell area. The brackets where the proposed Mitsubishi PUZ-M140VAR1 external condenser unit will be installed and the intake and extraction ductwork for the Mitsubishi LGH-100RVX-E ventilation unit are highlighted in red within the inset photograph below.

The closest noise sensitive windows would be the first-floor windows overlooking the lightwell, which are understood to be residential properties:

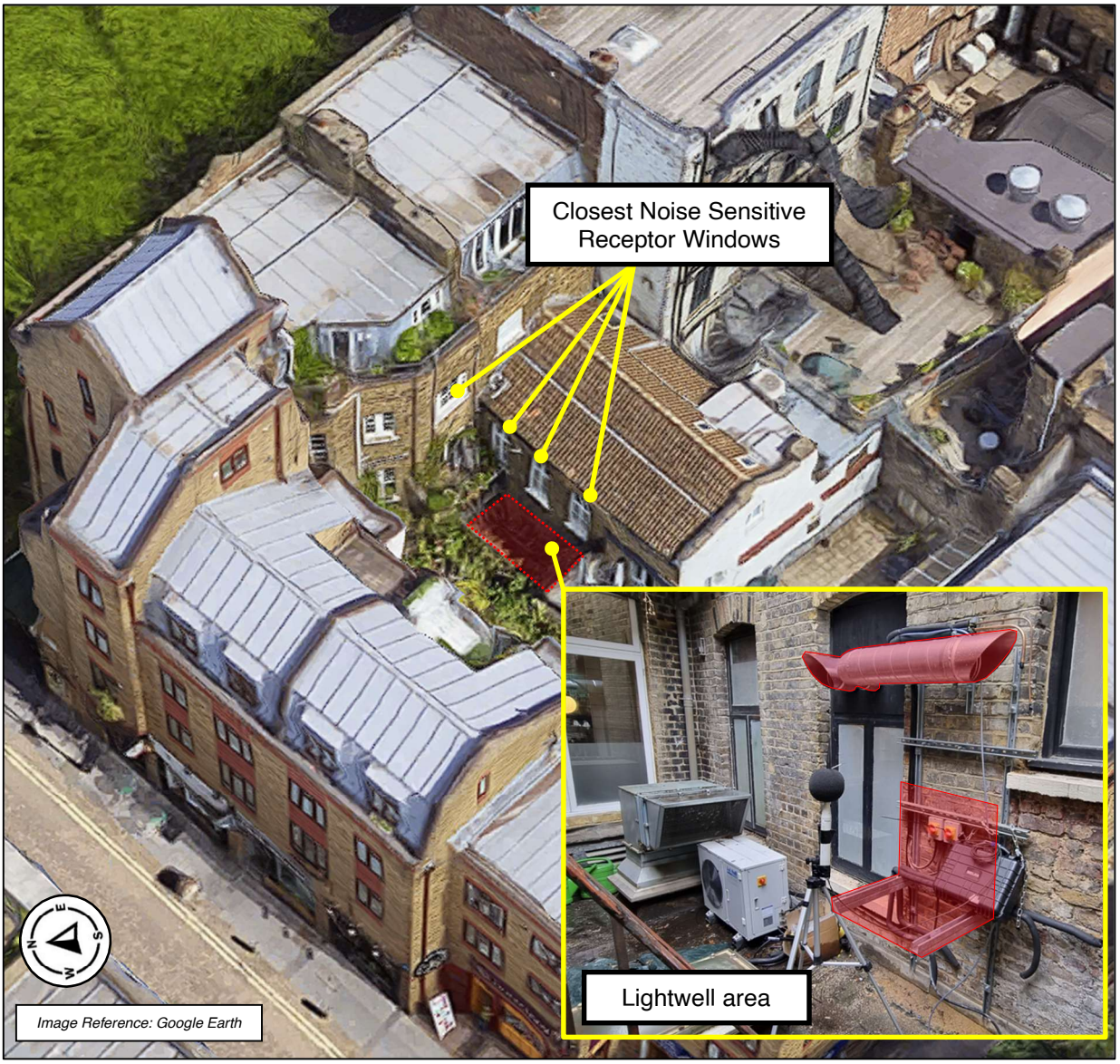


Figure 2 Indicative site plan indicating lightwell area

Noise emissions data for the proposed units and the full noise impact assessment is presented in Section 5.

4 ENVIRONMENTAL NOISE SURVEY

4.1 Measurement Location and Procedure

A noise survey was undertaken on the proposed site as shown in the figure below:

Figure 3 Noise survey measurement location

An initial appraisal of the site during the site visit determined existing plant noise from neighbouring plant installations to be the dominant noise affecting the site, in particular the extraction duct to the right of the photograph serving Parsons Restaurant. Noise from another extraction duct terminating at high level above the roof line was also observed, which is understood to be serving the Sushi-So Restaurant.

The condenser unit located under the metal stairs was decommissioned with the pipework disconnected, and noise associated with the other condenser units within the lightwell was not notable over the noise from the aforementioned extraction fans.

The measurement procedure complied with ISO 1996-2:2017 Acoustics '*Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels*', with automated monitoring undertaken between 10:45 on 27/01/2023 and 22:30 on 29/01/2023.

The key acoustic descriptors measured for this assessment are as follows:

- $L_{Aeq,T}$ *(the continuous equivalent A-weighted noise level over a given time period, T);*
- $L_{A90,T}$ *(the noise level exceeded for 90% of the measurement period T, referred to as the 'background' noise level);*

4.2 Measurement Equipment

The table below presents the equipment used for the baseline noise survey. The equipment calibration was verified before and after use and no abnormalities were observed.

Equipment	Make and Model	Serial Number
Sound Level Meter	Svantek 977 Class 1 Sound Level Meter	34191
Microphone Capsule	Svantek MK 255	77747
Microphone Preamplifier	Svantek SV 12L	32446
Calibrator	Svantek SV33 Class 1 Sound Calibrator	125829

Table 3 Noise survey equipment

Copies of calibration certificates are available upon request.

4.3 Weather Conditions

Weather conditions during the automated monitoring were generally dry with light winds and therefore suitable for the measurement of environmental noise.

4.4 Survey Results

A summary of the measurement results for daytime, night-time, as well as the hours of operation of the proposed plant is presented in the table below:

Period	Residual Sound Level $L_{Aeq,\,T}$ (dB)	Representative Background Sound Level L_{A90} (dB)
Daytime 07:00-23:00	54	53
Night-time 23:00-07:00	46	33
Operating hours 10:00-18:00	55	53

Table 4 Measured noise levels

Note that the representative background sound levels are the most commonly occurring L_{A90} values during the reported time period.

5 NOISE IMPACT ASSESSMENT

5.1 Proposed Plant Details

The proposed external building services plant outlined in Section 3.2 is comprised of the following units:

- 1 no. Mitsubishi PUZ-M140VAR1 external condenser unit
- 1 no. Mitsubishi LGH-100RVX-E ventilation unit

Noise emissions for the units have been sourced from the manufacturer for each unit, as shown in the table below:

Unit	Octave band centre frequency SRI, dB								dB(A)
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
Mitsubishi PUZ-M140VAR1 (SPL@1m)	66	58	56	52	50	46	42	33	55
Mitsubishi LGH-100RVX-E (SPL@1m)	46	46	40	37	33	25	18	13	39

Table 5 Overall sound pressure levels of proposed plant from Mitsubishi

5.2 Predicted Noise Levels at Closest Receptor Locations

The Specific Sound Level of the proposed plant has been assessed to the noise sensitive receptor location, considering various factors such as attenuation over distance, surface reflections and barrier/screening effects.

The unit is assumed to be operating at its maximum duty/fan speed during the operating period.

To establish the Rating Level as required by BS 4142:2014+A1:2019, appropriate acoustic feature corrections should be applied to the Specific Sound Level. It must be noted that the acoustic feature corrections are applied based on the level at receptor location, not at source, as they are reflective of the sound perceived by the receptor.

Tonality is commonly defined as being present when a single octave band sound level is 6dB higher than the adjacent octave bands. The calculated spectrum of the Specific Sound Level at the receptor would be considered tonal in nature as the 63Hz single octave band level is sufficiently higher than the 125Hz single octave band (shown in Appendix C). Therefore, a 2dB correction would be applied for tonality.

While the condenser unit would cycle on and off depending on the cooling load requirement internally, no correction would be applied for intermittency as plant noise is already the dominant source within the lightwell, and the receptor would not notice the unit switch on and off based on the calculated Specific Noise Level.

Operational noise emissions from an external air condenser units would not be considered impulsive and therefore no correction is applied.

Note that basic acoustic theory states that when one sound source is 10dB louder than another, the louder source will mask the quieter sound. Therefore, considering the Specific Sound Level calculated at

the receptor façade is 12dB below the representative background noise level, it is unlikely that any acoustic feature corrections would indeed be perceived at the receptor façade. However, in the interest of robustness, the tonality correction is included to ensure that a worst-case scenario is assessed.

The table below compares the Rating Sound Level calculated at the receptor against the background sound level during the retail unit operating hours. Full calculations are presented in Appendix C.

Time	**Residual Sound Level** **dB L_r = $L_{Aeq, T}$**	**Representative Background Sound Level** **dB $L_{A90, T}$**	**Calculated Specific Sound Level at 1m from Receptor Façade** **dB L_s = $L_{Aeq, Tr}$**	**Calculated Rating Level at 1m from Receptor Façade** **dB $L_{Ar, Tr}$**	**+/- compared against background** **dB**
Operating hours 10:00-18:00	55	53	39	41	-12

Table 6 Summary of the Rating Level at receptor

The resultant Rating Level established above considers that additional mitigation would be required to obtain a level sufficiently below background. The proposed mitigation measures are detailed in Section 5.3.

5.3 Proposed Mitigation

In order to reduce noise emissions from the external condenser plant to the closest noise sensitive window, a barrier should be installed to block line of sight from the unit to the receptor window, as follows:

- *The barrier should be formed of a top and two sides which should be placed as close to the unit as possible in an upside-down 'U' shape configuration (note that the manufacturer of the unit must be contacted to obtain safe operational distances of the barrier to the unit to ensure the barrier does not compromise the unit's operation e.g. installing the barrier too close can result in overheating);*
- *The barrier must make contact with the rear wall behind the unit and the floor below, ensuring a tight seal at all abutment points;*
- *The barrier should extend at least 200mm beyond the unit from the rear wall behind;*
- *The surface mass of the barrier material should be at least 14kg/m^2 e.g. 25mm weatherproofed plywood, as an example;*
- *The unit facing side of the barrier should be lined with a waterproof absorbent lining such as 100mm Whisper® UV (available from CMS Danksin).*

5.4 Context

As outlined in Section 2.3.1, the three types of context which should be considered are:

- *aspects of the absolute level;*

- *aspects of character; and*
- *aspects of the receptor, including physical measures designed to reduce noise.*

With regards to aspects of the absolute level, the residual sound level and rating level would not be considered high, and conversely would not be considered low either. It is therefore considered that aspects of the absolute level are not particularly relevant in this specific case.

With regards to aspects of character, the immediate area is one dominated by noise from existing plant installations. As the residential properties are located in central London above commercial units, it would be accepted that some level of 'commercial noise' would be present, and the expectation would not be one of a quiet suburban environment. As the character of the area is already very much one of plant and commercial noise, the sources under assessment would effectively merge with the existing environment, and not stand out in the context of said environment. Therefore, it would be considered that the relative impact of the plant would be lower in this specific case when compared to a situation where no plant noise is present within context of the existing background noise climate.

With regards to aspects of the receptor property, it is understood that as the property is of a certain age, the only means to reduce internal heat gains would be via openable windows. As the condenser unit in question would only be used in hot summer months, it is likely that receptor would require a partially open window to mitigate against internal heat gains, meaning that the occupant would be more exposed to the noise emissions than if the window were closed.

Finally, the actual use of the air conditioning unit should be considered within the context of the assessment. As the purpose of the condenser unit is to provide cooling, it would only be used in summer months. Therefore, for most of the year the unit would not be operational. Furthermore, when operational, the unit would only be used between the hours of 10:00-18:00, and not during critical hours where receptors would be sleeping.

5.5 Assessment of Impacts

Considering the calculated Rating Levels compared to the background sound level and the context in which the sound occurs, we would draw the following conclusions with regards to likelihood of adverse impact:

Time	+/- compared against background dB	Assessment of Impact
Operating hours 10:00-18:00	-12	Low likelihood of adverse impact

Table 7 Assessment of impacts

It has been concluded noise emissions from the proposed plant would be sufficiently below the background sound level to be considered as a low likelihood of adverse impact in accordance with BS 4142:2014+A1:2019.

6 CONCLUSION

An environmental noise survey has been undertaken at 37 Endell Street, Covent Garden, London, WC2H 9EE to establish background sound levels representative of the closest noise sensitive receptor locations relative to the proposed external building services plant installations.

Noise criteria for the proposed external building services plant have been proposed based on the findings of the noise survey alongside consultation of relevant planning policy and local authority guidance.

Manufacturer's noise data of the proposed external building services plant have been used to calculate expected noise levels at the closest noise sensitive receptor for compliance with the established noise criteria.

It has been concluded that providing that the mitigation measures are implemented as detailed within this report, noise emissions from the proposed external building services plant would meet the set noise criteria, therefore ensuring no adverse impact on the closest residential receptor.

APPENDIX A

ACOUSTIC TERMINOLOGY

Decibel scale - dB

The decibel (dB) is a relative unit of measurement used in acoustics. The dB is a logarithmic ratio between a measured level and a reference level of 0 dB (i.e the threshold of human hearing). Simply put, the decibel compresses the wide range of sounds we hear into more manageable numbers.

Addition of noise from several sources

Sound produced by multiple sound sources are added logarithmically e.g. power ratio of 2 = 3dB, power ratio of 10 = 10dB. Therefore, two equally intense sound sources operating simultaneously produce a sound level which is 3dB higher than a single source e.g. 60dB + 60dB = 63dB.

Subjective impression of noise

Human response to sound is highly individualized and often based on psychological factors such as emotion and expectation. Sensitivity to sound typically depends on the loudness, pitch, duration of the occurrence, and time of occurrence (e.g. a sound source could cause annoyance during the night where it would not during the day). The following table is a guide to explain increases or decreases in sound levels for many scenarios.

Change in sound level	Change in perceived loudness
1 dB	Imperceptible
3 dB	Just barely perceptible
6 dB	Clearly noticeable
10 dB	About twice as loud

'A' Weighted Frequency Filter - dB(A)

The human ear is not equally sensitive in all frequencies. The A-weighting filter was devised to take this into account when undertaking noise measurements and allows a sound level meter to replicate the human ears response to sound.

$L_{Aeq, T}$

Sound can fluctuate widely over a given period. L_{Aeq} is the A-weighted equivalent continuous sound level, with T denoting the time period over which the fluctuating sound levels were averaged e.g. $L_{Aeq,16h}$ is the equivalent continuous noise level over an 16 hour period.

L_{A90}

A-weighted sound level exceeded for 90% of the measurement period, calculated via statistical analysis. The L_{A90} descriptor is typically used to establish background sound levels for noise impact assessments

L_{A10}

A-weighted sound level exceeded for 10% of the measurement period, calculated via statistical analysis.

L_{AFmax}

A-weighted sound level maximum sound pressure level that has been measured over a given time period

APPENDIX A

ACOUSTIC TERMINOLOGY

Octave Bands

The audio or frequency spectrum of the human ear is in the range of 20Hz to 20 kHz. The spectrum tells how the energy of the sound signal is distributed in frequency. Octave bands divides the audio spectrum into 10 equal parts. The International Standards Organisation defines the centre frequency of these bands as 31.5Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1kHz, 2kHz, 4kHz, 8kHz and 16kHz.

Noise Rating (NR) Curves

A method of rating noise using a set of curves relating octave band sound pressure levels. Typically used for building services systems within offices

Airborne sound

Sound radiated from a source into the surrounding air e.g. musical instruments, tv/radio, machinery/equipment. Airborne sound insulation refers to the reduction or attenuation of airborne sound, usually via a solid partition between a source and receiver.

Impact sound

Sound resulting from the impact between colliding objects, e.g. footfall impact upon a floor. Impact sound insulation refers to the resistance of a floor to the transmission of impact sound, typically via the installation of a 'resilient layer'

Flanking sound

The transmission of airborne sound between two adjacent rooms by paths other than via the separating partition between the rooms, e.g. the abutment point of a wall and floor.

Structure-borne noise

Noise caused by the vibration of elements of a structure. This can result in reradiated noise, whereby the vibrating element transmits airborne sound into a space e.g. vibration caused by mechanical plant installed within a plant room which is not adequately isolated from the structure, or construction/demolition work in an adjacent building.

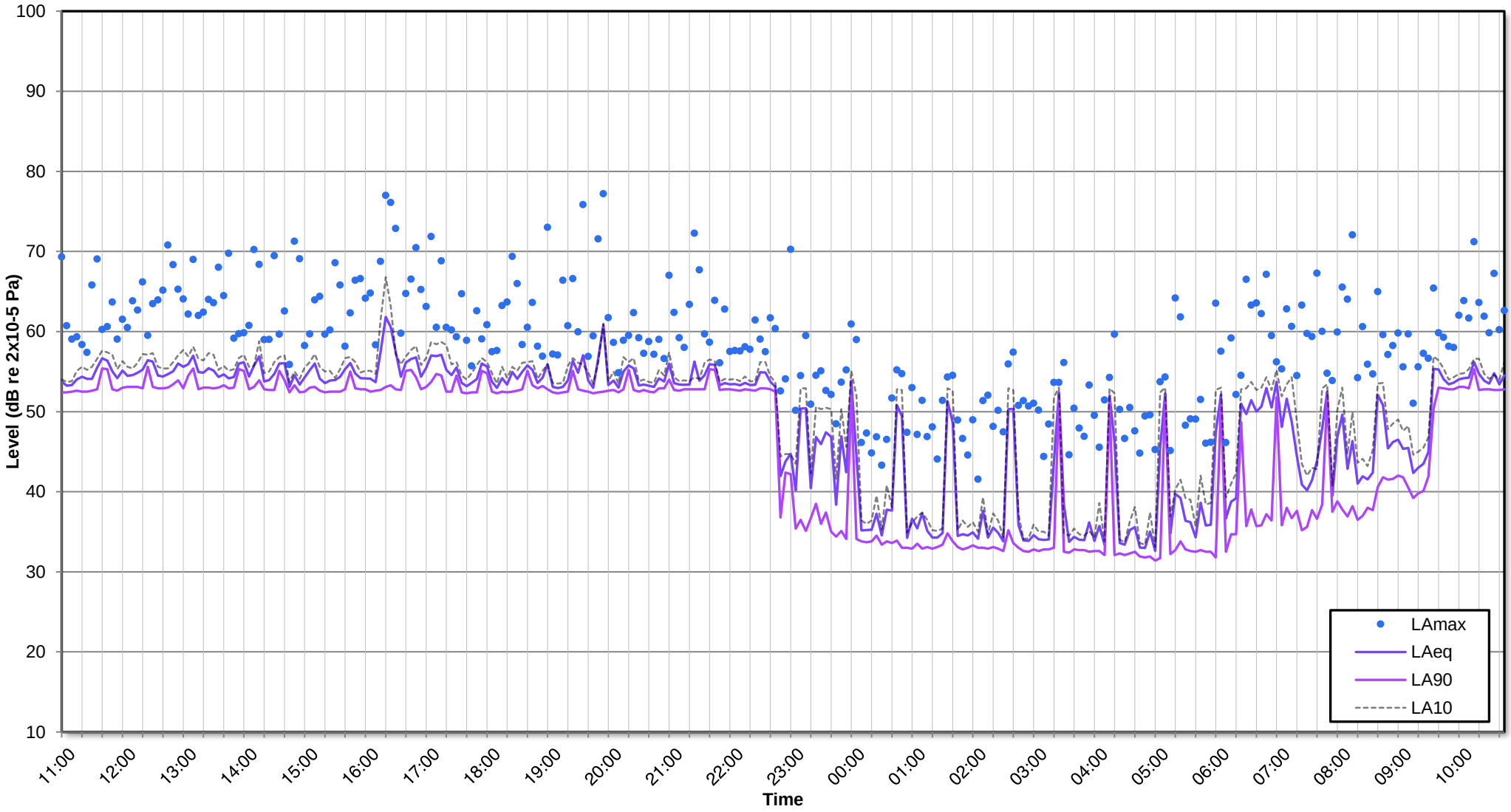
Reverberant sound

Sound in an enclosed space (usually a room), which results from repeated reflections at the boundaries. Reverberation time is the time taken for a steady sound level in an enclosed space to decay by 60dB, measured from the moment the sound source is switched off. A example of a typically reverberant space would be a classic church. Absorptive materials can be used to reduce reflections and reverberation times.

APPENDIX B

ENVIRONMENTAL NOISE TIME HISTORY

20338.NIA-RPT.01
10:45 on 14th March to 10:35 on 15th March 2023



APPENDIX C
PLANT NOISE EMISSION CALCULATIONS

es acoustics

Source: 1 no. external air condenser unit, 1 no. ventilation unit Receiver: First floor residential window	Frequency, Hz 63	125	250	500	1k	2k	4k	8k	dB(A)
Mitsubishi PUZ-M140VAR1 external condenser unit	66	58	56	52	50	46	42	33	
Correction due to surface reflections at source (1), dB	3	3	3	3	3	3	3	3	
Minimum attenuation provided by distance (4m), dB	-12	-12	-12	-12	-12	-12	-12	-12	
Proposed barrier attenuation, dB	-1	-2	-3	-5	-6	-8	-10	-13	
Proposed absorptive lining attenuation to eliminate reflections, dB	-3	-3	-3	-3	-3	-3	-3	-3	
Specific Sound Level at Receptor Façade, dB	**53**	**44**	**41**	**35**	**32**	**26**	**20**	**8**	**38**
Mitsubishi LGH-100RVX-E ventilation unit	46	46	40	37	33	25	18	13	
Correction for no. of units (1 no. intake, 1 no. extract), dB	3	3	3	3	3	3	3	3	
Duct end reflection loss, dB	-12	-8	-4	-1	0	0	0	0	
Correction due to surface reflections at source (1), dB	3	3	3	3	3	3	3	3	
Minimum attenuation provided by distance (3m), dB	-10	-10	-10	-10	-10	-10	-10	-10	
Specific Sound Level at Receptor Façade, dB	**30**	**34**	**32**	**32**	**29**	**21**	**14**	**9**	**34**
Total Specific Sound Level at Receptor Façade of all Plant, dB	**53**	**44**	**41**	**37**	**34**	**27**	**21**	**12**	**39**
BS4142 Acoustic Feature Corrections									
Tonality									2
Impulsivity									0
Intermittency									0
Total Rating Noise Level at Receptor Façade, dB									**41**

Background Noise Level LA90	53

Notes:
Note 1: Equipment free-field sound pressure levels at 1m sourced from manufacturers data with the unit running in 'normal' mode
Note 2: Noise treatment proposed for the condenser in the form of an acoustic barrier to block line of site with an internal absorptive acoustic lining
Note 3: Distances noted are from the centre point of the unit (fan in the case of the condenser, and duct in case of the ventilation unit) to a central position on the receptor window
Note 4: No directivity correction has been applied as a cautious approach. In reality, directivity would be present thus further reducing the noise level at the receptor location