

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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Mercury Land Holdings Ltd, Dorrington Gardens

Residential planning noise report

London, Manchester, Edinburgh, Birmingham, Belfast Leeds

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Summary

Sandy Brown has been commissioned by Mercury Land Holdings Ltd to provide an acoustic assessment and advice in relation to the proposed development on the site of the existing Dorrington Gardens Car Park, Hornchurch, RM12 4HX.

The proposed scheme comprises of a mix of apartments and family houses.

Environmental noise surveys have been carried out at the site, the purpose of which was to understand the existing noise environment. Noise surveys were carried out between 5 December 2023 and 11 December 2023, and between 2 January 2024 and 5 January 2024.

Representative background sound levels measured during the survey were $L_{A90,15min}$ 44 dB during the day and $L_{A90,15min}$ 34 dB at night at the north side of the site, and $L_{A90,15min}$ 56 dB during the day and $L_{A90,15min}$ 49 dB at night at the south side of the site.

The average ambient noise levels measured during the survey were $L_{Aeq,16h}$ 56 dB during the day and $L_{Aeq,8h}$ 49 dB at night at the north side of the site, and $L_{Aeq,16h}$ 62 dB during the day and $L_{Aeq,8h}$ 56 dB at night at the south side of the site.

Based on the requirements of the London Borough of Havering and on the results of the noise survey, any new plant equipment associated with the development should be designed such that the cumulative noise level at 1 m from the worst affected windows of the nearby noise sensitive premises does not exceed $L_{Aeq,15min}$ 37 dB during the day and $L_{Aeq,15min}$ 27 dB during the night. These have been corrected relative to the measured free-field background sound levels by the addition of 3 dB at the north position (as per the guidance provided in BS 8233:2014 Section G.2.1),

An initial assessment has also been carried out to determine the required acoustic performances for the facades and provide guidance on the ventilation strategy.

Minimum recommended sound insulation performances for facade elements are provided to achieve appropriate internal noise criteria. These are reasonably typical for urban residential buildings and are considered achievable, subject to appropriate specifications within the final design.

An initial assessment is presented in relation to the acoustic requirements outlined in Approved Document O (2021) to the Building Regulations 2010. Based upon the expected external noise levels, open windows in bedrooms at night can likely not be relied upon as a method to remove excess heat, and the 'dynamic thermal modelling method' (eg, a CIBSE TM59 assessment) will need to be used to demonstrate compliance with the requirements of ADO2021.

In line with the Association of Noise Consultants *Acoustics Ventilation and Overheating, Residential Design Guide* (AVO Guide), a Level 1 assessment of noise ingress during an overheating condition for living rooms has also been completed during the day. AVO Guide compliance is not a statutory requirement, though represents best practice and is

recommended. The Level 1 assessment indicates that the majority of facades fall within 'low' or 'negligible' risk levels during the daytime and the use of open windows for ventilation is likely to be acceptable, however southern facing facades on the houses at the south end of the site fall into the 'medium' risk category and therefore a Level 2 assessment is required. It is likely that passive ventilation via open windows will not result in acceptable internal acoustic conditions in line with AVO Guide on locations at the south end of the site, and alternative means of cooling may need to be considered as the design is progressed, however passive ventilation may be acceptable during the daytime at other locations.

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1 Introduction

Sandy Brown has been commissioned Mercury Land Holdings Ltd to provide an acoustic assessment and advice in relation to the proposed development of 34 new residential units on the site of the existing Dorrington Gardens Car Park, Hornchurch, RM12 4HX.

Environmental noise surveys have been carried out to establish:

- background sound levels around the site and by nearby noise sensitive premises
- ambient and maximum noise levels at the site.

The background sound levels measured during the survey are used as the basis for setting limits for noise emission from proposed building services plant. These limits are set in accordance with the requirements of the London Borough of Havering as the Local Planning Authority.

Ambient and maximum noise levels are used to assess building envelope sound insulation requirements to achieve appropriate internal noise levels for residences. These follow standards set in accordance with London Borough of Havering guidelines and relevant British Standards.

This report presents details of the noise surveys, including the measurement results, and outlines the relevant acoustic criteria with which the development will subsequently comply.

2 Site description

2.1 The site and its surroundings

The site location in relation to its surroundings is shown in Figure 1.

The site is bounded to the north by Dorrington Gardens, existing buildings on Appleton Way and Station Lane to the east, existing buildings on The Avenue to the south, and existing buildings on Bruce Avenue and Dorrington Gardens to the west.

The primary noise sources are vehicle traffic on the surrounding roads and building services plant located to the rear of commercial premises on Station Lane.



The site is surrounded on all sides by existing developments. These are predominantly residential, with some commercial properties bordering the east side of the site on Station Lane

To the north and west of the site are residential properties on Dorrington Gardens and Bruce Avenue, with 30 Dorrington Gardens, 145 Bruce Avenue and 136 Bruce Avenue being the closest and immediately bordering the site.

To the east of the site from 60-42 Station Lane there are commercial properties including restaurants/takeaway outlets, a barbers, a tattoo studio and offices. Additionally, there are residential units above these commercial properties. A number of these units have associated building services plant located at the rear near to the site boundary which will generate noise incident on the proposed development.

Due to the enveloping nature of the surround residential streets, the nearest/most affected existing noise-sensitive development will vary based upon the location of specific plant items on the site. For the purposes of this assessment, the acoustic criteria derived should be taken to apply at all of the residential properties outlined above.

3 Development proposals

3.1 Overview

The scheme comprises a mix of apartments and family houses. Proposals include eight two-storey newbuild houses, four three-storey newbuild houses and two blocks of three-storey newbuild residential apartments to create an overall total of 34 new residential units.

Figure 2 demonstrates the proposed layout of the site.



Figure 2 Proposed layout of the site

The three-storey houses are located on the north side of the site and are arranged as two pairs of semi-detached dwellings. The two-storey houses are located on the south side of the site and are arranged as four pairs of semi-detached dwellings. The apartments are distributed evenly across two blocks each with independent cycle and refuse store at Ground Floor. Block A is located on the west side of the site and Block B is located on the east side of the site.

A new electrical substation is also proposed to serve the development, located on the north-east corner of the site adjacent to Brazemore Court.

3.2 Potential noise sources

Residential units are not usually considered a significant source of noise, and the use would be similar to the immediately surrounding premises. However, potential noise sources associated with the scheme may include any new building services plant for heating, cooling or ventilation. Details of relevant plant equipment remain under development, but typical solutions for residential developments of this nature might include items such as air source heat pumps (ASHPs), air conditioning condenser units, or external vents for mechanical ventilation and heat recovery (MVHR) units.

The proposed electrical substation will also contain equipment which may generate noise incident both upon the existing residential premises and the proposed new residential units which will be created within the site.

The potential impact of these sources has been assessed and preliminary guidance provided to minimise the impact on existing and proposed noise sensitive premises around the development.

4 Assessment criteria

4.1 NPPF and NPSE

The *National Planning Policy Framework*, September 2023 (NPPF) sets out the UK government's national framework for planning policy in England. It supersedes previous guidance notes such as PPG24. The NPPF also makes reference to a separate policy document, the *Noise Policy Statement for England* (NPSE).

The NPPF states:

Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- *mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life.*
- *identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*

and

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.

The NPSE states that its aims are as follows:

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.*

Neither document sets out specific acoustic criteria for new residential developments, however they outline the general principles with which development should comply. Specifically, they require consideration of the effect of existing noise on the new development and the effect of noise from the development on the surroundings.

4.2 ProPG

ProPG *Planning & Noise (Professional Practice Guidance on Planning & Noise), New Residential Development, 2017* provides guidance to the management of noise within the planning system in England. It is restricted to consideration of new residential developments that will be exposed predominantly to airborne noise from transport sources.

The two stages of the approach are given below

- Stage 1 – Initial noise risk assessment of the proposed development site
- Stage 2 – Systematic consideration of four key elements
 - Element 1 – Demonstrating a “Good Acoustic Design Process”
 - Element 2 – Observing internal “Noise Level Guidelines”
 - Element 3 – Undertaking an “External Amenity Area Noise Assessment”
 - Element 4 – Consideration of “Other Relevant Issues”.

Following this approach, there are four possible recommendations, the choice of recommendation is as follows:

- Grant without conditions
- Grant with conditions
- Avoid
- Prevent.

Guidance provided in ProPG has been used to assess the proposed development site and recommend mitigation measures to reduce noise levels.

4.3 Noise egress

4.3.1 Standard guidance

BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound* (BS 4142) provides a method for assessing noise from items such as building services plant against the existing background sound levels at the nearest noise sensitive premises.

BS 4142 suggests that if the noise level is 10 dB or more higher than the existing background sound level, it is likely to be an indication of a significant adverse impact. If the level is 5 dB above the existing background sound level, it is likely to be an indication of an adverse impact. If the level does not exceed the background sound level, it is an indication of having a low impact.

Whilst this guidance suggests rating levels equivalent to the existing background will have a low impact, plant may still be audible at this level. In boroughs where existing environmental noise levels are already relatively high (eg, exceeding WHO guidelines for external noise levels in residential areas), it is not uncommon for local authorities to require more onerous limits on new noise sources such as 5 or even 10 dB below the existing background to protect against overall environmental noise creep.

If the noise contains 'attention catching features' such as tones, bangs etc, a penalty, based on the type and impact of those features, is applied. Further guidance is provided in Appendix C.

4.3.2 Local Authority criteria

The *Havering Local Plan 2016 – 2021* sets out the Local Authority's planning policies.

Policy 7: *Residential design and amenity* states that the Council will support developments that do not result in 'unacceptable levels of noise, vibration and disturbance'. It also clarifies that 'affordable and market housing will be expected to have the same external appearance and equivalent amenity in relation to views, daylight, noise and proximity to open space.'

Policy 34: *Managing pollution* states that the Council will support developments that 'do not unduly impact on amenity, human health and safety and the natural environment by noise, dust, odour and light pollution, vibration and land contamination.'

The Havering planning portal also refers applicants to the Mayor of London's *London Plan 2021*.

Policy D14: Noise (A) states:

In order to reduce, manage and mitigate noise to improve health and quality of life, residential and other non-aviation development proposals should manage noise by:

- 1) avoiding significant adverse noise impacts on health and quality of life*
- 2) reflecting the Agent of Change principle as set out in Policy D13 Agent of Change*
- 3) mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses*
- 4) improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity)*
- 5) separating new noise-sensitive development from major noise sources (such as road, rail, air transport and some types of industrial use) through the use of distance, screening, layout, orientation, uses and materials – in preference to sole reliance on sound insulation*
- 6) where it is not possible to achieve separation of noise-sensitive development and noise sources without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through applying good acoustic design principles*
- 7) promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver.*

The explanatory text under paragraph 3.14.3 of the *London Plan* goes on to state that:

The management of noise also includes promoting good acoustic design of the inside of buildings. Section 5 of BS 8223:2014 provides guidance on how best to achieve this. The Institute of Acoustics has produced advice, Pro:PG Planning and Noise (May 2017), that may assist with the implementation of residential developments. BS4214 provides guidance on monitoring noise issues in mixed residential/industrial areas.

It is assumed that the reference to 'BS4214' above is an error and that the plan intends to refer to BS 4142, which is the primary relevant standard document in relation to environmental noise (BS 4214 does not relate to noise).

Based upon the above policy documents, it is assumed that a BS 4142 assessment will be accepted as the most appropriate approach for assessing the noise impact arising from the new development on existing noise sensitive properties. Neither the Havering nor London planning documents define specific limits in relation to the background noise level, however a review of other recent planning applications in the area indicates that the Local Authority typically accepts criteria set 10 dB below the representative background level.

4.4 Noise ingress

4.4.1 British Standard guidance

Guidance on acceptable internal noise levels in residential dwellings is given in BS 8233:2014 *Sound insulation and noise reduction for buildings*. The guidance limits are shown in Table 1.

These internal levels are based on annual average data and do not have to be achieved in all circumstances. It is normal to exclude occasional events, such as fireworks night or New Year's Eve.

Table 1 Internal noise criteria for sleeping/resting

Internal space	Indoor ambient noise level, L_{Aeq} (dB)	
	Day (07:00 – 23:00)	Night (23:00 – 07:00)
Living rooms	35	-
Dining room	40	-
Bedrooms	35	30 ^[1]

[1] BS 8233 notes that individual noise events can cause sleep disturbance, and that a guideline value may be set depending on the character and number of events per night, although no specific limit is provided. For regular events, such as scheduled aircraft or passing trains, a guideline value may be set in terms of SEL or $L_{Amax,F}$. Sporadic noise events could require separate values.

The standard states that where development is considered necessary or desirable, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.

For external amenity areas, such as gardens and patios, the standard states:

it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.

4.4.2 ProPG

Internal noise ingress criteria in ProPG are the same as in BS 8233:2014 but additional guidance is provided. In relation to regular individual noise events the following additional guidance is provided:

In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events.

4.4.3 Local Authority requirements

The *Havering Local Plan* does not provide any specific guidance on internal noise criteria within residential developments.

As noted above, whilst the *London Plan* does not stipulate specific criteria, it does make reference to guidance documents and standards including BS 8223. It is therefore assumed that development in line with the criteria outlined in Table 1 will be considered acceptable.

4.4.4 Approved Document O – Overheating

Approved Document O 2021 Edition (to the Building Regulations 2010) states the following in relation to noise ingress during overheating periods:

In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (23:00-07:00 hours).

Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.

- a. $L_{Aeq,T}$ 40 dB average over 8 hours (between 23:00-07:00)
- b. L_{AFmax} 55 dB more than 10 times a night (between 23:00-07:00).

The above applies to residential dwellings, institutional residential accommodation, and other types of residential accommodation, such as student accommodation.

4.4.5 Acoustics, ventilation and overheating

Guidance on external noise levels from transport noise sources and the assessment of risk in an overheating condition is given in the Association of Noise Consultants *Acoustics Ventilation and Overheating, Residential Design Guide* (AVO Guide).

AVO Guide compliance is not a statutory requirement, though represents best practice and is recommended. The guidance for internal noise levels during the night for an overheating

condition set out in AVO Guide is superseded by the requirements set out in ADO2021 and therefore is provided for information only. However, as ADO2021 does not stipulate noise criteria during the daytime, the AVO Guide remains a valuable reference for criteria during daytime hours.

A Level 1 assessment comprises assessing the external free-field noise levels to guideline thresholds. External noise levels and the associated risk categories for a Level 1 assessment are adapted and summarised in Table 2, though consideration also has to be given to the duration and frequency of any overheating periods.

Table 2 Guidance for Level 1 assessment of noise from transport sources relating to overheating condition

Risk category for Level 1 assessment	External free-field noise level	
	Day (07:00 – 23:00)	Night (23:00 – 07:00)
Negligible	$L_{Aeq} \leq 52$ dB	$L_{Aeq} \leq 47$ dB
Low	$L_{Aeq} > 52$ dB and $L_{Aeq} \leq 57$ dB	$L_{Aeq} > 47$ dB and $L_{Aeq} \leq 52$ dB
Medium	$L_{Aeq} > 57$ dB and $L_{Aeq} \leq 62$ dB	$L_{Aeq} > 52$ dB and $L_{Aeq} \leq 55$ dB
High	$L_{Aeq} > 62$ dB	$L_{Aeq} > 55$ dB

If a Level 1 assessment finds that the development falls into a ‘Medium’ or ‘High’ risk category a Level 2 assessment should be carried out, assessing the expected internal noise levels for an overheating condition and the associated risk of adverse effect. The Level 2 assessment would consider the following:

- duration of period where additional ventilative cooling is required (to be assessed by others, typically part of a CIBSE TM59 assessment)
- how wide the external windows would need to be open to control overheating (to be assessed by others, typically part of a CIBSE TM59 assessment).

A Level 2 assessment is beyond the scope of this report and, if required, should be further developed as the design progresses.

The AVO Guide provides guidance in relation to suitable internal noise levels and control of noise ingress for an overheating condition. These are adapted and summarised in Table 3, though are not supposed to be taken as limits, rather these should be interpreted as guidelines to be assessed while also considering the adverse effect of any overheating (duration and severity).

The lowest observed affect level (LOAEL) and the significant observed affect level (SOAEL) for increased noise levels associated with controlling overheating are specific to each project as these depend on the magnitude of the increased internal noise levels and the duration for which they occur.

Table 3 Guidance for Level 2 assessment of noise from transport sources relating to overheating condition

Effect level	Internal noise level from transport sources		
	Day (07:00 – 23:00)	Night (23:00 – 07:00)	
LOAEL (noise can be heard, but does not cause any change in behaviour)	$L_{Aeq} \leq 35$ dB	$L_{Aeq} \leq 30$ dB	L_{AFmax} 45 dB not normally exceeded
SOAEL upper limit for longer overheating durations	$L_{Aeq} > 35$ dB and $L_{Aeq} \leq 40$ dB	$L_{Aeq} > 30$ dB and $L_{Aeq} \leq 35$ dB	-
SOAEL upper limit for shorter overheating durations	$L_{Aeq} > 40$ dB and $L_{Aeq} \leq 50$ dB	$L_{Aeq} > 35$ dB and $L_{Aeq} \leq 42$ dB	-
Exceeds SOAEL (noise causes a material change in behaviour)	$L_{Aeq} > 50$ dB	$L_{Aeq} > 42$ dB	L_{AFmax} 65 dB normally exceeded

The AVO Guide illustrates that there is a link between adverse effects, increasing internal ambient noise levels and the duration of exposure to noise for an overheating condition. These are indicated in Figure 3.

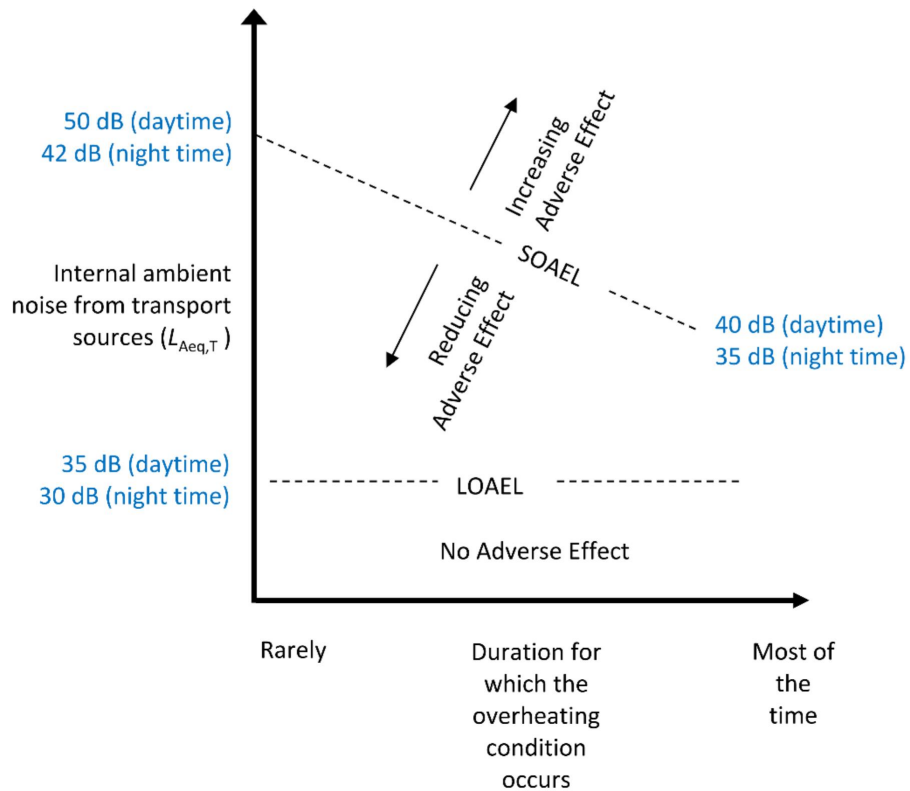


Figure 3 Internal ambient noise levels and increasing adverse effects for an overheating condition

When internal noise levels are above Significant Observed Adverse Effect Level (SOAEL), it is likely that there will be a high potential for an adverse outcome. These adverse outcomes will include:

- material change in behaviour and/or attitude, eg, 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 and difficulty in getting back to sleep
- quality of life diminished.

As illustrated, the potential for adverse risk increases with the duration of exposure to noise, ie, a shorter exposure will result in a lower risk of adverse outcomes.

5 Survey method

5.1 Noise survey method

The survey included unattended and attended noise measurements.

5.1.1 *Unattended measurements*

Unattended noise monitoring was undertaken at the site over seven days between 5 and 12 December 2023 and over three days between 2 and 5 January 2024. The measurement locations are indicated in Figure 1 as positions A and B.

A technical equipment fault (battery failure) meant that only limited data was obtained at position A during the initial survey. Accordingly, additional measurements were completed at this position on a subsequent visit.

Details of the equipment used, and the noise indices measured are provided in Appendix A.

The unattended measurements were taken over 15-minute periods between 12:36 on 5 December 2023 and 12:21 on 12 December 2023 and between 14:04 on 2 January 2024 and 12:49 on 5 January 2024.

Measurements at position A are considered to be free-field. The microphone was positioned approximately 2 m above the ground and greater than 3.5 m from any other reflective surface. The measurements at position B are considered facade measurements. The microphone was positioned approximately 2 m above the ground and 1 m from the nearest reflective surface (the boundary fence).

5.1.2 *Attended measurements*

Attended sample measurements were taken at three locations around the site. These are indicated in Figure 1 as positions 1 to 3. The attended measurements were carried out on 2 January 2024 over 15-minute periods and were synchronised with the loggers at position A to enable direct comparison of noise levels around the site.

At each position the microphone was mounted on a tripod approximately 1.5 m above the ground level. All positions were at least 3.5 m from any other reflective surfaces and are considered to be free-field measurements. Details of the equipment used, and the noise indices measured are provided in Appendix A.

Dominant noise sources occurring during the measurements were noted.

5.2 Weather conditions

Weather conditions during the survey are described in Appendix A.

6 Measurement results

6.1 Observations

Ambient noise sources noted during the attended measurements included road traffic on Dorrington Gardens, Appleton Way and other roads in the wider area, as well as vehicles moving within the carpark.

At position B (the logger located at the south end of the site) noise was noted from building services plant at the rear of the adjacent property.

6.2 Noise measurement results

6.2.1 Unattended measurement results

Graphs showing the results of the unattended measurements are provided in Appendix B. Both the initial and repeat surveys are presented for position A, though only limited data is presented for the December survey (prior to the battery fault occurring).

Ambient noise levels measured during the unattended survey are presented in Table 4 for the north position and in Table 5 for the south position.

Table 4 Ambient noise levels measured during the repeat unattended survey at position A

Date	Day (07:00 – 23:00)	Night (23:00 – 07:00)
	$L_{Aeq,16h}$ (dB)	$L_{Aeq,8h}$ (dB)
Tuesday 2 January 2024	-	46
Wednesday 3 January 2024	55	51
Thursday 4 January 2024	57	
Average	56	49

Table 5 Ambient noise levels measured during the unattended survey at position B

Date	Day (07:00 – 23:00) $L_{Aeq,16h}$ (dB)	Night (23:00 – 07:00) $L_{Aeq,8h}$ (dB)
Tuesday 5 December 2023	-	55
Wednesday 6 December 2023	61	54
Thursday 7 December 2023	62	55
Friday 8 December 2023	60	55
Saturday 9 December 2023	61	58
Sunday 10 December 2023	68	56
Monday 11 December 2023	60	56
Average	62	56

Analysis of night-time maximum noise levels indicates that the night-time maximum noise level not normally exceeded 10 times a night is L_{AFmax} 67 dB at position A and L_{AFmax} 70 dB at position B.

In line with BS 4142:2014+A1:2019, representative background sound levels have been determined using statistical analysis of the continuous measurements.

Day and night statistical analysis of representative values for the site are presented in Appendix B.

From this analysis, the representative background sound levels measured during the survey at the position A were $L_{A90,15min}$ 44 dB during the day and $L_{A90,15min}$ 34 dB at night, and $L_{A90,15min}$ 56 dB during the day and $L_{A90,15min}$ 49 dB at night at the position B.

6.2.2 Attended measurement results

Noise levels and key sources recorded during the attended measurements are summarised in Table 6.

Table 6 Noise levels and key noise sources from attended measurements on 2 January 2024

Position	Start time	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,15min}$	$L_{AFmax,15min}$	$L_{A90,15min}$	
1	17:48	51	76	47	Plant from commercial properties
2	18:03	48	64	44	Vehicle movements within the carpark
3	18:18	50	61	47	Residential plant from 10A The Avenue, vehicle movements within the carpark

7 Plant noise egress

7.1 Limits

Based on the criteria discussed in Section 4.3.2 and the measurement results, the cumulative noise level from the operation of all new plant should not exceed the limits set out in Table 7. These limits are set to be 10 dB below the representative background noise levels.

These limits apply at 1 m from the worst affected windows of the nearest noise sensitive premises and are presented as facade levels. These limits have been derived from the logger at position A as observations indicate that position B was impacted by existing nearby plant equipment and localised background levels here may not be representative of conditions at the surrounding receptors. These have been corrected relative to the measured free-field background sound levels by the addition of 3 dB (as per the guidance provided in BS 8233:2014 Section G.2.1). In this case these limits would apply at the nearest facades of the residential plots identified in Section 2.2.

Table 7 Plant noise limits at 1 m from the nearest noise sensitive premises north

Time of day	Maximum sound pressure level at 1 m from noise sensitive premises, $L_{Aeq,15min}$ (dB)
Day (07:00-23:00)	37
Night (23:00-07:00)	27

^[1] The limits set out in Table 7 do not include any attention catching features. The penalty corrections for attention catching features may be significant, and will need to be considered as the building services design progresses. This is discussed in Appendix C.

7.2 Assessment

All building services plant (including equipment associated with the new electrical substation) will be designed to achieve the noise limits set out above, including any corrections for attention catching features. At this stage, detailed information in relation to the proposed plant equipment is unavailable. This will need to be assessed further as the design progresses.

8 Facade sound insulation – noise ingress

This section describes an assessment of facade sound insulation to control noise ingress. The required facade specification largely depends on the external noise levels and the internal noise criteria.

The following assessment is based on achieving the internal noise levels recommended in BS 8233 which are set out in Section 4.4.

8.1 Methodology

A 3D acoustic computer model of the site and the immediately surrounding areas has been developed using the CadnaA (2022 MR2) environmental prediction software. CadnaA carries out calculations of environmental noise propagation based upon algorithms set out in ISO 9613-2: 1996 *Attenuation of sound during propagation outdoors*, taking into account of the effects of topography, reflections, screening and distance attenuation.

Noise sources within the model have been calibrated based upon the results of the environmental noise survey. The model has then been used to predict noise levels incident on the facades of the proposed development.

Noise from the proposed new electrical substation has not been specifically included within the assessment, however it is noted that any equipment within the electrical substation will be required to comply with the environmental noise egress criteria stipulated in Table 7. Considering the location and orientation of the proposed substation, provided these criteria are achieved at the nearest noise sensitive premises (in the case of the substation this will be Brazemore Court), it is not anticipated that there would be any significant additional noise impact affecting the proposed new properties within the development.

8.2 External noise levels

Predicted external noise levels during the daytime and night-time at the facades of the proposed development are shown in Figure 4 and Figure 5 respectively.



Figure 4 Predicted external noise levels ($L_{Aeq, 16hr}$) at the facades during the day



Figure 5 Predicted external noise levels ($L_{Aeq, 8hr}$) at the facades during the night

Maximum noise levels are typically attributable to individual sources rather than cumulative contributions. As such, maximum levels incident on the facades will vary in each case depending on the specific sources and their location relative to the development (including whether or not they are stationary or moving). This makes maximum external noise levels difficult to accurately predict at individual positions, however noise levels are not generally expected to exceed those measured during the survey (eg, L_{AFmax} 70 dB not normally exceeded during the night-time). It is recommended that this figure is used as the basis for design.

This is a conservative assumption which potentially slightly over-estimates noise levels on facades which are less exposed to existing environmental noise sources (ie, those facades away from the perimeter of the site). Proceeding on this basis will therefore ensure that the internal noise criteria are either satisfied or bettered.

8.3 Facade sound insulation

Masonry facades typically provide a relatively high sound insulation performance. For the purposes of this assessment, it is assumed that the solid portions of the facades will provide a sound insulation performance of at least $R_w + C_{tr}$ 50 dB.

Minimum facade sound insulation requirements for the glazed facade elements are given in Table 8. These have been determined to achieve the internal noise criteria for bedrooms and living areas based upon the predicted external noise levels at the facades and assuming no other significant noise sources. If mechanical ventilation is required then noise from such systems will need to be considered in addition to external sources, under such circumstances it may be necessary to enhance the facade performance requirements below dependent upon the internal noise levels produced by these systems. This will require further evaluation as the design progresses.

At this site, the facade performance requirements are driven by the ambient noise levels during the day and a combination of ambient noise levels and maximum noise levels during the night.

The assessment of facade sound insulation is done for the most impacted façade which is the south elevation of the houses towards the south of the site. This is due to close proximity to existing plant. This means that although the performance outlined in Table 8 is required on the specified facade, reduced performances may be acceptable for facades towards the centre of the development which are screened from the existing plant.

Table 8 Recommended minimum glazing sound insulation performance requirements

Room	Minimum sound insulation performance, $R'_w + C_{tr}$ (dB)	
	South facing facades of houses on the southern perimeter	All other facades
Living rooms	30	25
Bedrooms	30	25

8.4 Guidance on facade construction, glazing, and ventilation strategy

Table 9 sets out some examples of glazing configurations that could achieve the required sound insulation performances.

Specific performances of the proposed glazing systems should be confirmed with the relevant suppliers prior to procurement.

Table 9 Example glazing configurations

Glazing sound insulation, R'_w+C_{tr} (dB)	Example glazing configuration
27	6 mm glass/16 mm cavity/6 mm glass
29	8 mm glass/16 mm cavity/6 mm glass
31	8 mm glass/16 mm cavity/6 mm glass
33	6.8 mm acoustic laminate glass/16 mm cavity/6 mm glass
35	8.8 mm acoustic laminate glass/16 mm cavity/6 mm glass
37	8.8 mm acoustic laminate glass/16 mm cavity/10 mm glass
39	8.8 mm acoustic laminate glass/20 mm cavity/10 mm glass
41	8.8 mm acoustic laminate glass/16 mm cavity/12.8 mm acoustic laminate glass
42-46	10.8 mm acoustic laminate glass/24 mm cavity/16.8 mm acoustic laminate glass
47	12.8 mm acoustic laminate glass/20 mm cavity/16.8 mm acoustic laminate glass

9 Acoustics, ventilation and overheating

9.1 Approved Document O 2021 (during the night)

Although demonstrating compliance with ADO2021 is not strictly a requirement of planning (as this falls under the separate remit of Building Control), achieving the requirements will likely have implications on the building's design. This may include impacts on the appearance of the facade and requirements for additional building services plant (eg, external heat rejection plant, mechanical ventilation with/without cooling units within apartments etc).

The results of the noise survey and acoustic modelling have been used to assess internal noise levels within bedrooms at night, assuming windows are open and based on inputs associated with the 'simplified method' as described in ADO2021. The Association of Noise Consultants'

Guide to Demonstrating Compliance with the Noise Requirements of Approved Document O recommends that, for areas with a high overheating risk, a 4 dB external to internal noise level correction is used for assessments in line with the simplified method.

The predicted internal noise levels at night with windows open for ventilation are:

- North houses:
 - north facade: L_{Aeq} 41 dB and L_{AFmax} 63 dB
 - east facade: L_{Aeq} 39 dB and L_{AFmax} 63 dB
 - south facade: L_{Aeq} 34 dB and L_{AFmax} 63 dB
 - west facade: L_{Aeq} 39 dB and L_{AFmax} 63 dB
- Apartment blocks:
 - north facade: L_{Aeq} 34 dB and L_{AFmax} 63 dB
 - east facade: L_{Aeq} 41 dB and L_{AFmax} 66 dB
 - south facade: L_{Aeq} 40 dB and L_{AFmax} 66 dB
 - west facade: L_{Aeq} 33 dB and L_{AFmax} 63 dB
- South houses:
 - north facade: L_{Aeq} 35 dB and L_{AFmax} 66 dB
 - east facade: L_{Aeq} 39 dB and L_{AFmax} 66 dB
 - south facade: L_{Aeq} 52 dB and L_{AFmax} 66 dB
 - west facade: L_{Aeq} 36 dB and L_{AFmax} 66 dB

When compared with the levels set out in Section 3.2 of ADO2021, the results indicate that noise in all bedrooms will be such that windows will likely be closed overnight. This is primarily due to high regular maximum noise (L_{AFmax}) levels, though the average noise levels are also predicted to exceed the ADO2021 criteria at facades at the perimeter of the site. Therefore, open windows in bedrooms at night can likely not be relied upon as a method to remove excess heat, and the 'dynamic thermal modelling method' (eg, a CIBSE TM59 assessment) will need to be used to demonstrate compliance with the requirements of ADO2021.

9.2 Acoustics, ventilation and overheating assessment (during the day)

The results of noise survey and acoustic modelling have been used to carry out a Level 1 assessment of noise ingress during an overheating condition for living rooms during the day in line with Association of Noise Consultants *Acoustics Ventilation and Overheating, Residential Design Guide* (AVO Guide).

ADO2021 sets out requirements for internal noise levels in bedrooms during the night, and therefore takes precedence over the AVO Guide. However, for living rooms during the day the guidance in AVO Guide has been used to inform the recommendations provided.

The Level 1 assessment indicates that the majority of facades fall within 'low' or 'negligible' risk levels during the daytime and the use of open windows for ventilation is likely to be acceptable, however southern facing facades on the houses at the south end of the site fall into the 'medium' risk category and therefore a Level 2 assessment is required.

This would need to consider the following:

- the frequency and duration of periods where additional ventilative cooling is required (to be assessed by others, typically part of a dynamic thermal model, eg, a CIBSE TM59 assessment)
- how wide the external windows would need to be open to control overheating (to be assessed by others, typically part of a dynamic thermal model, eg, a CIBSE TM59 assessment)
- design, extent and construction of attenuated passive ventilation.

The Level 2 assessment is beyond the scope of this report and will need to be developed as the design progresses, including input from overheating engineers (for example, to clarify the likely frequency and duration of overheating events).

9.3 Recommendations

Based on the results of the ADO2021 simplified assessment and the AVO Guide Level 1 assessment, it is likely that passive ventilation via open windows will not result in acceptable internal acoustic conditions in bedrooms at night-time (though may be acceptable during the daytime across most facades) and alternative means of cooling may need to be considered as the design is progressed.

It is recommended that measures other than the use of opening windows be incorporated within the design that reduce overheating within the apartments and houses. Further advice should be sought from an overheating engineer, but typically these measures will include:

- minimising internal heat generation through energy efficient designs
- reducing the amount of heat entering the building by:
 - reducing the proportion of glass and/or adjusting the depth of window reveal
 - reducing the glazing's G-value
 - installing internal blinds
 - utilising fixed shading devices, eg, shutters, external blinds, overhangs, awnings.
- exposing thermal mass within the apartments

- removing excess heat via:
 - Ventilation louvres in external walls
 - a mechanical ventilation system
 - a mechanical cooling system (mechanical cooling is expected only to be used where insufficient heat is capable of being removed via openings).
- providing shared amenity which will be comfort cooled.

Through a combination of the above the total amount of time that windows will need to be open to control overheating may be reduced. It is recommended that the overheating strategies developed during subsequent design phases provide feedback on the duration of time when overheating is expected to occur and the extent of opening required, so that further analyses of internal noise levels and their effects can be provided.

10 Conclusion

Representative background sound levels measured during the survey were $L_{A90,15min}$ 44 dB during the day and $L_{A90,15min}$ 34 dB at night for the north position and $L_{A90,15min}$ 56 dB during the day and $L_{A90,15min}$ 49 dB at night for the south position.

The average ambient noise levels measured during the survey were $L_{Aeq,16h}$ 56 dB during the day and $L_{Aeq,8h}$ 49 dB at night for the north position and $L_{Aeq,16h}$ 62 dB during the day and $L_{Aeq,8h}$ 56 dB at night for the south position.

Based on the requirements of the London Borough of Havering and on the results of the noise survey, any new plant equipment associated with the development should be designed such that the cumulative noise level at 1 m from the worst affected windows of the nearby noise sensitive premises does not exceed $L_{Aeq,15min}$ 37 dB during the day and $L_{Aeq,15min}$ 27 dB during the night. These have been corrected relative to the measured free-field background sound levels by the addition of 3 dB (as per the guidance provided in BS 8233:2014 Section G.2.1).

An initial assessment has also been carried out to determine the required acoustic performances for the facades and provide guidance on the ventilation strategy.

Minimum recommended sound insulation performances for facade elements are provided to achieve appropriate internal noise criteria. These are reasonably typical for urban residential buildings and are considered achievable, subject to appropriate specifications within the final design.

An initial assessment is presented in relation to the acoustic requirements outlined in Approved Document O (2021) to the Building Regulations 2010. Based upon the expected external noise levels, open windows in bedrooms at night can likely not be relied upon as a method to remove excess heat, and the 'dynamic thermal modelling method' (eg, a CIBSE TM59 assessment) will need to be used to demonstrate compliance with the requirements of ADO2021.

In line with the Association of Noise Consultants *Acoustics Ventilation and Overheating, Residential Design Guide* (AVO Guide), a Level 1 assessment of noise ingress during an overheating condition for living rooms has also been completed during the day. AVO Guide compliance is not a statutory requirement, though represents best practice and is recommended. The Level 1 assessment indicates that the majority of facades fall within 'low' or 'negligible' risk levels during the daytime and the use of open windows for ventilation is likely to be acceptable, however southern facing facades on the houses at the south end of the site fall into the 'medium' risk category and therefore a Level 2 assessment is required. It is likely that passive ventilation via open windows will not result in acceptable internal acoustic conditions in line with AVO Guide on locations at the south end of the site, and alternative means of cooling may need to be considered as the design is progressed, however passive ventilation may be acceptable during the daytime at other locations.

Appendix A

Survey details

Equipment

The unattended and attended noise measurements were taken using a Rion NL-32 sound level meter and a Rion NL-52 sound level meter.

Calibration details for the equipment used during the survey are provided in Table A1.

Table A1 Equipment calibration data

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
Sound level meter	NL-32/00623769	Rion	10 Nov 25	TCRT23/1827
Microphone	UC-53A/319244	Rion	10 Nov 25	TCRT23/1827
Pre-amp	NH-21/36677	Rion	10 Nov 25	TCRT23/1827
Calibrator	NC-74/34336009	Rion	10 Nov 25	TCRT23/1825
Sound level meter	NL-32/00623761	Rion	10 Nov 25	TCRT23/1824
Microphone	UC-53A/319233	Rion	10 Nov 25	TCRT23/1824
Pre-amp	NH-21/36669	Rion	10 Nov 25	TCRT23/1824
Calibrator	NC-74/34536129	Rion	10 Nov 25	TCRT23/1823
Sound level meter	NL-52/00242702	Rion	27 Feb 25	TCRT23/1190
Microphone	UC-59/06185	Rion	27 Feb 25	TCRT23/1190
Pre-amp	NH-25/32730	Rion	27 Feb 25	TCRT23/1190
Calibrator	CAL200/4499	Larson Davis	24 Feb 25	TCRT23/1184

Calibration of the meters used for the measurements is traceable to national standards. Calibration certificates for the sound level meters used in this survey are available upon request.

Calibration checks were carried out on the meters and their measurement chains at the beginning and end of the survey. No significant calibration deviation occurred.

Noise indices

Noise indices recorded included the following:

- $L_{Aeq,T}$ The A-weighted equivalent continuous sound pressure level over a period of time, T.
- $L_{AFmax,T}$ The A-weighted maximum sound pressure level that occurred during a given period, T, with a fast time weighting.
- $L_{A90,T}$ The A-weighted sound pressure level exceeded for 90% of the measurement period. Indicative of the background sound level.

Sound pressure level measurements are normally taken with an A-weighting (denoted by a subscript 'A', eg L_{A90}) to approximate the frequency response of the human ear.

A more detailed explanation of these quantities can be found in BS 7445: Part 1: 2003 *Description and measurement of environmental noise, Part 1. Guide to quantities and procedures.*

Weather conditions

During the attended noise measurements, the weather was generally clear and dry and no rain occurred.

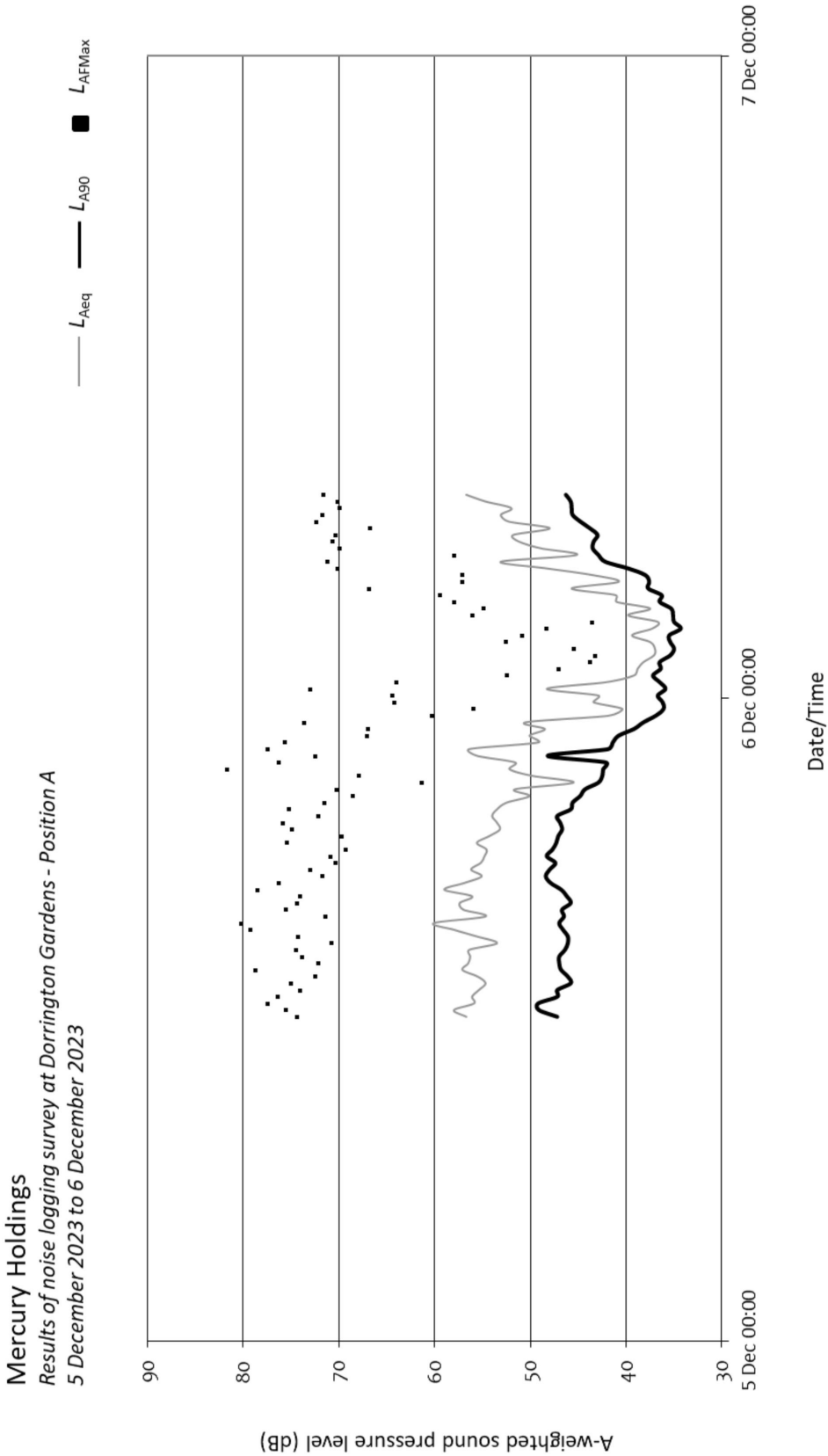
During the unattended noise measurements for the initial survey, weather reports for the area indicated that temperatures varied between -4°C at night and 8°C during the day. The wind speed was generally less than 5 m/s, with some periods up to 8 m/s, however there were sufficient periods of low wind to obtain representative measurements and analysis of the survey results does not indicate any adverse impact due to wind. Short periods of rain occurred but analysis does not indicate any significant effect on the measured noise levels.

During the repeat survey, weather reports for the area indicated that temperatures varied between 4°C at night and 12°C during the day, and the wind speed was generally less than 5 m/s, with some periods up to 7 m/s, however there were sufficient periods of low wind to obtain representative measurements and analysis of the survey results does not indicate any adverse impact due to wind.. Short periods of rain occurred but analysis does not indicate any significant effect on the measured noise levels.

These weather conditions are considered suitable for obtaining representative measurements.

Appendix B

Results of unattended measurements at Dorrington Gardens
positions A and B



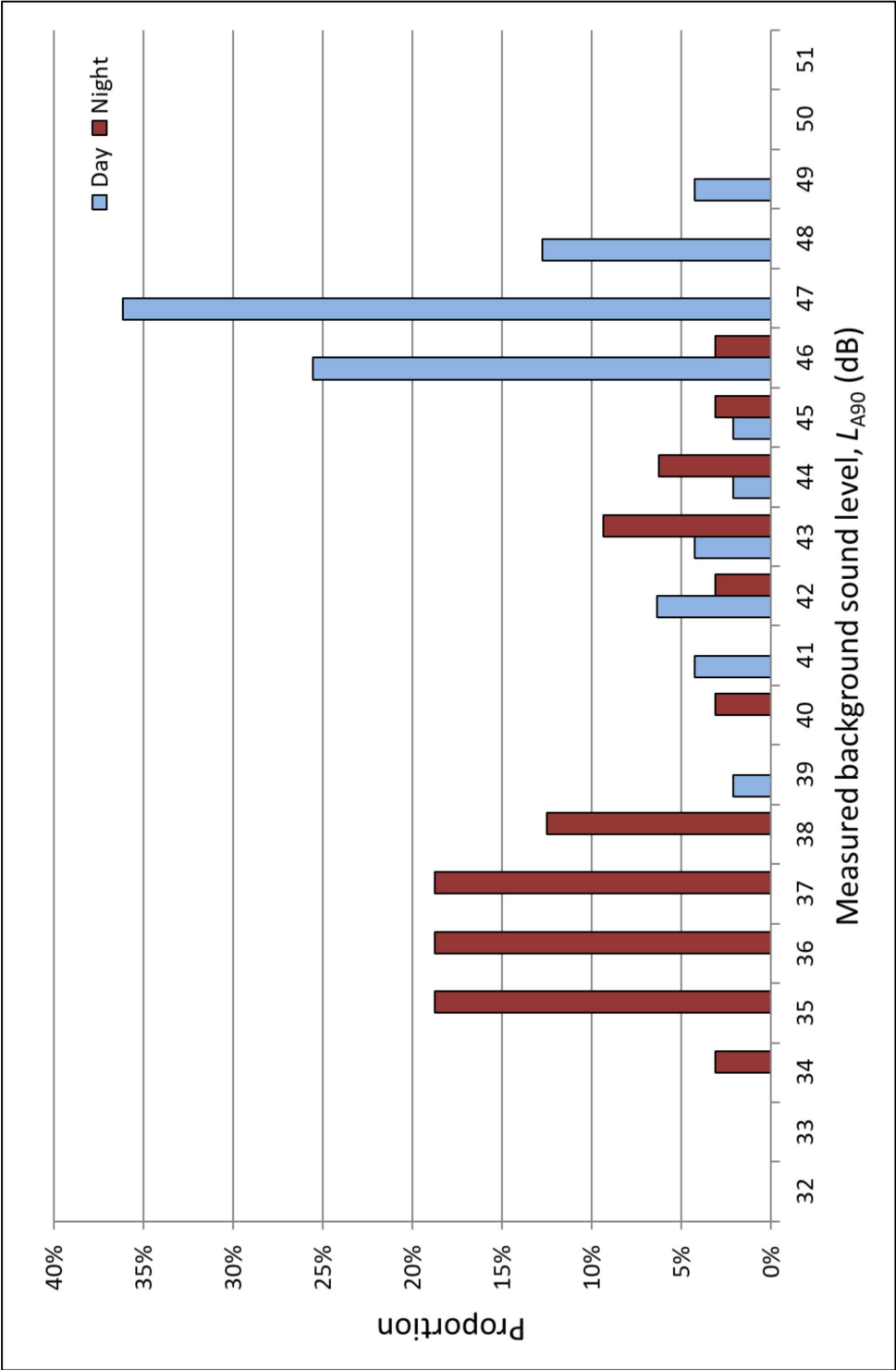
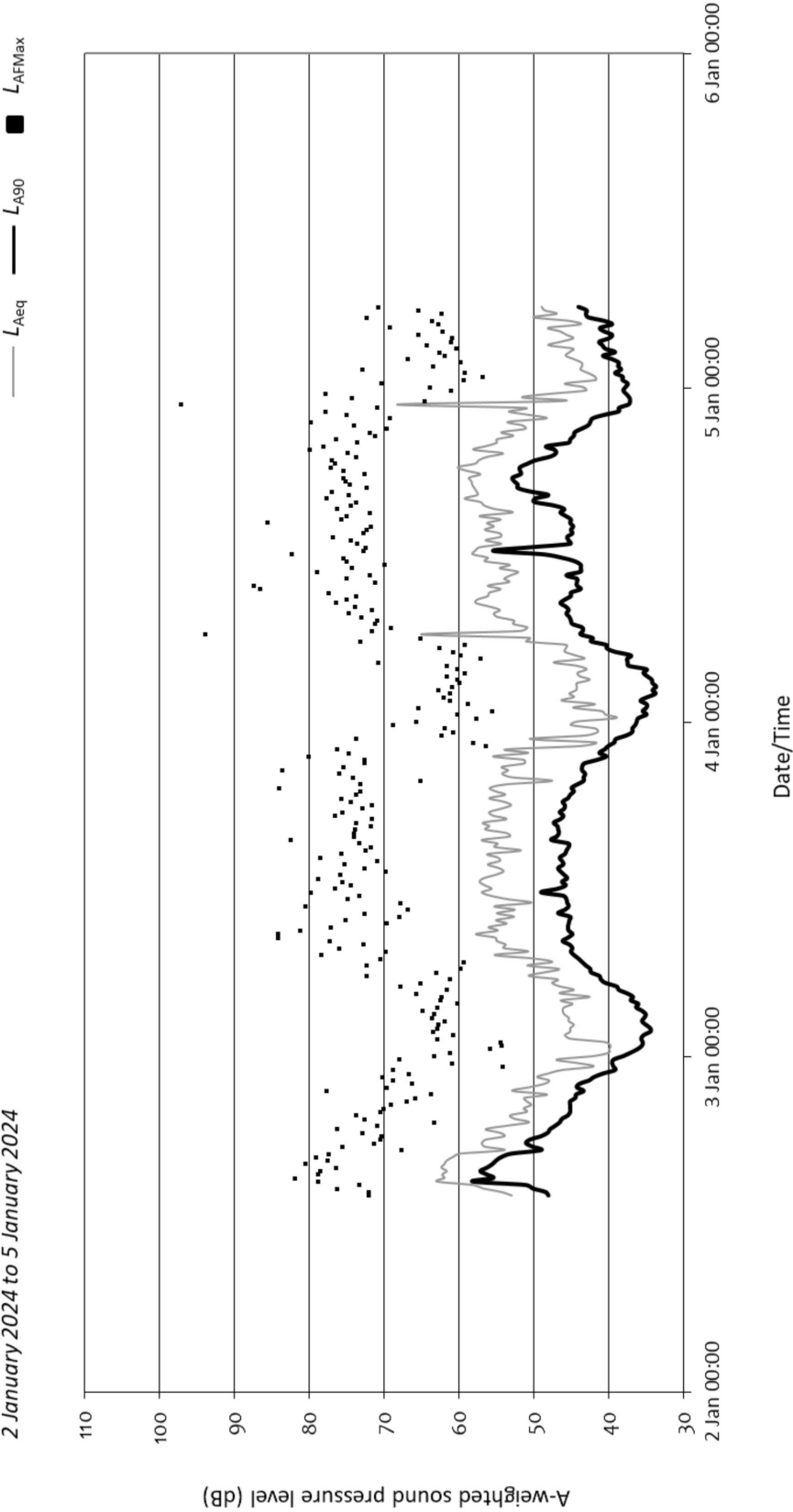


Figure 6 Statistical analysis of the results of the noise logging survey at position A, 5 to 6 December 2023

Mercury Holdings
Results of noise logging survey at Dorrington Gardens - Position A
2 January 2024 to 5 January 2024



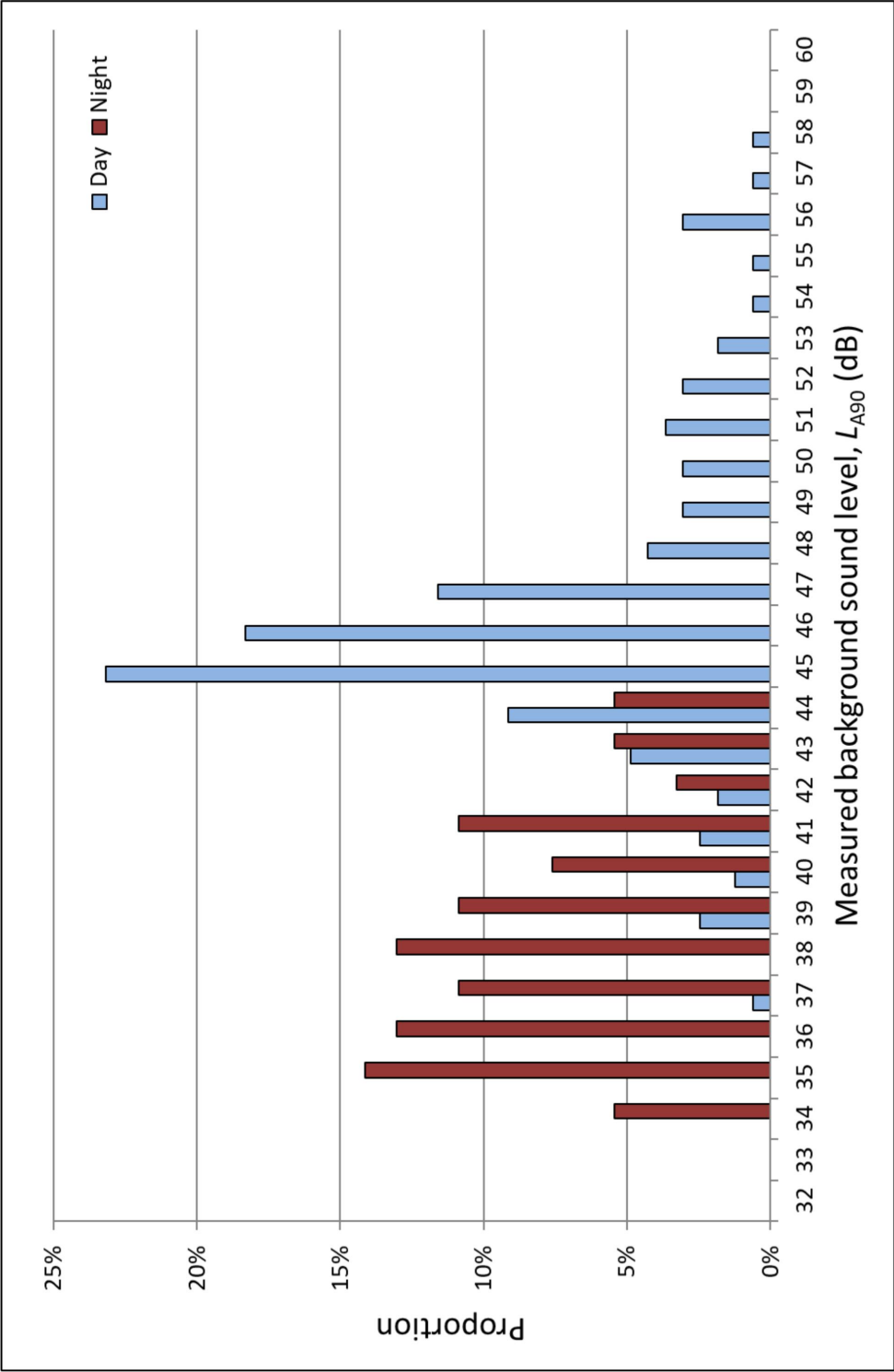
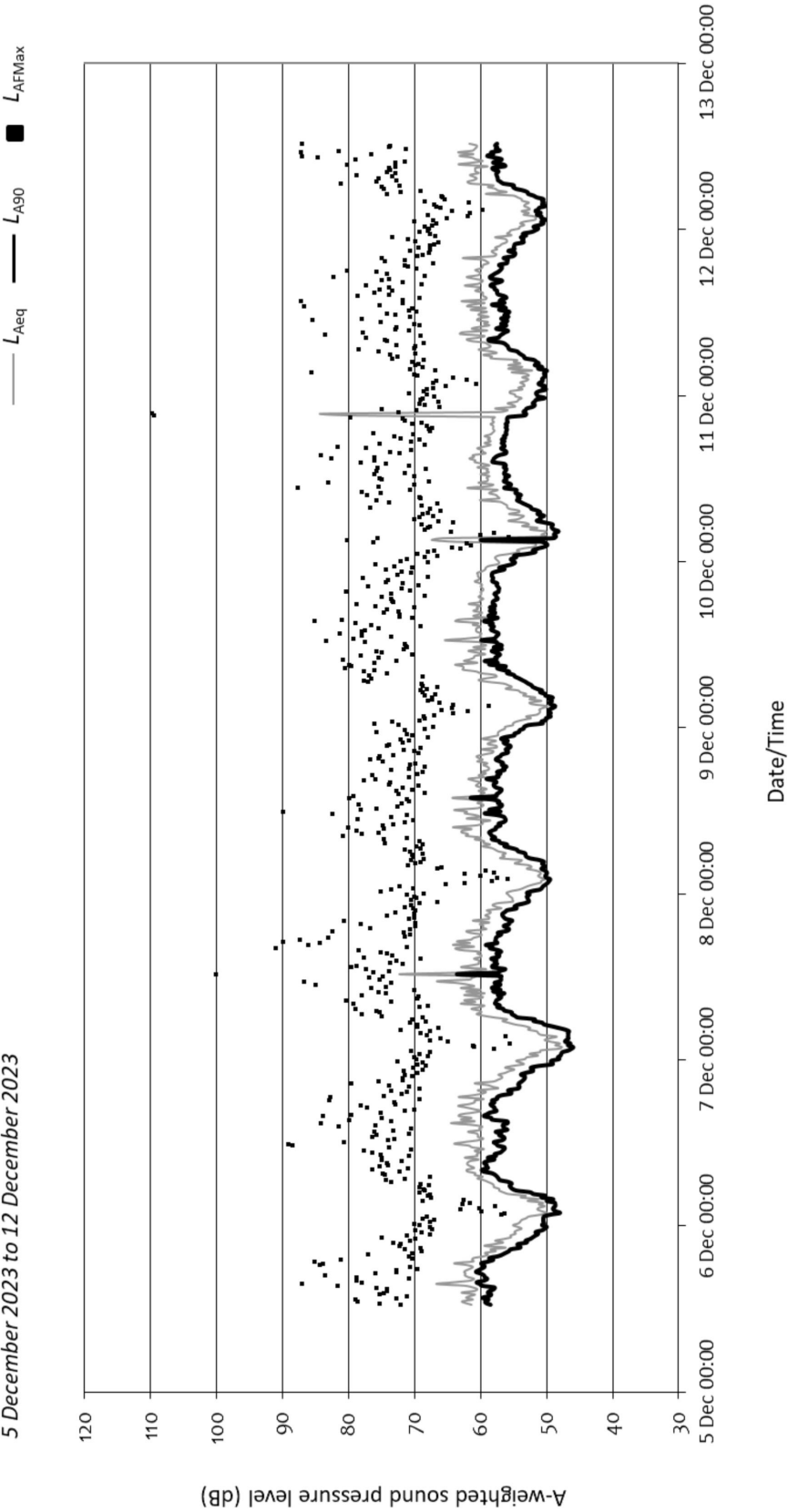


Figure 7 Statistical analysis of the results of the noise logging survey at position A, 2 to 5 January 2024

Mercury Holdings
Results of noise logging survey at Dorrington Gardens - Position B
5 December 2023 to 12 December 2023



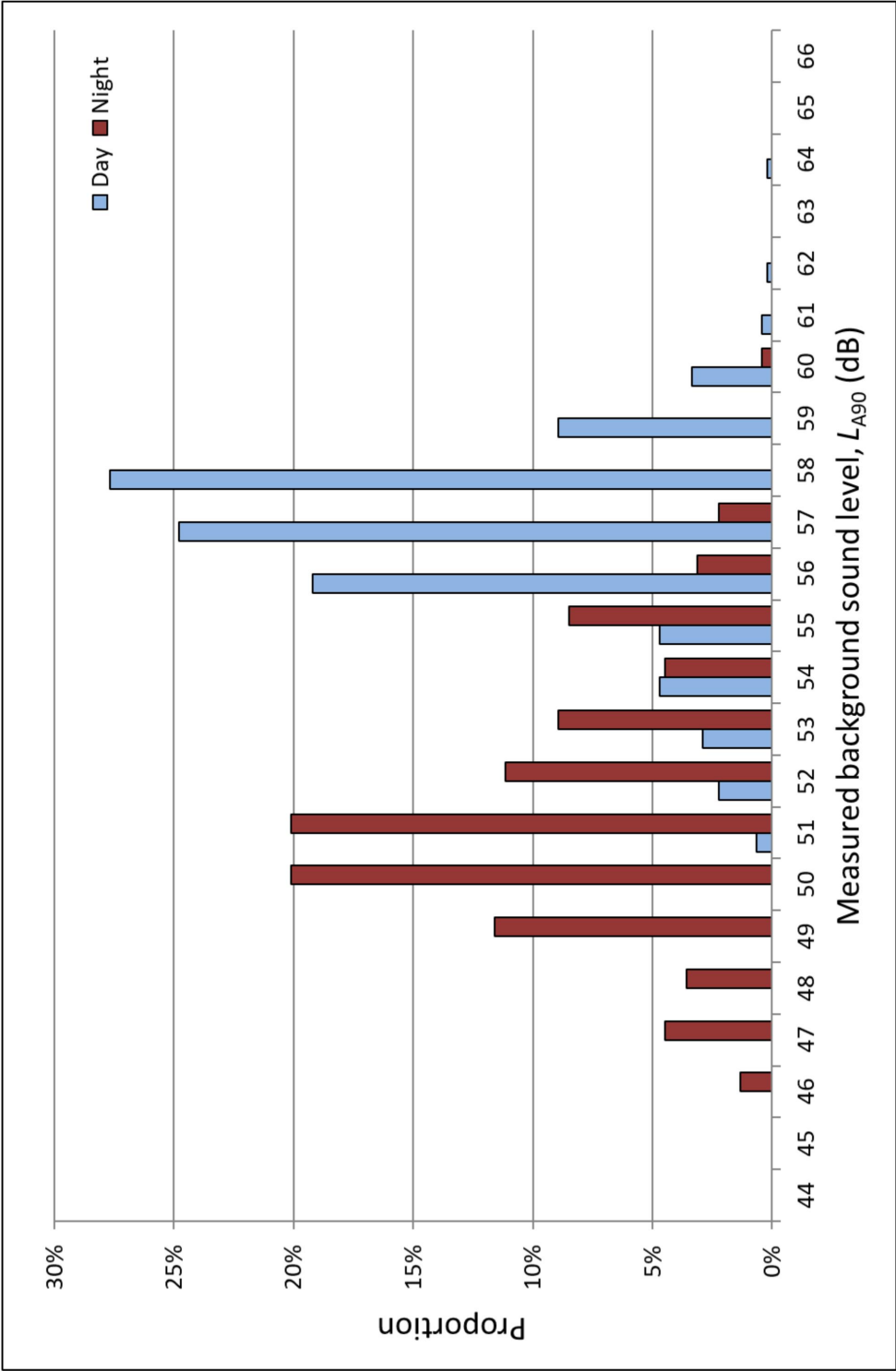


Figure 8 Statistical analysis of the results of the noise logging survey at position B, 5 to 12 December 2023

Appendix C

BS 4142 corrections for attention catching features

The following applies where plant noise is assessed in accordance with BS 4142:2014+A1:2019.

If the proposed plant noise contains attention catching features (such as tonal elements, whines, whistles, bangs etc), penalty corrections should be applied based on the type and impact of the features.

If appropriate, a subjective assessment of the plant features can be adopted. Where the plant noise contains tonal elements, the following corrections can be made depending on how perceptible the tone is at the noise receptor:

- 0 dB where the tone is not perceptible
- 2 dB where the tone is just perceptible
- 4 dB where the tone is clearly perceptible
- 6 dB where the tone is highly perceptible.

Where the plant noise is impulsive, the following corrections can be made depending on how perceptible the impulsivity is at the noise receptor:

- 0 dB where the impulse is not perceptible
- 3 dB where the impulse is just perceptible
- 6 dB where the impulse is clearly perceptible
- 9 dB where the impulse is highly perceptible.

For noise which is equally both impulsive and tonal, then both features can be accounted for by linearly summing the corrections for both characteristics.

If the plant has other distinctive characteristics, such as intermittency, then a 3 dB correction can be made.

If a subjective assessment of tonality is not appropriate, an objective assessment can be made by analysis of time-averaged, third-octave band sound pressure levels. A noise source is deemed to be tonal if the level in a third-octave band exceeds the level in adjacent third-octave bands by the level differences given below:

- 15 dB in the low frequency third-octave bands (25 Hz to 125 Hz)
- 8 dB in the mid frequency third-octave bands (160 Hz to 400 Hz)
- 5 dB in the high frequency third-octave bands (500 Hz to 10000 Hz).

If an objective assessment identifies the plant noise to be tonal then a 6 dB correction must be made.