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Plant Noise Impact Assessment Report to Address Planning Condition

77 Mosley Street, Manchester

Report Reference 22658.PNIA-RPT.01

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1 INTRODUCTION

ES Acoustics Ltd have been commissioned by Hybrid Planning & Development Ltd to undertake an environmental noise survey and prepare a noise impact assessment in accordance with BS 4142:2014+A1:2019 for the installation of juice preparation area extraction equipment to serve the ground floor juice bar at 77 Mosley Street, Manchester, to address the requirements of the noise related Planning Condition, which reads as follows:

"Prior to the installation of the 2no. louvres on the northern elevation of the building hereby approved, either a scheme that demonstrates that the any plant, equipment or servicing utilising the 2no. extract louvres will achieve a rating level of 5dB (LAeq) below the typical background (LA90) level in each octave band at the nearest noise sensitive location, or a scheme showing a method to acoustically treat/insulate the louvres, plant, equipment or servicing so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level in each octave band at the nearest noise sensitive location, shall be submitted to and approved in writing by the Local Planning Authority.

b. Prior to the first operation of the louvres, plant, equipment or servicing, a verification report, which will include post-completion testing, shall be submitted to and be approved in writing by the Local Planning Authority to validate that the louvres, plant, equipment or servicing achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location.

c. In the event of non-conformity with a rating level of 5dB (LAeq) below the typical background (LA90) level in each octave band, then any measures/changes required to achieve conformity shall be carried out. Any required measures/changes and verification shall continue until conformity has been achieved and agreed in writing by the Local Planning Authority, before operation of the louvres, plant, equipment or servicing can commence.

Reason - To minimise the impact of the development and to prevent a general increase in pre-existing background noise levels around the site. Pursuant to policies SP1 and DM1 of the Core Strategy and saved policy DC26 of the UDP."

The purpose of this report is to;

- Review relevant national planning policy and guidance, and the scenario under assessment;
- Present the results of an environmental noise survey undertaken on site to determine background noise levels at nearby noise sensitive receptor locations;
- Undertake noise propagation calculations and a noise impact assessment in accordance with BS 4142:2014+A1:2019 of the proposed external building services plant to the closest noise sensitive receptors;
- Determine noise impacts on the closest noise sensitive receivers in relation to any relevant Local Planning requirements; and,
- Outline mitigation advice to ensure a low likelihood of adverse impact on the nearby noise sensitive receptors if required.

2 SITE CONTEXT AND BACKGROUND INFORMATION

2.1 Background Context

The installation and operation of juice preparation area extraction equipment is proposed to serve the juice bar, on the ground floor of 77 Mosley Street, Manchester. As such, a noise impact assessment is being undertaken to ensure that the unit does not create adverse impacts on the existing noise sensitive properties.

2.2 Site Description and Proposal

The site is situated in at the junction between Mosley Street and Princess Street in Manchester, adjacent to St Peter's Square, which contains a busy MetroLink station. The site location falls under the jurisdiction of Manchester City Council. The juice bar venue is proposed on the ground floor of the building, with offices above.

The proposal is for the proposed juice preparation area intake and exhaust plant to be ducted to the northern façade.

The site location is presented in Figure 1, which shows the application site, plant unit installation location, and the closest receptor windows relative to the plant location:

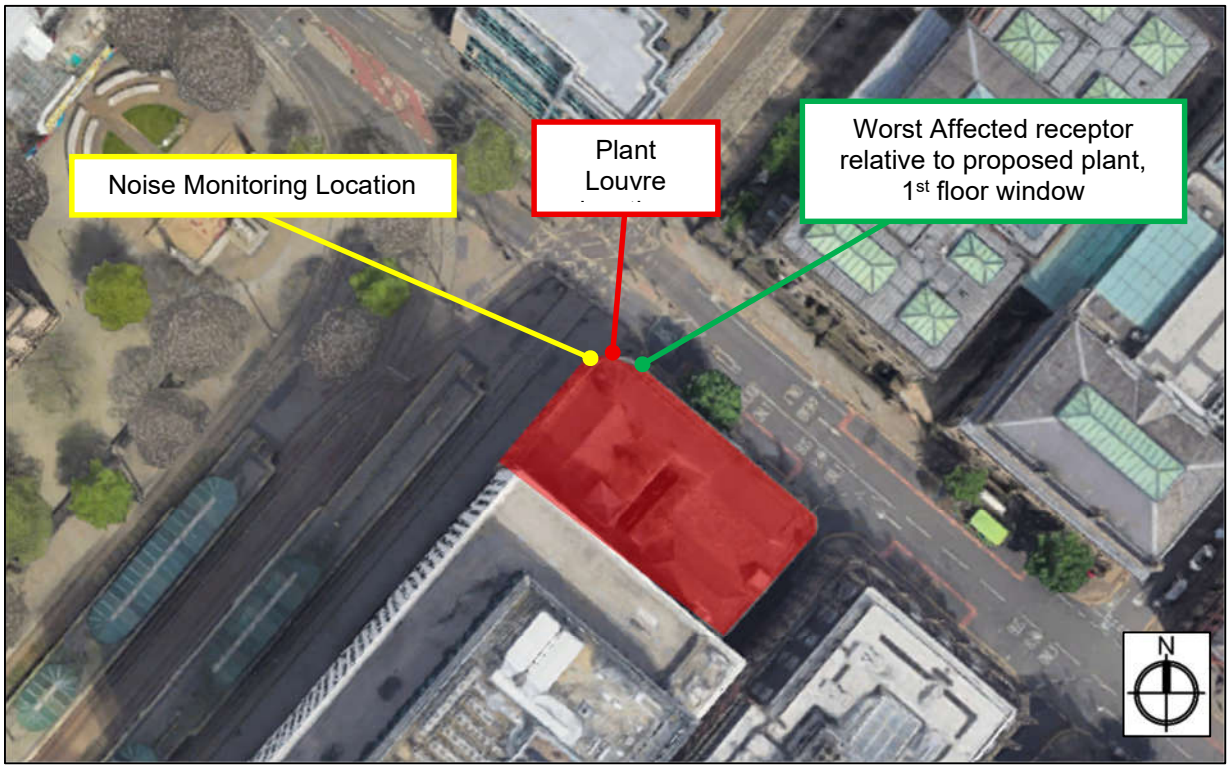


Figure 1 Site location plan (Ref: Google Maps)

A review of the satellite imagery of the site and surrounding area shows that all of the closest buildings to the proposed development are offices. The Planning Condition specifies that the assessment be conducted to the 'nearest noise sensitive location'. On this basis, these offices have been considered as the nearest noise sensitive location for this assessment.

3 PLANNING CONDITION AND RELEVANT NOISE IMPACT ASSESSMENT GUIDANCE

The planning condition for which this report is prepared is as follows:

"Prior to the installation of the 2no. louvres on the northern elevation of the building hereby approved, either a scheme that demonstrates that the any plant, equipment or servicing utilising the 2no. extract louvres will achieve a rating level of 5dB (LAeq) below the typical background (LA90) level in each octave band at the nearest noise sensitive location, or a scheme showing a method to acoustically treat/insulate the louvres, plant, equipment or servicing so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level in each octave band at the nearest noise sensitive location, shall be submitted to and approved in writing by the Local Planning Authority.

b. Prior to the first operation of the louvres, plant, equipment or servicing, a verification report, which will include post-completion testing, shall be submitted to and be approved in writing by the Local Planning Authority to validate that the louvres, plant, equipment or servicing achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location.

c. In the event of non-conformity with a rating level of 5dB (LAeq) below the typical background (LA90) level in each octave band, then any measures/changes required to achieve conformity shall be carried out. Any required measures/changes and verification shall continue until conformity has been achieved and agreed in writing by the Local Planning Authority, before operation of the louvres, plant, equipment or servicing can commence.

Reason - To minimise the impact of the development and to prevent a general increase in pre-existing background noise levels around the site. Pursuant to policies SP1 and DM1 of the Core Strategy and saved policy DC26 of the UDP."

A full review of relevant guidance has been undertaken, as outlined in Appendix B. For ease of reference, the following documentation has been reviewed:

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

4 ENVIRONMENTAL NOISE SURVEY

4.1 Measurement Location and Procedure

A noise survey was undertaken on site at the location shown in Figure 1. The microphone of the noise monitoring equipment was placed on the balcony of the window of the noise sensitive receptor, approximately 1m from the northern façade. This position directly overlooks the location of the proposed building services louvre and so it considered representative of the noise levels at the noise sensitive receptor.

An appraisal of the site during the site visit determined that the prevailing background noise of the area is consistent with most urban areas, with road and tram traffic noise being the primary contributor as a result of road traffic on Princess Street and tram traffic on Mosley Street and St Peter's Square.

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 12:50 on 1st May and 14:15 on 5th May 2026.

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); and*
- $L_{A90,T}$ *(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 significant drift/deviation was observed.

Equipment	Make and Model	Serial Number
Sound Level Meter	Svantek 958 Class 1 Sound Level Meter	59143
Microphone Capsule	PCB 377B02	359418
Microphone Preamplifier	PCB 426E01	170796
Calibrator	Svantek SV 84	H3379

Table 1 Noise survey equipment

4.3 Weather Conditions

Weather conditions at the time of the site visits were observed to be suitable for environmental noise measurement, with light winds and dry weather. Wind speeds varied between 1 and 10 m/s, with temperatures ranging from 6º and 17ºC.

4.4 Survey Results

An environmental noise time history graph of the noise survey data is presented in Appendix C.

With regards to the background sound level, BS 4142:2014+A1:2019 notes that "…*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."

The planning condition also clearly states that a 'typical' background noise level be used. It also references BS4142:2014, which outlines a histogram method for determining the typical background noise level. This method has been followed in this assessment to determine the typical background noise level at the noise sensitive receptor.

The statistical distribution of background noise levels measured through the survey for daytime and night-time is demonstrated in Appendix D.

Table 2 shows the overall typical background noise level, as well as the typical background noise level spectrum.

Period	**Typical Background Noise Level (dB $L_{A90,T}$)**	**Typical Octave Band Background Noise Level Spectrum (dB $L_{A90,T}$)**							
		63Hz	**125Hz**	**250Hz**	**500Hz**	**1000Hz**	**2000Hz**	**4000Hz**	**8000Hz**
Daytime (07:00-23:00)	57	57	58	54	53	51	48	46	40
Night-time (23:00-07:00)	50	57	54	49	45	44	41	39	31

Table 2 Typical Background Noise Levels

5 NOISE IMPACT ASSESSMENT

5.1 Plant Details

The juice preparation area is proposed to be served by a single AHU, which will provide all extract ventilation requirements. Both the intake and exhaust are proposed to be ducted to a single louvre on the northern façade. A ventilation layout drawing showing the ductwork layouts is shown as Figure 2, below.

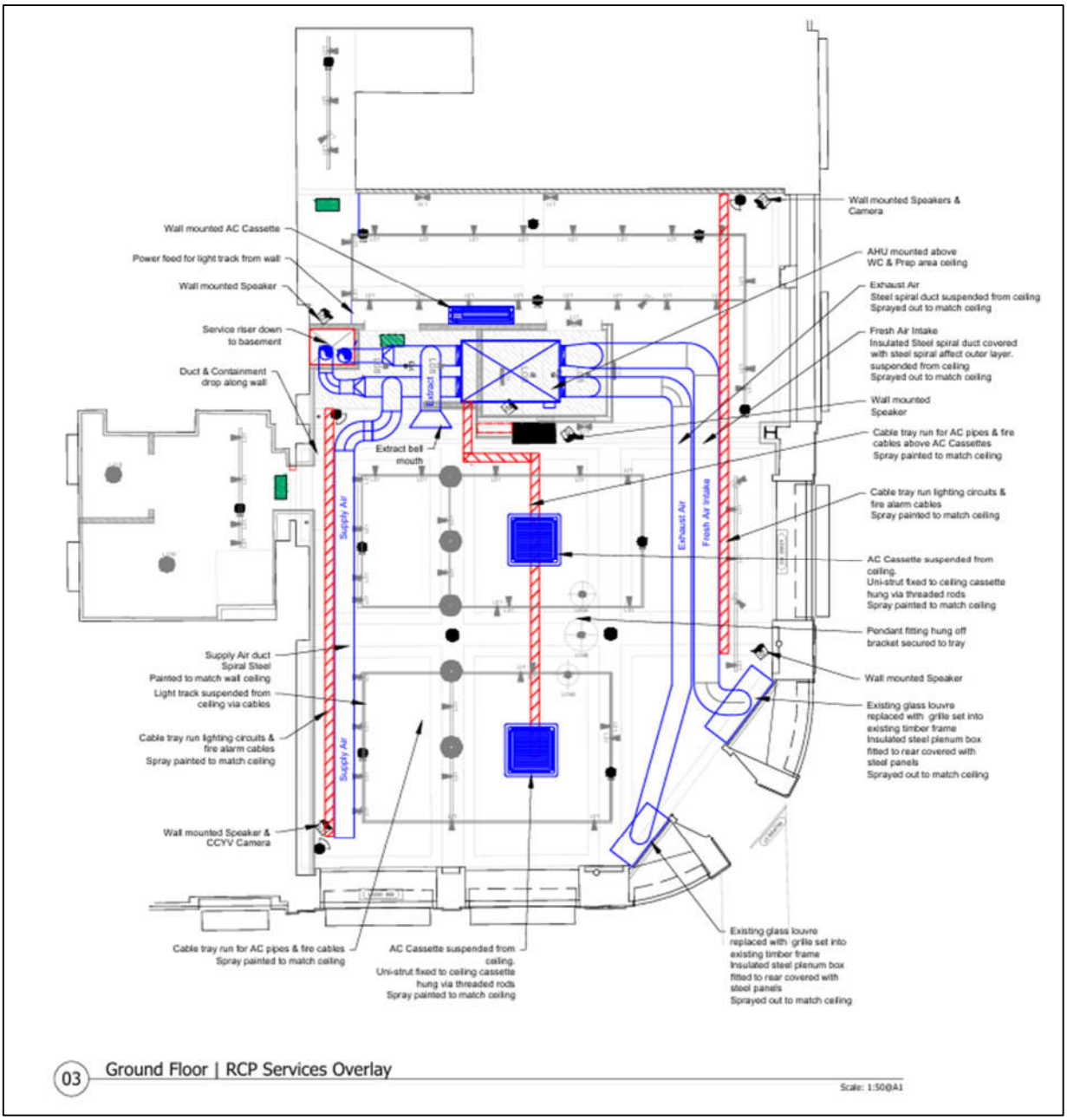


Figure 2 Juice Preparation Area Plant Ventilation Layout

The HRU is proposed to be a Toshiba VN-U01501SY-E / -TR unit, which is specified to have a sound pressure level at 1m of 58 dB L_{PA}. Octave band sound power levels have been provided by the manufacturer.

A datasheet showing the measured octave band sound power level of the AHU is provided in Appendix F.

5.2 Predicted Noise Levels at Closest Noise Sensitive Receptor

The Specific Sound Level of the extraction equipment has been assessed to the closest noise sensitive windows. These calculations consider various factors such as duct work attenuation, end reflection loss and attenuation over distance.

The Plant Noise Rating Level calculated at the receptor are summarised in the table below. As the receptor is an office that is closed during the night-time period, only a daytime assessment has been undertaken.

For the purposes of this assessment, no BS4142:2014 correction factors have been applied. The noise emissions are broadband so do not warrant any tonality corrections. When operating, they will operate consistently for the full assessment period, so no intermittency or impulsivity corrections are warranted.

Period	**Noise Level**	**Octave Band Noise Level Spectrum**								**Overall Noise Level**
		63Hz	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**	
Daytime (07:00-23:00)	Plant Noise Rating level (dB $L_{Ar,Tr}$)	30	32	33	31	37	37	33	24	42
	Typical Background Noise Level (dB $L_{A90,T}$)	57	58	54	53	51	48	46	40	57
	Difference	-27	-26	-21	-22	-15	-11	-13	-16	-15
	Compliant with Planning Condition?	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**

Table 3 Predicted Plant Noise Rating Levels at receptors

Table 3 shows that octave band plant noise rating level would meet the requirements of the Planning Condition.

5.3 Assessment Context

As outlined in the BS 4241:2014+A1:2019 guidance presented in Appendix B, 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 respect to the absolute level, the Plant Noise Rating Level outside the residential window would fall below the recommended external noise level recommended by WHO of 45 dB $L_{Aeq,T}$ to facilitate good resting conditions.

With regards to aspects of character of noise at the noise sensitive receiver properties, the existing noise profile of the area is dominated by noise from background road traffic noise, in addition to other low level plant in the area as evidenced by the environmental noise survey. As the received noise levels are so low as to be effectively inaudible during daytime hours, the addition of this noise source would not be expected to present a significant impact on the acoustic character of the area.

With regards to aspects of the receptor properties, the receiver properties are all office premises. As such, the primary source of cooling would be internal climate control. With this in consideration, the external building fabric can remain closed whilst maintaining suitable internal noise levels, and this would typically be the preference to prevent noise ingress from existing road traffic noise, which the plant noise from the proposed extraction equipment inherently falls below.

5.4 Assessment of Impacts

Considering the calculated Rating Level compared to the background sound level and the context in which the sound occurs, we would conclude that the plant installation would present a low likelihood of adverse impact when assessed in accordance with BS 4142:2014+A1:2019.

6 CONCLUSION

An environmental noise survey has been undertaken at 77 Mosley Street, Manchester to establish background sound levels representative of the closest noise sensitive receptor locations relative to the juice preparation area plant unit installation.

Calculations of noise emissions from the plant installation have been undertaken in respect to the requirements of an imposed Planning Condition.

It has been concluded that noise emissions from the plant would meet the requirements of the Planning Condition. The assessment indicated that the plant noise rating level is sufficiently below the background sound level to be considered as a low likelihood of adverse impact in accordance with BS 4142:2014+A1:2019.

No further remedial measures would be expected to be required to maintain a low likelihood of adverse impact, and it can be confirmed that the requirements of the Planning Condition can be achieved.

APPENDIX A

GLOSSARY OF 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

GLOSSARY OF 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

PLANNING POLICY AND RELEVANT ACOUSTIC GUIDANCE REVIEW

1 NATIONAL POLICY

1.1 National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) covers issues relating to noise and planning in England.

The paragraphs relating to noise state:

187. 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

198. 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; […]

200. 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.

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.'

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

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Response	Examples of Outcomes	Increasing Effect Level	Action
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 REGIONAL POLICY

2.1 The London Plan

Policy D14 'Noise' of the London Plan states the following regarding planning decisions:

Development proposals should seek to manage noise by:

- *Avoiding significant adverse noise impacts on health and quality of life as a result of new development;*
- *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 development or adding unduly to the costs and administrative burdens on existing businesses;*
- *Improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity);*
- *Separating new noise sensitive development from major noise sources, such as road, rail, air transport and some types of industrial development) through the use of distance, screening or internal layout – in preference to sole reliance on sound insulation;*
- *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 the application of good acoustic design principles;*
- *Having particular regard to the impact of aviation noise on noise sensitive development;*
- *Promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver.*

In addition, Policy D13 'Agent of Change' is intrinsically linked with noise, and states:

A. *The Agent of Change principle places the responsibility for mitigating impacts from existing noise and other nuisance-generating activities or uses on the proposed new noise-sensitive development. Boroughs should ensure that Development Plans and planning decisions reflect the Agent of Change principle and*

take account of existing noise and other nuisance-generating uses in a sensitive manner when new development is proposed nearby;

A. *Development should be designed to ensure that established noise and other nuisance-generating uses remain viable and can continue or grow without unreasonable restrictions being placed on them;*

B. *New noise and other nuisance-generating development proposed close to residential and other noise-sensitive uses should put in place measures to mitigate and manage any noise impacts for neighbouring residents and businesses;*

C. *Development proposals should manage noise and other potential nuisances by:*

   1) *ensuring good design mitigates and minimises existing and potential nuisances generated by existing uses and activities located in the area*

   2) *exploring mitigation measures early in the design stage, with necessary and appropriate provisions including ongoing and future management of mitigation measures secured through planning obligations*

   3) *separating new noise-sensitive development where possible from existing noise-generating businesses and uses through distance, screening, internal layout, sound-proofing, insulation and other acoustic design measures.*

D. *Boroughs should not normally permit development proposals that have not clearly demonstrated how noise and other nuisances will be mitigated and managed.*

3 LOCAL POLICY

3.1 Lambeth Local Plan 2020–2035 (adopted September 2021)

Policy D4: Planning obligations

A. *secure affordable housing (see policy H2);*

B. *B. ensure that development proposals provide or fund local improvements to mitigate the impact of the development and/or additional facilities and requirements made necessary by the development. Depending on the nature of the development, this may include:*

   iv. *mitigation of noise impacts;*

Policy H6: Residential conversions

A. *To ensure mixed and balanced communities with a choice of family-sized housing and to manage the cumulative effects of residential conversions on environmental quality and local amenity, the council will protect dwellings suitable for occupation by families of less than 130m2 (as originally constructed) from conversion into flats.*

B. *Where a dwelling has a floor area (as originally constructed) of at least 130m2, conversion of the property into self-contained units may be acceptable provided:*

iii. *the conversion will not lead to an unacceptable level of noise and disturbance to occupiers and adjoining properties (see Local Plan policy Q2);*

Policy ED8: Evening economy and food and drink uses

The council wishes to support the evening economy in its town centres whilst making sure that any adverse impact on local amenity is minimised. It also wishes to manage the location of hot food takeaways near schools in order to promote healthy lifestyles.

A. *Evening and food and drink uses should be primarily located in town centres and Central Activities Zone retail clusters in accordance with the requirements in the Places and Neighbourhoods policies in Section 11.*

B. *Evening and food and drink uses will not be permitted where this would cause unacceptable harm to community safety or the amenity of neighbouring residential areas and sensitive uses as a result of:*

   i. *noise;*

C. *Proposals for evening and food and drink uses should be accompanied by a management plan and a customer management plan, including mitigation measures for any negative impacts of these uses. Impacts such as noise and light pollution on local wildlife and biodiversity should be considered through appropriate location, design and scheduling to address the requirements of London Plan policy G6 Biodiversity and access to nature.*

Policy Q2: Amenity

Development will be supported if:

v. *the adverse impact of noise is reduced to an acceptable level through the use of attenuation, distance, screening, or layout/orientation in accordance with London Plan policy D14;*

vi. *adequate outdoor amenity space is provided, practical in layout, free from excessive noise or disturbance, pollution or odour, oppressive enclosure, unacceptable loss of privacy, wind/downdraught and overshadowing; and vii. service equipment (including lift plant, air handling/extract, boiler flues, meter boxes, gas pipes and fire escapes) is fully integrated into the building envelope or located in visually inconspicuous locations within effective and robust screening/enclosures, and does not cause disturbance through its operation. viii. it addresses London Plan policy D13 on the agent of change*

viii. *it addresses London Plan policy D13 on the agent of change.*

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4 BEST PRACTICE AND GUIDANCE

4.1.1 World Health Organization (WHO) Guidelines

WHO Guidelines for Community Noise (1999) provides guideline values for community noise in specific environments. This has since been supplemented by WHO Environmental Noise Guidelines for European Region (WHO, Regional office for Europe, 2018).

The WHO guideline values most relevant to new residential development are outlined in the table below:

Specific Environment	Critical Health Effects	$L_{Aeq,T}$ [dB]	L_{Afmax} [dB]	Time Base
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	n/a	07:00-23:00
	Sleep disturbance night-time	30	45	23:00-07:00
Dwelling, outdoors	Sleep disturbance, window open (outdoor values)	45	60	23:00-07:00
Outdoor living area	Serious annoyance, daytime and evening	55	n/a	07:00-23:00
	Moderate annoyance, daytime and evening	50	n/a	07:00-23:00

Table 2 Guideline Values from WHO Guidelines for Community Noise (1999)

The effects of noise in dwellings are typically sleep disturbance, annoyance and speech interference. For bedrooms the critical effect is sleep disturbance. Indoor guideline values for bedrooms at night are 30dB L_{Aeq} for continuous noise and 45dB L_{Amax} for single sound events, but the guidance also notes that lower noise levels may be disturbing depending on the nature of the noise source.

4.2 BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings'

Table 4 of BS 8233:2014 (reproduced below) provides guidance on recommended internal ambient noise levels in residential spaces based on World Health Organization (WHO) research.

Room	Daytime (07:00-23:00)	Night-time (23:00-07:00)
Living Room	≤ 35 dB $L_{Aeq,16hr}$	N/A
Dining Room	≤ 40 dB $L_{Aeq,16hr}$	N/A
Bedroom	≤ 35 dB $L_{Aeq,16hr}$	≤ 30 dB $L_{Aeq,8hr}$

Table 3 BS 8233:2014 indoor ambient noise levels for dwellings

The following notes should be considered alongside the levels presented above:

- *The levels presented above are for steady external noise sources without a specific character. Noise is considered to have a specific character if it contains features such as a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content, in which case lower noise limits might be appropriate*
- *The levels are based on annual average data and do not have to be achieved in all circumstances e.g. it is normal to exclude occasional events, such as fireworks night or New Year's Eve*

- *Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved*
- *If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level*
- *The levels outlined above are not applicable under "purge ventilation" conditions as defined by Approved Document F of the Building Regulations, as this should only occur occasionally e.g. to remove odour from painting or burnt food). However, the levels above should be achieved whilst providing sufficient background ventilation, either via passive or mechanical methods*

It should be noted that the 2014 version of BS 8233:2014 does not include any specific requirement for maximum instantaneous noise levels (L_{max}) within dwellings. However, methodology for the assessment of maximum noise levels is included in ProPG and referenced in WHO guidelines.

Section 7.7.3.2 of BS 8233:2014 *'Guidance on sound insulation and noise reduction for buildings'* presents desirable guideline levels for amenity areas. The section is presented in its entirety below:

"For traditional external areas that are used for amenity space, such as gardens and patios, 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.

Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space."

4.3 ProPG: Professional Practice Guidance on Planning and Noise

ProPG was published to provide practitioners with guidance and a recommended approach for the assessment of noise impact on residential developments during the planning stage.

The guidance can be seen as the missing link between the current NPPF and its predecessor, PPG24 (Planning Policy Guidance 24: Planning and Noise), which provided a prescriptive method for assessing sites for residential development but without the nuance of the key elements described in ProPG.

The guidance seeks to assist in the delivery of sustainable development by promoting good health and wellbeing through the effective management of noise and encourage a good acoustic design in and around proposed new residential development whilst considering national policy on planning and noise.

The recommend approach for assessment is summarised below:

- *Stage 1 – an initial noise risk assessment of the proposed development site*
- *Stage 2 – a systematic consideration of four key elements:*
    - *Element 1 – Demonstrating a "Good Acoustic Design Process" (including feasibility of reducing or relocating existing noise sources, site orientation and building layout and appropriate constructions methods to meet performance requirements);*
    - *Element 2 – Observing internal "Noise Level Guidelines" (as presented in Section 3.3.1 of this report, with additional consideration of individual noise events which should normally not exceed L_{AFmax} 45 dB more than 10 times in bedrooms at night);*
    - *Element 3 – Undertaking an "External Amenity Area Noise Assessment" (ProPG aligns with BS 8233:2014 and suggests that noise levels in external amenity areas should ideally not be above $L_{Aeq,16hr}$ 50-55dB. However, there is an acceptance that these guideline values may not be achievable in all circumstances where development might be desirable, and in such situations, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces but should not be prohibited.); and*
    - *Element 4 – Consideration of "other relevant issues" (including compliance with national and local policy, acoustic design vs unintended adverse consequences, acoustic design vs wider planning objectives)*

To help consider noise at a site at an early stage an initial noise risk assessment should assess the Noise Risk Category of the site to help provide an indication of the likely suitability of the site for new residential development from a noise perspective. The table below sets out the indicative noise levels for the Noise Risk Categories and a description of the potential effect of noise where no further noise mitigation is to take place as well as additional guidance.

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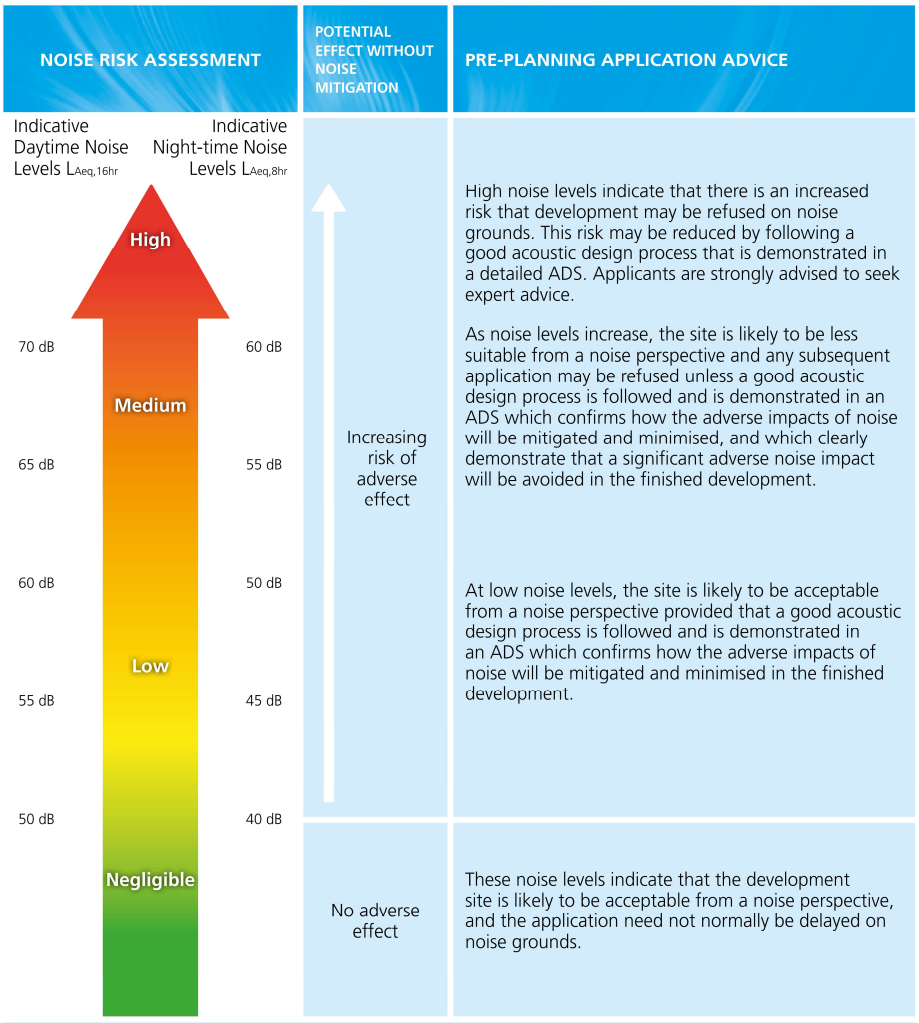


Figure 1. Stage 1– Initial Site Noise Risk Assessment

4.3.1 Possible Options for the Identification of SOAELs and LOAELs in Support of the NPSE (2014)

Commissioned by Defra and developed through research conducted by AECOM, the study titled "Possible Options for the Identification of SOAELs and LOAELs in Support of the NPSE" explores potential numerical values for SOAELs and LOAELs, which are concepts introduced within the Noise Policy Statement for England (NPSE). Following the revocation of PPG24: Planning and Noise in 2012, which previously outlined Noise Exposure Categories with defined numerical thresholds, the NPSE faced criticism for lacking specific quantitative guidance. Although both the NPSE and the National Planning Policy Framework (NPPF) advocate for context-driven,

location-specific noise criteria, the absence of numerical benchmarks posed challenges in applying the NPSE effectively.

To address this, the research project proposes indicative values and potential value ranges for SOAELs and LOAELs across various noise sources, with the findings summarised in Table 4.

Source	Effect	LOAEL	SOAEL
Road	Annoyance (Daytime)	**56** (53-59)	**66** (64-68)
	Sleep (Night-time)	**46** (43-52)	**56** (51-64)
Rail	Annoyance (Daytime)	**63** (61-66)	**72** (70-74)
	Sleep (Night-time)	**55** (52-63)	**68** (61-77)
Air	Annoyance (Daytime)	**52** (50-54)	**60** (58-62)
	Sleep (Night-time)	**41** (40-49)	**53** (47-60)

Table 4 Possible Value & Ranges of Values for LOAEL & SOAEL

4.3.2 Approved Document O: Overheating

Approved Document O took effect on 15 June 2022 with the aim to protect the health and welfare of occupants of a building by reducing the occurrence of high indoor temperatures with residential buildings.

Paragraph 3.3 covers the noise consideration and is presented below:

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

a. 40dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am).

b. 55dB L_{AFmax}, more than 10 times a night (between 11pm and 7am).

Following the adoption of ADO, the 'Approved Document O Noise Guide' has been published by the Institute of Acoustics and Association of Noise Consultants to provide guidance for practitioners when implementing the standards within ADO relating to noise.

Requirement O1 requires reasonable provision for limiting unwanted solar gain as well as providing an adequate means of removing excess heat from the indoor environment. Compliance with Requirement O1 can be demonstrated via a simplified method or via dynamic thermal modelling.

The simplified method presents minimum free areas for bedrooms as a percentage of the floor area for high and medium risk locations, which are 13% and 4% respectively. The ADO Noise Guide clarifies the following external noise levels above which the simplified method cannot be used:

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Parameter	High Risk Location	Moderate Risk Location
$L_{Aeq,8h}$ averaged over 8 hours (between 11pm and 7am)	45 dB	50 dB
L_{AFmax} more than 10 times a night (between 11pm and 7am)	60 dB	65 dB

Table 5 External noise levels above which the simplified method cannot be used (Ref: ADO Noise Guide)

Note that these values do not account for façade elements in front of the window (e.g. balconies).

The thermal modelling method requires a CIBSE TM59 assessment and consideration of acceptable strategies for reducing overheating risk via limiting solar gains and removing excess heat from the building.

Paragraphs 2.7 and 2.10 are presented below:

2.7 Solar gains in summer should be limited by any of the following means.

a. Fixed shading devices, comprising any of the following.

- *i. Shutters, ii. External blinds, iii. Overhangs, iv. Awnings.*

b. Glazing design, involving any of the following solutions.

- *i. Size, ii. Orientation, iii. g-value, iv. Depth of the window reveal.*

c. Building design – for example, the placement of balconies.

d. Shading provided by adjacent permanent buildings, structures, or landscaping.

2.10 Excess heat should be removed from the residential building by any of the following means.

a. Opening windows (the effectiveness of this method is improved by cross-ventilation).

b. Ventilation louvres in external walls.

c. A mechanical ventilation system.

d. A mechanical cooling system

In meeting the obligations noted above, consideration must be given to noise during night, pollution, security, protection from falling and protection from entrapment.

The ADO Noise Guide suggests that in the case of dynamic thermal modelling (when noise and air quality are not a constraint), the primary approach to remove excess heat should be via an open window. From the established external noise exposure at each bedroom window, the outside to inside level difference should be calculated, and then the target Equivalent Area should be predicted using the following equations (depending on whether the required level difference is free-field or façade):

Equation 1[8]

$$EA\ based\ on\ façade\ level\ difference = V \times 10^{\left(\frac{-(D_{2m,nT}+5)}{10}\right)}$$

Where

$D_{2m,nT}$ is the is the façade level difference between the A-weighted level 2m in front of the façade ($L_{1,2m}$), and the standardised internal A-weighted level ($L_{eq,2,nT}$). In the absence of any better alternative method, the same principle can be applied to L_{AFmax}.

V is the room volume (m^3)

EA is the Equivalent Area of the open window (m^2)

Equation 2[8]

$$EA\ based\ on\ freefield\ level\ difference = V \times 10^{\left(\frac{-(D_{nT}+8)}{10}\right)}$$

The total maximum Equivalent Area for each bedroom to meet the required standardised level difference should then be communicated to the dynamic thermal modelling consultant to verify whether or not the building is still at risk of overheating with the Equivalent Areas calculated.

In the case where openable windows are not suitable and a mechanical ventilation system is required, the following noise limits should be observed:

Parameter	Bedrooms
Mechanical ventilation or mechanical cooling system noise	$L_{Aeq,T}$ 30 (±5) dB

Table 6 Recommended noise level for mechanical ventilation or mechanical cooling systems

Higher noise levels than those in Table 2, e.g. by up to 10 dBA, may be appropriate in some operating scenarios, where rapid changes to the cooling or ventilation rates quickly improve the thermal comfort of the occupant. Equally, lower noise levels may be appropriate for some types of residential development.

The ADO Noise Guide suggests the following assessment steps:

To determine if an open window can be used for removing excess heat, it is recommended that the acoustic consultant adopts the following process:

1. *Establish the night-time noise exposure at all bedroom windows as advised in this document;*
2. *Determine the outside to inside sound insulation for each bedroom window required to meet the noise threshold;*
3. *Determine the Equivalent Area to achieve the required outside to inside sound insulation as determined in 2) above; and*
4. *Communicate the required total maximum night-time Equivalent Area via an open window for the dynamic thermal modeller to use.*

For bedrooms that cannot rely on an open window to remove excess heat at night due to noise constraints, the thermal modeller should identify the solution to remove excess heat. The acoustic consultant can then advise the acoustic requirements for any proposed provisions.

One clear way of communicating the advice is to provide a mark-up showing the required performance at each façade / window.

The dynamic thermal modelling report should contain sufficient reference to any associated noise assessment, the required sound insulation performance and maximum night-time Equivalent Area and the basis for defining these.

4.4 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. In the context of this report, this guidance would be relevant for any new fixed plant installations that might be installed for the scheme.

The methodology involves comparing the Rating Noise Level due to the sound source/s under assessment with the existing background sound 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 sound. 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 sound 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.

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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.

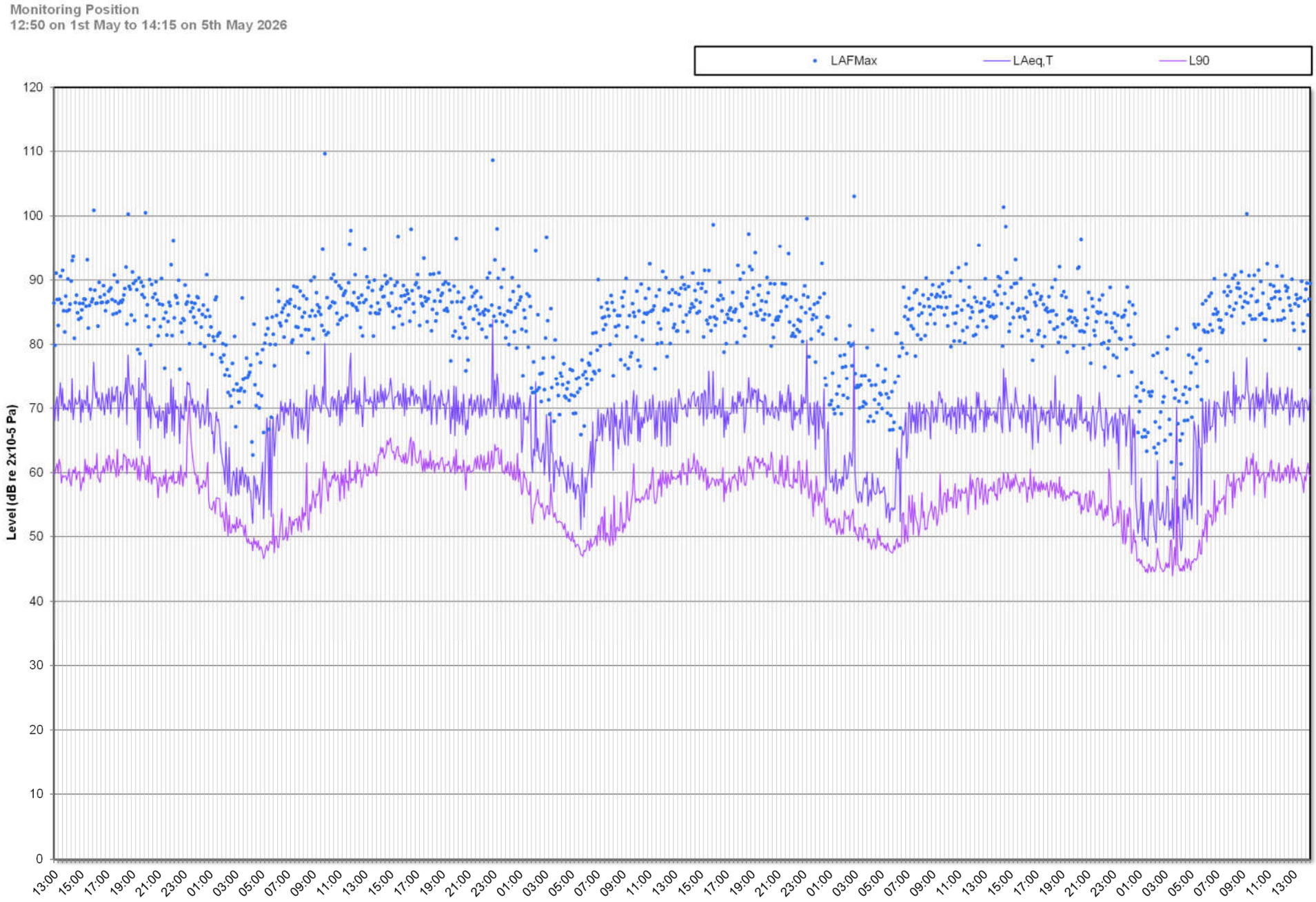
Subclause 11(3)

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.

APPENDIX C

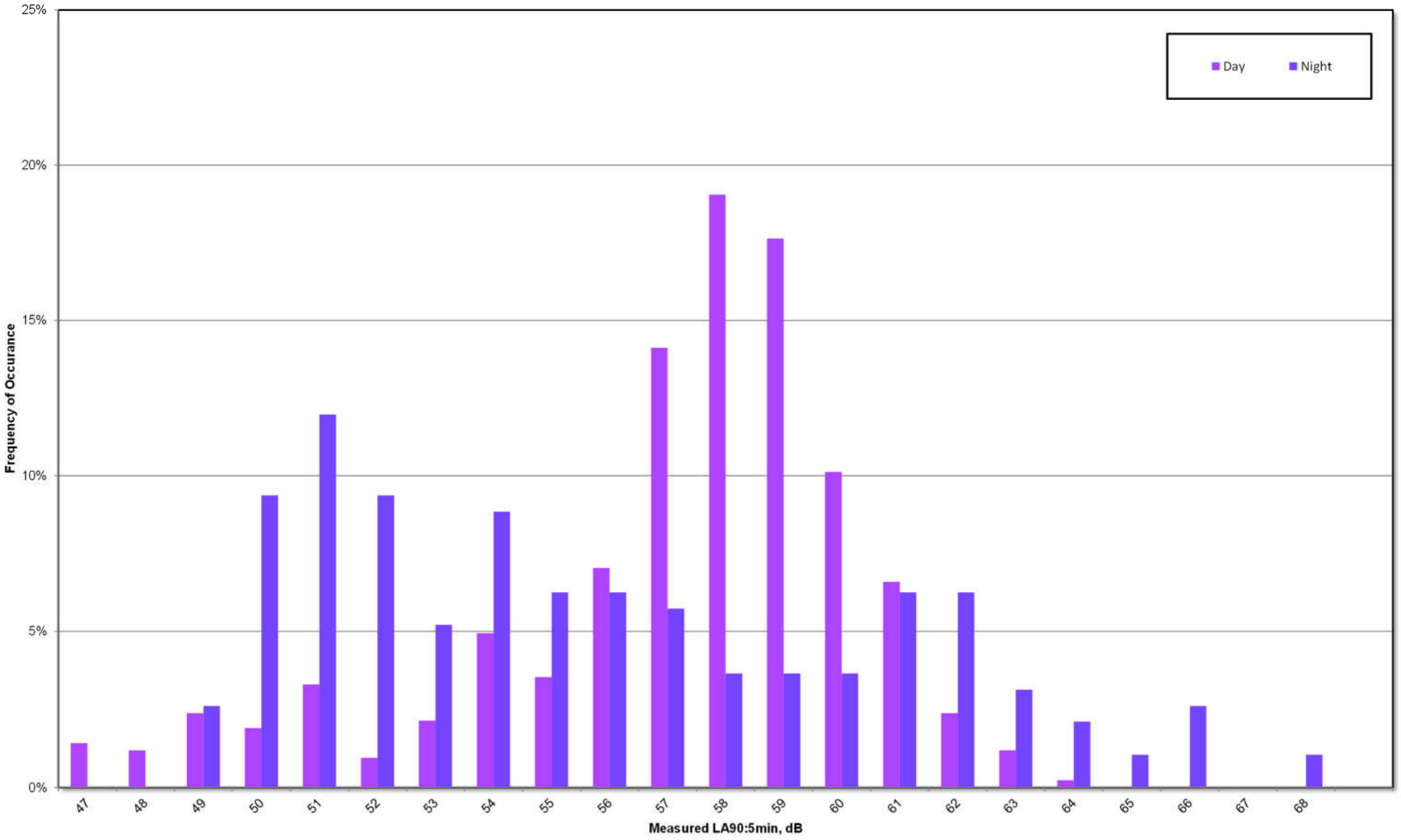
ENVIRONMENTAL NOISE TIME HISTORY



APPENDIX D

BACKGROUND NOISE STATISTICAL DISTRIBUTION CHART

22658.PNIA-RPT.01
Statistical Distribution of Background Levels



APPENDIX E

PLANT NOISE EMISSION CALCULATIONS

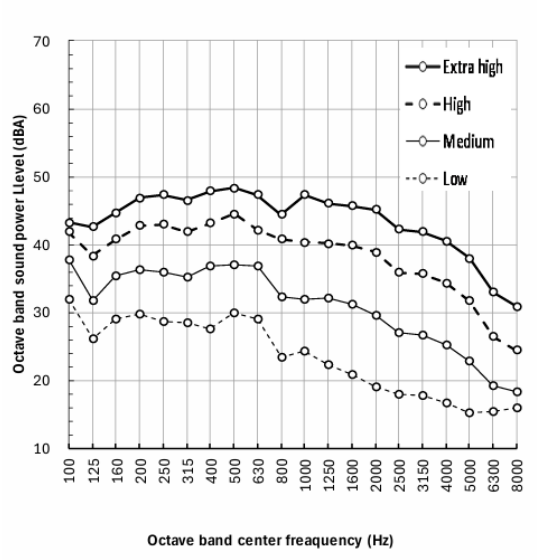
	Frequency, Hz								dB(A)
	63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	
Toshiba VN-U01501SY dB Lw FAI	50	48	52	53	51	49	45	36	
Rectangular Duct Length Correction	-7	-6	-3	-1	-1	-1	-1	-1	
Square Bend Corrections	0	-2	-10	-16	-8	-6	-6	-6	
End Reflection Loss Correction	-8	-3	-1	0	0	0	0	0	
Sound Power Level at opening	35	37	38	36	42	42	38	29	
Sound Pressure Level 1m from NSR	27	29	30	28	34	34	30	21	
Toshiba VN-U01501SY dB Lw EX	50	48	52	53	51	49	45	36	
Circular Duct Length Correction	-7	-6	-3	-1	-1	-1	-1	-1	
Round Bend Corrections	0	-2	-10	-16	-8	-6	-6	-6	
End Reflection Loss Correction	-8	-3	-1	0	0	0	0	0	
Sound Power Level at opening	35	37	38	36	42	42	38	29	
Sound Pressure Level 1m from NSR	27	29	30	28	34	34	30	21	
Total Specific Sound Level at 1m from Receptor Façade, dB	***30***	***32***	***33***	***31***	***37***	***37***	***33***	***24***	**42**
BS4142 Acoustic Feature Corrections									
Tonality									0
Intermittency									0
Impulsivity									0
Total Rating Noise Level at Receptor Window, dB	**30**	**32**	**33**	**31**	**37**	**37**	**33**	**24**	**42**

APPENDIX F

TECHNICAL DATASHEETS

VN-U01501SY-E / -TR

Fan tap	Extra high	High	Medium	Low
Sound pressure (dBA)	58	54	47	40



VN-U02001SY-E / -TR

Fan tap	Extra high	High	Medium	Low
Sound pressure (dBA)	60	56	49	40

