

Appendix: Noise and Vibration

Annex 1: Acoustic Terminology

Annex 2: Relevant Acoustic Standards, Policies & Legislation

Annex 3: Environmental Noise Survey Report

Annex 4: Noise Modelling Assumptions

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Annex 1: Acoustic Terminology

Annex 2: Relevant Acoustic Standards, Policies & Legislation

Annex 3: Environmental Noise Survey Report

Annex 4: Noise Modelling Assumptions



ANNEX 1 – ACOUSTIC TERMINOLOGY

The acoustic terms used in the ES Chapter are defined as follows:

dB	Decibel - Used as a measurement of sound level. Decibels are not an absolute unit of measurement but an expression of ratio between two quantities expressed in logarithmic form. The relationships between Decibel levels do not work in the same way that non-logarithmic (linear) numbers work (e.g. 30dB + 30dB = 33dB, not 60dB).
dBA	The human ear is more susceptible to mid-frequency noise than the high and low frequencies. The 'A'-weighting scale approximates this response and allows sound levels to be expressed as an overall single figure value in dBA. The _A subscript is applied to an acoustical parameter to indicate the stated noise level is A-weighted It should be noted that levels in dBA do not have a linear relationship to each other; for similar noises, a change in noise level of 10dBA represents a doubling or halving of subjective loudness. A change of 3dBA is just perceptible.
L _{90,T}	L ₉₀ is the noise level exceeded for 90% of the period <i>T</i> (i.e. the quietest 10% of the measurement) and is often used to describe the background noise level.
L _{eq,T}	L _{eq,T} is the equivalent continuous sound pressure level. It is an average of the total sound energy measured over a specified time period, <i>T</i> .
L _{max}	L _{max} is the maximum sound pressure level recorded over the period stated. L _{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L _{eq} noise level.
L _p	Sound Pressure Level (SPL) is the sound pressure relative to a standard reference pressure of 2 x 10 ⁻⁵ Pa. This level varies for a given source according to a number of factors (including but not limited to: distance from the source; positioning; screening and meteorological effects).
L _w	Sound Power Level (SWL) is the total amount of sound energy inherent in a particular sound source, independent of its environment. It is a logarithmic measure of the sound power in comparison to a specified reference level (usually 10 ⁻¹² W).



Vibration Units

The vibratory motion of a surface can be described by either:

- (a) displacement (m),
- (b) velocity (m/s), or
- (c) acceleration (m/s²).

Furthermore the vibration magnitude can be quantified in several ways:

peak to peak	:	This value gives the <u>total</u> excursion of the oscillation about the zero datum. The unit is often used where the vibratory displacement of a component is critical for maximum stress or mechanical clearance calculations.
peak	:	This value gives the maximum excursion of the oscillation above or below the zero datum. This value is useful for indicating the level of short duration shocks.
r.m.s	:	This value gives the root mean square of the time history over a specific time interval (time constant). This value is useful for indicating the energy content of the vibration.
dB	:	Decibel quantities are often encountered. A reference level of 10 ⁻⁶ m/s ² r.m.s is typically used for acceleration.

Vibration Dose Value (V.D.V) (m/s^{1.75})

This value assesses both the magnitude of vibration and its duration. Where possible the vibration dose value should be determined over the full exposure to vibration. It is often estimated from the frequency weighted r.m.s value of the acceleration and its duration and is then referred to as e.V.D.V.

Peak Particle Velocity (PPV)

The maximum value of the amplitude of the vibration velocity time-domain signal that refers to the movement within the ground of molecular particles and not surface movement. The displacement value in mm refers to the movement of particles at the surface (surface movement).

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Annex 1: Acoustic Terminology

Annex 2: Relevant Acoustic Standards, Policies & Legislation

Annex 3: Environmental Noise Survey Report

Annex 4: Noise Modelling Assumptions

ES Volume 3: Appendix:
Noise and Vibration:
Annex 2

Relevant Acoustic Standards, Policies & Legislation



Relevant Acoustic Standards, Policies & Legislation

Contents	Page
1.0 Noise Policy Statement for England	1
2.0 National Planning Policy Framework (NPPF)	2
3.0 Planning Practice Guidance on Noise	3
4.0 The London Plan (2021)	4
5.0 Local Planning Policy	6
6.0 World Health Organization	7
7.0 British Standard BS8233: 2014	8
8.0 ProPG : Planning & Noise : 2017	10
9.0 Building Regulations Approved Document O	12
10.0 British Standard 4142:2014 + A1:2019	13



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1.0 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) was published in March 2010 (i.e. before the NPPF). The NPSE is the overarching statement of noise policy for England and applies to all forms of noise other than occupational noise, setting out the long term vision of Government noise policy which is to:

“Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.”

That vision is supported by the following NPSE noise policy aims which are reflected in three of the four aims of planning policies and decisions in paragraph 123 of the NPPF (see paragraph 8.2 (b) below):

“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 Explanatory Note to the NPSE has three concepts for the assessment of noise in this country:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected and below which there is no detectable effect on health and quality of life due to noise.

LOAEL – Lowest Observable Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.

None of these three levels are defined numerically and for the SOAEL the NPSE makes it clear that the noise level is likely to vary depending upon the noise source, the receptor and the time of day/day of the week, etc. The need for more research to investigate what may represent an SOAEL for noise is acknowledged in the NPSE and the NPSE asserts that not stating specific SOAEL levels provides policy flexibility in the period until there is further evidence and



guidance.

The NPSE concludes by explaining in a little more detail how the LOAEL and SOAEL relate to the three NPSE noise policy aims listed above. It starts with the aim of avoiding significant adverse effects on health and quality of life, then addresses the situation where the noise impact falls between the LOAEL and the SOAEL when *“all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development.”* The final aim envisages pro-active management of noise to improve health and quality of life, again taking into account the guiding principles of sustainable development which include the need to minimise travel distance between housing and employment uses in an area.

2.0 National Planning Policy Framework (NPPF)

The following paragraphs are from the NPPF (published December 2023):

191. 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; and
- c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.

193. 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.”

Paragraph 185 also references the Noise Policy Statement for England (NPSE). This document does not refer to specific noise levels but instead sets out three aims:

- “Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.”

3.0 Planning Practice Guidance on Noise

Planning Practice Guidance (PPG) under the NPPF has been published by the Government as a web based resource at <http://planningguidance.planningportal.gov.uk/blog/guidance/>. This includes specific guidance on Noise although, like the NPPF and NPSE the PPG does not provide any quantitative advice. It seeks to illustrate a range of effect levels in terms of examples of outcomes as set out in the following table:

Perception	Examples of Outcomes	Increasing effect level	Action
Not noticeable	No effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, 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.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed Adverse Effect Level	

Perception	Examples of Outcomes	Increasing effect level	Action
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, 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
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable hard, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

4.0 The London Plan (2021)

The London Plan was published March 2021.

Policy D14 Noise states:

A. “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
- 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.



B. Boroughs, and others with relevant responsibilities, should identify and nominate new Quiet Areas and protect existing Quiet Areas in line with the procedure in Defra's Noise Action Plan for Agglomerations.

3.14.1 The **management of noise** is about encouraging the right acoustic environment, both internal and external, in the right place at the right time. This is important to promote good health and a good quality of life within the wider context of achieving sustainable development. The management of noise should be an integral part of development proposals and considered as early as possible. Managing noise includes improving and enhancing the acoustic environment and promoting appropriate soundscapes. This can mean allowing some places or certain times to become noisier within reason, whilst others become quieter. Consideration of existing noise sensitivity within an area is important to minimise potential conflicts of uses or activities, for example in relation to internationally important nature conservation sites which contain noise sensitive wildlife species, or parks and green spaces affected by traffic noise and pollution. Boroughs, developers, businesses and other stakeholders should work collaboratively to identify the existing noise climate and other noise issues to ensure effective management and mitigation measures are achieved in new development proposals.

3.14.2 The **Agent of Change Principle** places the responsibility for mitigating impacts from existing noise-generating activities or uses on the new development. Through the application of this principle existing land uses should not be unduly affected by the introduction of new noise sensitive uses. Regard should be given to noise-generating uses to avoid prejudicing their potential for intensification or expansion.

3.14.3 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.

3.14.4 Deliberately **introducing sounds** can help mitigate the adverse impact of existing sources of noise, enhance the enjoyment of the public realm, and help protect the relative tranquillity and quietness of places where such features are valued. For example, playing low-level music outside the entrance to nightclubs has been found to reduce noise from queueing patrons, leading to an overall reduction in noise levels.



Water features can be used to reduce the traffic noise, replacing it with the sound of falling water, generally found to be more pleasant by most people.

3.14.5 Heathrow and London City Airport Operators have responsibility for noise action plans for airports. Policy T8 Aviation sets out the Mayor's approach to **aviation-related development**.

3.14.6 The definition of **Tranquil Areas, Quiet Areas and spaces of relative tranquillity** are matters for London boroughs. These are likely to reflect the specific context of individual boroughs, such that Quiet Areas in central London boroughs may reasonably be expected not to be as quiet as Quiet Areas in more residential boroughs. Defra has identified parts of Metropolitan Open Land and local green spaces as potential Quiet Areas that boroughs may wish to designate."

5.0 Local Planning Policy

Policy 66 (Reducing noise pollution and enhancing landscapes) of The Southwark Plan (Adopted 23 February 2022) states:

1. Development must:

1. Avoid significant adverse impacts on health and quality of life; and
2. Mitigate any adverse impacts caused by noise on health and quality of life; and
3. Mitigate and manage noise by separating noise sensitive developments from major noise sources by distance, screening or internal layout, in preference to sound insulation.

2. Major development adjacent to, or within:

1. Designated open space; and
2. Designated open water space; and
3. Hard landscaped civic spaces with public amenity value; and
4. Street markets,

should be designed to protect and enhance positive aspects of the acoustic environment. New spaces proposed as part of development should also assess the potential to enhance a place's character and identity through the acoustic environment and positive public soundscape.

3. Major development will be required to demonstrate how the noise pollution impacts created during the construction process will be reduced, mitigated and managed appropriately to minimise harm to present occupiers of the site and adjoining neighbours.

Reasons

1. Much of Southwark is a dense urban environment with high levels of activity that can generate noise. Noise can have a major detrimental impact on the quality of life for a user of a building or space. Effects can include stress, annoyance and sleep disturbance. It is important that noise management is considered as early as possible in the planning process and as an integral part of development proposals. Reducing noise pollution will minimise instances of such effects from unwanted noise and reduce risk of overheating. This can be achieved through an improved acoustic environment, incorporating appropriate soundscapes and ensuring development reflects good acoustic design principles, including traditional and innovative noise reduction measures. This can include separating noise sensitive developments from major noise sources; distance; screening or internal layout, in preference to use of sound insulation.
2. Some places and spaces in Southwark are highly valued for their amenity use and/or character. Noise and sound have an important role to play in both contributing, and sometimes detracting, from this character. Development can be designed to strengthen public soundscapes that contribute to the character of the place or space and enhance its identity. It can also be important in improving amenity value for users of a space.

6.0 World Health Organization

The current Environmental Noise Guidelines 2018 for the European Region (ENG) supersede the Guidelines for Community Noise from 1999 (CNG). Nevertheless, the ENG recommends that all CNG indoor guideline values and any values not covered by the current guidelines (such as industrial noise and shopping areas) remain valid.

A summary of the guidance from the ENG and CNG is shown in the table below.

Source	CNG guideline indoors all sources	ENG guideline outdoors noise from specific source only
Road traffic noise	35 LAeq, 16h	53 dB Lden
	30 LAeq, 8h	45 dB Lnight
Railway noise	35 LAeq, 16h	54 dB Lden
	30 LAeq, 8h	44 dB Lnight
Aircraft noise	35 LAeq, 16h	45 dB Lden
	30 LAeq, 8h	40 dB Lnight

With regard to single-event noise indicators, Section 2.2.2 of the WHO Environmental Noise Guidelines 2018 state:

“In many situations, average noise levels like the L_{den} or L_{night} indicators may not be the best to explain a particular noise effect. Single-event noise indicators – such as the maximum sound pressure level ($L_{A,max}$) and its frequency distribution – are warranted in specific situations, such as in the context of night-time railway or aircraft noise events that can clearly elicit awakenings and other physiological reactions that are mostly determined by $L_{A,max}$. Nevertheless, the assessment of the relationship between different types of single-event noise indicators and long-term health outcomes at the population level remains tentative. The guidelines therefore make no recommendations for single-event noise indicators.”

7.0 British Standard BS8233: 2014

British Standard 8233: 2014 “Guidance on sound insulation and noise reduction for buildings” provides guidance for the control of noise in and around buildings.

Internal Areas

BS8233:2014 Section 7.7.2 titled “Internal ambient noise levels for dwellings” states:

“In general for steady external noise sources, it is desirable that internal ambient noise levels do not exceed the following guideline values:

Activity	Location	Desirable Internal Ambient Criteria	
		07:00 – 23:00	23:00 to 07:00
Resting	Living Rooms	35 dB LAeq,16hour	-
Dining	Dining Room/Area	40 dB LAeq,16hour	-
Sleeping (Daytime Resting)	Bedroom	35 dB LAeq,16hour	30 dB LAeq,8hour

Note 1 The above table provides recommended levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Groundborne noise is assessed separately and is not included as part of these targets, as human response to groundborne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

Note 2 The levels shown in the above table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the levels recommended in the above table.



Note 3 These levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks nigh or News Year's Eve.

Note 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$ depending on the character and number of events per night. Sporadic noise events could require separate values.

Note 5 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.

If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment.

Note 6 Attention is drawn to the Building Regulations.

Note 7 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."

External Amenity Areas

BS8233:2014 Section 7.7.3.2 titled "Design criteria for external noise" states:

"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 $L_{Aeq,T}^1$, 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 55dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space."



8.0 ProPG : Planning & Noise : 2017

The primary goal of the ProPG is to assist the delivery of sustainable development by promoting good health and well-being through the effective management of noise. It seeks to do that through encouraging a good acoustic design process in and around proposed new residential development having regard to national policy on planning and noise. It is applicable to noise from existing transport sources (noting that good professional practice should have regard to any reasonably foreseeable changes in existing and/or new sources of noise). The recommended approach is also considered suitable where some industrial or commercial noise contributes to the acoustic environment provided that is "not dominant".

This ProPG advocates a systematic, proportionate, risk based, 2-stage, approach. The approach encourages early consideration of noise issues, facilitates straightforward accelerated decision making for lower risk sites, and assists proper consideration of noise issues where the acoustic environment is challenging.

The two sequential stages of the overall approach are:

- Stage 1 – an initial noise risk assessment of the proposed development site; and
- Stage 2 – a systematic consideration of four key elements.

The four key elements to be undertaken in parallel during Stage 2 of the recommended approach are:

- Element 1 – demonstrating a "Good Acoustic Design Process";
- Element 2 – observing internal "Noise Level Guidelines";
- Element 3 – undertaking an "External Amenity Area Noise Assessment"; and
- Element 4 – consideration of "Other Relevant Issues".

The ProPG considers suitable guidance on internal noise levels found in "BS8233:2014: Guidance on sound insulation and noise reduction for buildings". Table 4 in Section 7.7.2 of the standard suggests that "in general, for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guideline values". The standard states (Section 7.7.1) that "occupants are usually more tolerant of noise without a specific character" and only noise without such character is considered in Table 4 of the standard.



Activity	Location	07:00 – 23:00 Hours	23:00 – 07:00 Hours
Resting	Living Room	35dB $L_{Aeq,16hr}$	-
Dining	Dining Room / Area	40dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35dB $L_{Aeq,16hr}$	30dB $L_{Aeq,16hr}$ 45dB $L_{Amax,F}$

NOTE 1 the Table provides recommended internal L_{Aeq} target levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Ground-borne noise is assessed separately and is not included as part of these targets, as human response to ground-borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

NOTE 2 The internal L_{Aeq} target levels shown in the Table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the L_{Aeq} target levels recommended in the Table.

NOTE 3 These internal L_{Aeq} target levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year’s Eve.

NOTE 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values. 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 (see Appendix A).

NOTE 5 Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the “open” position



and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7.

NOTE 6 Attention is drawn to the requirements of the Building Regulations.

NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5dB and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5dB, the more that most people are likely to regard them as “unreasonable”. Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10dB, they are likely to be regarded as “unacceptable” by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing “unacceptable” noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form (See Section 3.D).

9.0 Building Regulations Approved Document O

Building Regulations Approved Document O relates to setting standards for overheating in new residential buildings. It aims to protect the health and welfare of occupants of the building by reducing the occurrence of high indoor temperatures.

Requirement O1 of Approved Document O is met by designing and constructing the building to achieve both of the following:

- a. Limiting unwanted solar gains in summer.
- b. Providing an adequate means of removing excess heat from the indoor environment.

Sections 3.2 to 3.4 of this document relate to noise and state the following:

“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 (11pm to 7am).

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).

Where in-situ noise measurements are used as evidence that these limits are not exceeded, measurements should be taken in accordance with the Association of Noise Consultants' Measurement of Sound Levels in Buildings with the overheating mitigation strategy in use.

NOTE: Guidance on reducing the passage of external noise into buildings can be found in the National Model Design Code: Part 2 – Guidance Notes (MHCLG, 2021) and the Association of Noise Consultants' Acoustics, Ventilation and Overheating: Residential Design Guide (2020).

10.0 British Standard 4142:2014 + A1:2019

When setting plant noise emission criteria reference is commonly made to BS 4142:2014 "Methods for rating and assessing industrial and commercial sound".

The procedure contained in BS 4142:2014 provides an assessment of the likely effects of sound on people when comparing the specific noise levels from the source with representative background noise levels. Where the noise contains "a tone, impulse or other characteristic" then various corrections can be added to the specific (source) noise level to obtain the "rating level".

BS 4142 states that: "The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs". An estimation of the impact of the specific noise can be obtained by the difference of the rating noise level and the background noise level and considering the following:

- "Typically, the greater this difference, the greater the magnitude of the impact."
- "A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context."
- "A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context."
- "The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the



specific sound source having a low impact, depending on the context."

The determination of the "rating level" and the "background level" are both open to interpretation, depending on the context.

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Annex 4: Noise Modelling Assumptions

ES Volume 3: Appendix: Noise and Vibration: Annex 3

Environmental Noise Survey Report

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Environmental Noise Survey Report

29263/ENS1

5 March 2024

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Environmental Noise Survey Report
29263/ENS1

Document Control

Rev	Date	Comment	Prepared by	Authorised by
0	05/03/2024	-		
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Contents		Page
1.0	Introduction	1
2.0	Objectives	1
3.0	Site Description	1
4.0	Acoustic Terminology	3
5.0	Methodology	3
6.0	Results	6
7.0	Discussion of Noise Climate	9
8.0	3D Noise Modelling	10
9.0	Atmospheric Plant Noise Emission Criteria	11
10.0	Conclusions	12

Attachments

- Appendix A – Acoustic Terminology
- Appendix B – Time History Graphs 29263/TH1 to 29263/TH4



1.0 Introduction

A residential led mixed-use development is proposed at The Aylesham Centre. The development is to comprise two phases which each includes retail and leisure outlets and ground level and residential apartments at upper floors.

Hann Tucker Associates have been commissioned to undertake a detailed environmental noise survey at the site in order to establish the existing noise levels.

This report presents the methodology and findings of our noise survey.

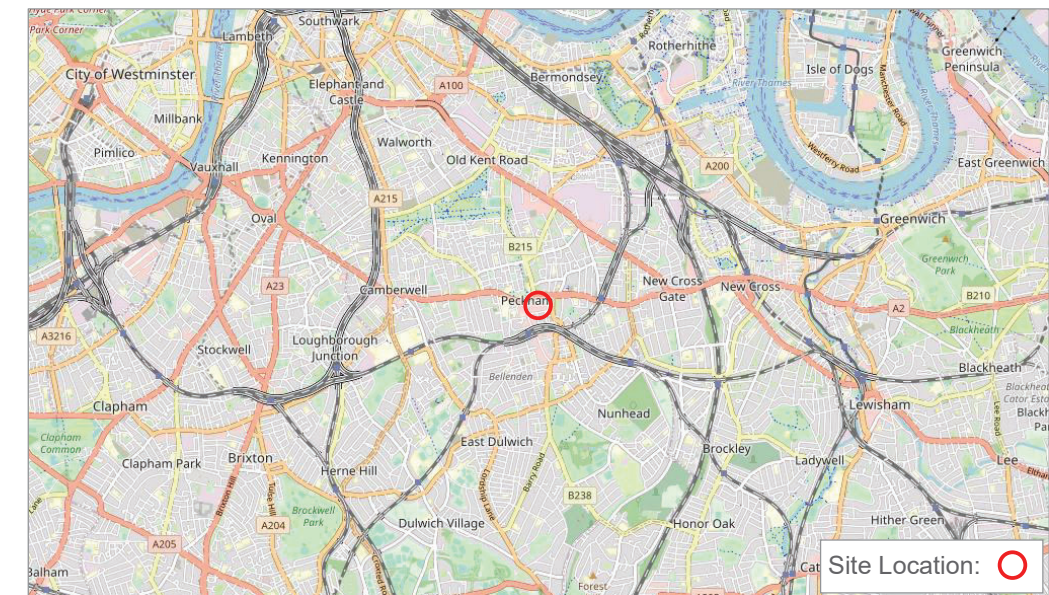
2.0 Objectives

To establish by means of an unattended survey the existing L_{Amax} , L_{Aeq} and L_{A90} environmental road, rail and air traffic noise levels at up to 4no. secure and accessible on-site positions, using fully computerised noise monitoring equipment.

3.0 Site Description

3.1 Location

The site falls within the jurisdiction of London Borough of Southwark. The site location is shown in the following Location Map.



Location Map (© Open Street Map contributors)

3.2 Description

The site is currently The Aylesham Centre shopping centre and associated car parking. The surrounding area is of mixed use, comprising mainly of residential and retail units. Immediately north of the site is the Peckham Bus Station with Peckham High Street beyond. West of the site passes Rye Lane, a commercial street that is largely pedestrianised with a single bus lane. The south and east of the site bounded by Hanover Park and Mckerrell Road.



Location Plan (Imagery © CNES / Airbus, Getmapping plc, Infoterra Ltd & Bluesky, Map data © 2022)



4.0 Acoustic Terminology

For an explanation of the acoustic terminology used in this report please refer to Appendix A enclosed.

5.0 Survey Methodology

The survey was undertaken by Kyle Donald BSc(Hons), AMIOA.

5.1 Noise Survey

5.1.1 Unattended Procedure

Fully automated environmental noise monitoring was undertaken from approximately 13:00 hours on Wednesday 03 August to 14:30 hours on Monday 08 August 2022.

During the periods we were on site the wind conditions were moderate from approximately a south-westerly direction. The sky was generally clear. We understand that generally throughout the survey period the weather conditions were similar to this. These conditions are considered suitable for obtaining representative measurement results.

Measurements were taken continuously of the A-weighted (dBA) L_{90} , L_{eq} and L_{max} sound pressure levels over 15 minute periods. all results are free-field noise levels.

5.1.2 Attended Procedure

Further attended environmental noise monitoring was undertaken between approximately 15:00 hours and 15:30 hours on 03 August 2022 and between approximately 12:30 hours and 13:45 hours on 09 August 2022.

Measurements were taken continuously of the A-weighted (dBA) L_{90} , L_{eq} and L_{max} sound pressure levels over 15 minute periods. all results are free-field noise levels.

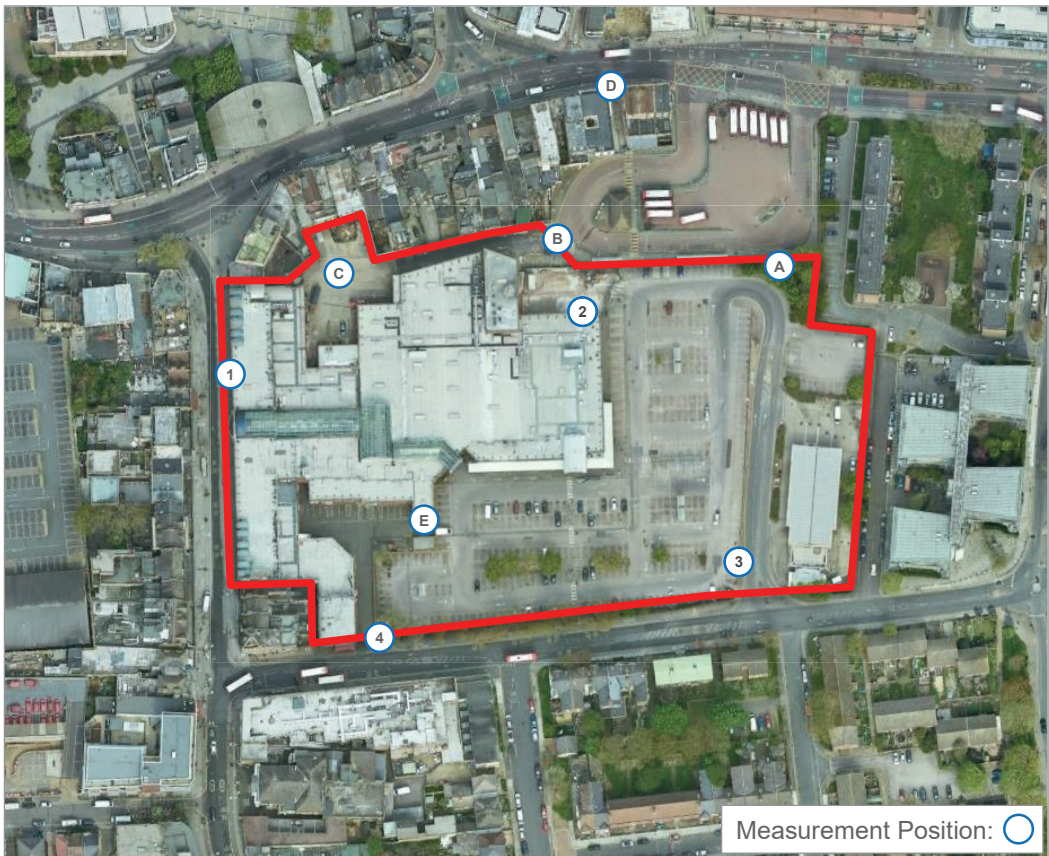


5.1.3 Measurement Positions

The noise level measurements were undertaken at 9No. positions as described in the table below.

Position No.	Type	Description
1	Unattended	The sound level meter was positioned on the western boundary of the site, overlooking Rye Lane. The microphone was attached to a pole that protruded 1m from the roof edge, fully exposed to passing traffic and activity. This location was selected to represent the western boundary of the site.
2	Unattended	The sound level meter was positioned toward the north of the site, overlooking Peckham Bus Station. The microphone was attached to a pole that was placed on the roof edge, approximately 2m from roof level, fully exposed to passing traffic and activity. This location was selected to represent northern boundary of the site.
3	Unattended	The sound level meter was installed inside a small security box with the microphone protruding approximately 6cm out of the box. The security box was fixed to a lamp post on the junction with the existing Morrisons car park entrance and Hannover Park (on the side facing the road) with the microphone at a height of approximately 3.5m above ground level. In order to minimise the effect of the box, the microphone was orientated vertically downwards such that it was not screened from the road.
4	Unattended	The sound level meter was installed inside a small security box with the microphone protruding approximately 6cm out of the box. The security box was fixed to the Aylesham Centre entrance sign on the southern boundary on Hannover Park (on the side facing the road) with the microphone at a height of approximately 3.5m above ground level. In order to minimise the effect of the box, the microphone was orientated vertically downwards such that it was not screened from the road.
A	Attended	The sound level meter was mounted on a tripod which was positioned toward the northeast corner of the site on the boundary with Peckham Bus Station. The microphone was approximately 1.2m from local ground level.
B	Attended	The sound level meter was mounted on a tripod which was positioned north of the site, within Peckham Bus Station. The microphone was approximately 1.2m from local ground level.
C	Attended	The sound level meter was mounted on a tripod which was positioned within the centre of The Aylesham Centre northern service yard. The microphone was approximately 1.2m from local ground level.
D	Attended	The sound level meter was mounted on a tripod which was positioned on Peckham High Street, at the junction with Bull Yard. The microphone was approximately 1.2m from local ground level and 3m from Peckham High Street.
E	Attended	The sound level meter was mounted on a tripod which was positioned on the roof of the existing Aylesham Centre, overlooking the southern elevation. The microphone was approximately 1.8m from roof level.

The monitoring positions are shown on the aerial image overleaf.



Plan Showing Unattended Measurement Positions (Imagery © CNES / Airbus, Getmapping plc, Infoterra Ltd & Bluesky, Map data © 2022)

5.1.4 Instrumentation

The instrumentation used during the survey is presented in the table below:

Position	Description	Manufacturer	Type	Serial Number	Calibration
1	Type 1 Data Logging Sound Level Meter	Svantek	971	74415	Calibration on 31/01/2022
	Type 1 ½" Condenser Microphone	ACO Pacific	7052E	71786	Calibration on 31/01/2022
	Preamp	Svantek	SV18	75754	Calibration on 31/01/2022
2	Type 1 Data Logging Sound Level Meter	Svantek	971	72538	Calibration on 31/01/2022
	Type 1 ½" Condenser Microphone	ACO Pacific	7052E	68293	Calibration on 31/01/2022



Position	Description	Manufacturer	Type	Serial Number	Calibration
	Preamp	Svantek	SV18	72276	Calibration on 31/01/2022
3	Type 1 Data Logging Sound Level Meter	Svantek	971	80232	Calibration on 06/07/2022
	Type 1 ½" Condenser Microphone	ACO Pacific	7052E	67976	Calibration on 06/07/2022
	Preamp	Svantek	SV18	71473	Calibration on 06/07/2022
4	Type 1 Data Logging Sound Level Meter	Svantek	971	87087	Calibration on 19/07/2022
	Type 1 ½" Condenser Microphone	ACO Pacific	7052E	75560	Calibration on 19/07/2022
	Preamp	Svantek	SV18	83547	Calibration on 19/07/2022
A-E	Type 1 Data Logging Sound Level Meter	Bruel & Kjaer	2250	3007292	Calibration on 27/08/2020
	Type 1 ½" Condenser Microphone	Bruel & Kjaer	4189	3004879	Calibration on 27/08/2020
	Type 1 Preamp	Bruel & Kjaer	ZC0032	29256	Calibration on 27/08/2020
All	Type 1 Calibrator	Bruel & Kjaer	4230	584692	Calibration on 05/11/2021

Each sound level meter, including the extension cable, was calibrated prior to and on completion of the surveys. No significant changes were found to have occurred (no more than 0.1 dB). Each sound level meter was located in an environmental case with the microphone connected to the sound level meter via an extension cable. Each microphone was fitted with a windshield.

6.0 Results

6.1 Results of Unattended Survey

The results have been plotted on Time History Graphs 29263/TH1 to 29263/TH4 enclosed presenting the 15-minute A-weighted (dBA) L₉₀, L_{eq} and L_{max} levels at each measurement position throughout the duration of the survey.



6.1.1 L_{eq} Noise Levels

In order to compare the results of our survey with the relevant guidelines it is necessary to convert the measured L_{Aeq(15minute)} noise levels into single figure daytime L_{Aeq(16-hour)} (07:00-23:00 hours) and night-time L_{Aeq(8-hour)} (23:00-07:00 hours) levels.

The daytime L_{Aeq(16-hour)} and measured night-time L_{Aeq(8-hour)} & L_{AFmax} noise levels for each position are presented in the tables below.

Position	Date	Measured L _{Aeq,T} Noise Level (dB re 2 x 10 ⁻⁵ Pa)	
		Daytime (07:00 – 23:00) Hours, L _{Aeq,16hr}	Night-Time (23:00 – 07:00) Hours, L _{Aeq,8hr}
1	03/08/2022	66*	60
	04/08/2022	69	60
	05/08/2022	65	62
	06/08/2022	66	62
	07/08/2022	63	60
	08/08/2022	64*	-
2	03/08/2022	61*	59
	04/08/2022	61	59
	05/08/2022	61	59
	06/08/2022	62	59
	07/08/2022	61	59
	08/08/2022	51*	-
3	03/08/2022	68*	57
	04/08/2022	68	57
	05/08/2022	69	57
	06/08/2022	69	57
	07/08/2022	67	56
	08/08/2022	68*	-
4	03/08/2022	65*	61
	04/08/2022	66	60
	05/08/2022	65	60
	06/08/2022	66	61
	07/08/2022	64	60
	08/08/2022	65*	-

* Daytime data not complete

The following table presents the 10th highest L_{max} events measured at each position during the night-time periods.



Position	Date	Night-Time L _{max} (23:00 – 07:00) Hours
1	03/08/2022	81
	04/08/2022	79
	05/08/2022	83
	06/08/2022	84
	07/08/2022	81
2	03/08/2022	70
	04/08/2022	73
	05/08/2022	74
	06/08/2022	72
	07/08/2022	72
3	03/08/2022	78
	04/08/2022	76
	05/08/2022	76
	06/08/2022	76
	07/08/2022	76
4	03/08/2022	90
	04/08/2022	87
	05/08/2022	87
	06/08/2022	88
	07/08/2022	87

6.1.2 Modal L_{A90} Results

The following table presents the modal average of the measured L_{A90} background noise levels during the survey:

Position	Modal Average Measured L _{A90} Background Noise Level (dB re 2 x 10 ⁻⁵ Pa)	
	Daytime (07:00 – 23:00) Hours	Night-Time (23:00 – 07:00) Hours
1	58 dB	49 dB
2	59 dB	57 dB
3	60 dB	44 dB
4	57 dB	53 dB



6.1.3 Typical Minimum L_{A90} Results

The following table presents typical minimum L_{A90} noise levels which have been derived from statistical analysis of the survey data.

Position	Typical Minimum L_{A90} Background Noise Level (dB re 2×10^{-5} Pa)		
	Daytime (07:00 – 23:00) Hours	Night-Time (23:00 – 07:00) Hours	24 Hours
1	52	44	44
2	58	56	46
3	48	42	42
4	54	53	53

6.2 Results of Attended Survey

The A-weighted (dBA) L_{90} , L_{eq} and L_{max} sound levels are recorded during the attended measurements are presented overleaf.

Position	Time	Sound Pressure Level (dB)		
		L_{90}	L_{eq}	L_{max}
A	15:00 to 15:15	58	63	82
B	15:30 to 15:45	56	62	80
C	12:00 to 12:15	49	53	72
D	13:00 to 13:15	63	69	83
E	13:30 to 13:45	52	55	80

7.0 Discussion of Noise Climate

During the periods we were on site, the dominant noise sources toward the west and south of the site were passing road traffic and activity on Rye Lane and Hanover Park. Road traffic on Rye Lane comprises only buses but also sees heavy continuous foot traffic from shoppers and nearby residents.

Toward the north of the site, manoeuvring buses within the Bus Station and road traffic on Peckham Street were dominant.

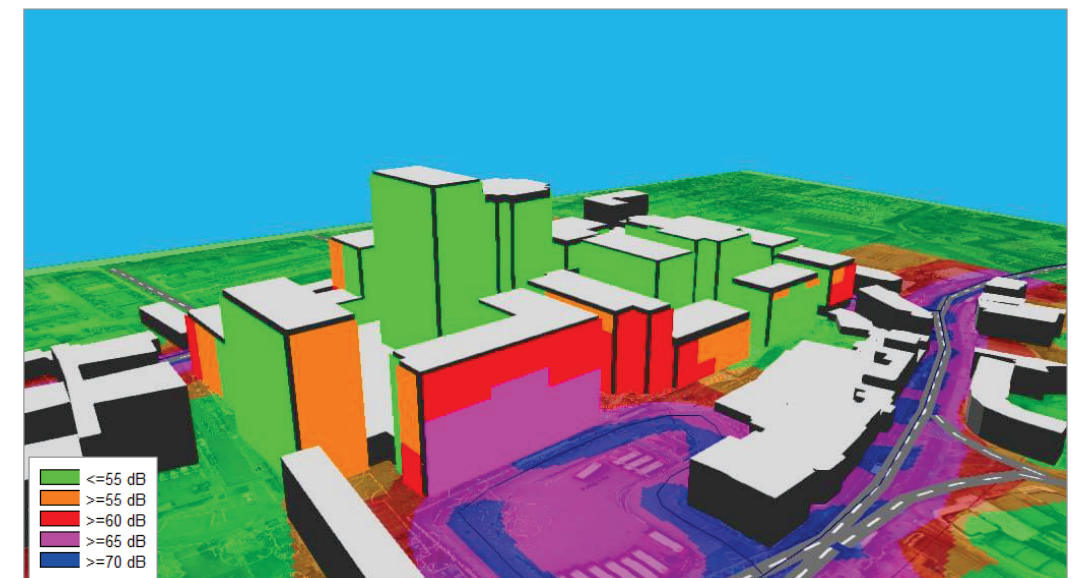
Noise from the existing shopping centre and Morrisons supermarket was notable at Positions 2 & 3 and included manoeuvring vehicles in the car park and fixed plant equipment.



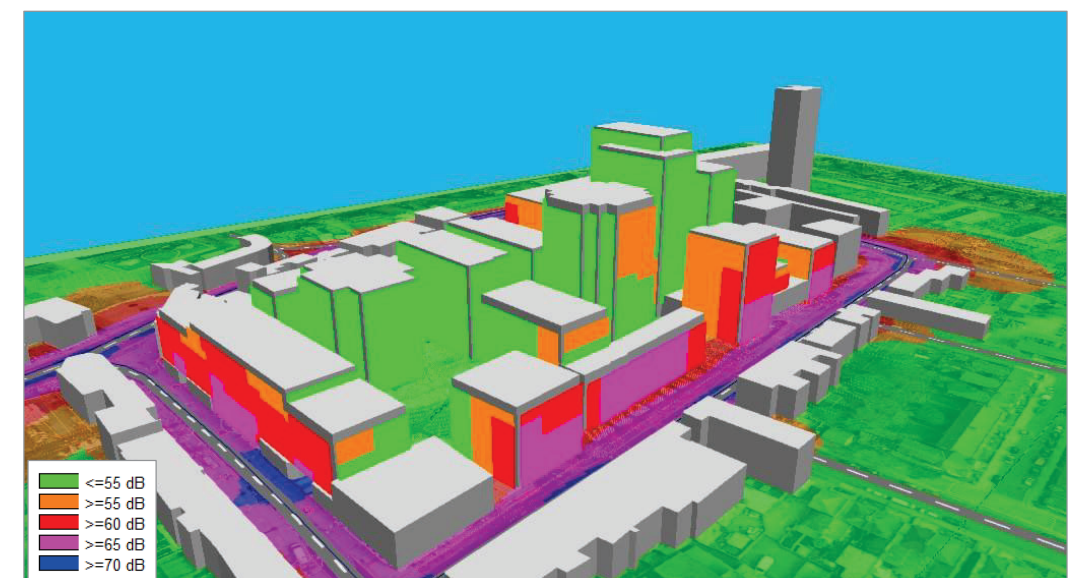
8.0 3D Noise Modelling

Using the survey data, we have created a 3D noise model in CadnaA® to predict the incident noise levels upon each elevation of the proposed development.

3D noise maps displaying the daytime $L_{Aeq(16\text{hour})}$ are shown below.



CadnaA image showing the daytime $L_{Aeq(16\text{hour})}$ noise levels on the north and east elevations



CadnaA image showing the daytime $L_{Aeq(16\text{hour})}$ noise levels on the south and west elevations



Using the above model, the following table and associated mark-ups outline the worst-case free-field incident noise levels across the development. For purposes of any subsequent assessment, these zones are considered to be the “Façade Zones”.

Façade Zone	Calculated Worst-Case Incident Noise Levels		
	Daytime L _{Aeq,16hr} (dB)	Night L _{Aeq,8hr} (dB)	10 th Highest Night L _{AFmax} (dB)
Zone A (Purple)	69	62	82
Zone B (Red)	66	62	82
Zone C (Orange)	58	53	72
Zone D (Green)	55	50	65



Site Plan mark-up of designated Façade Zones

N.B. The indicated Façade Zones above apply to all floors of the respective elevation.

9.0 Atmospheric Plant Noise Emission Criteria

Plant noise emissions will need to comply with London Borough of Southwark criteria. Their ‘Technical Guidance for Noise’ presents the following policy for noise from fixed plant and machinery.



“In order for planning permission to be recommended it is required that the assessment Rating sound level does not exceed the typical minimum L_{A90} (15 minute) background sound level at any time. Furthermore in order to prevent gradually creeping background levels over time it is required that the unrated ‘Specific’ sound level does not exceed 10dB below the typical minimum LA90 (15 minute) background sound level at any time. The ‘Specific’, ‘Rating’ and ‘Background’ sound levels shall be calculated fully in accordance with the methodology of BS 4142:2014+A1:2019.”

On the basis of the above and the results of the environmental noise survey, we propose that the following plant noise emission criteria be achieved at 1 metre from nearest or worst affected property.

Location	Parameter	Noise Emission Limit (dBA)	
		Daytime (07:00 – 23:00) Hours	Night-Time (23:00 – 07:00) Hours
Rye Lane Blocks A, B, C, E	Specific Sound Level Limit	42 dB	34 dB
Hanover Road Blocks F, H, J, M, Q, P, G		38 dB	32 dB
Peckham Bus Station Blocks L, K		48 dB	46 dB
Rye Lane Blocks A, B, C, E	Rating Level Limit	52 dB	44 dB
Hanover Road Blocks F, H, J, M, Q, P, G		48 dB	42 dB
Peckham Bus Station Blocks L, K		58 dB	56 dB

Noise shall be assessed in accordance with BS 4142:2014 with corrections applied for any plant emitting noise of a tonal or irregular quality. Emergency plant items (e.g. smoke extract equipment) should be subject to more relaxed criteria.

These limits are to be achieved cumulatively by landlord and tenant plant and subject to approval by the Local Authority.

10.0 Conclusions

An environmental noise survey has been undertaken in order to establish the currently prevailing noise levels.

The data obtained shall be used in the future to undertake a variety of detailed acoustic analysis.

Appendix A – Acoustic Terminology

The acoustic terms used in this report are defined as follows:

dB	Decibel - Used as a measurement of sound level. Decibels are not an absolute unit of measurement but an expression of ratio between two quantities expressed in logarithmic form. The relationships between Decibel levels do not work in the same way that non-logarithmic (linear) numbers work (e.g. 30dB + 30dB = 33dB, not 60dB).
dBA	The human ear is more susceptible to mid-frequency noise than the high and low frequencies. The ‘A’-weighting scale approximates this response and allows sound levels to be expressed as an overall single figure value in dBA. The _A subscript is applied to an acoustical parameter to indicate the stated noise level is A-weighted It should be noted that levels in dBA do not have a linear relationship to each other; for similar noises, a change in noise level of 10dBA represents a doubling or halving of subjective loudness. A change of 3dBA is just perceptible.
L _{90,T}	L ₉₀ is the noise level exceeded for 90% of the period <i>T</i> (i.e. the quietest 10% of the measurement) and is often used to describe the background noise level.
L _{eq,T}	L _{eq,T} is the equivalent continuous sound pressure level. It is an average of the total sound energy measured over a specified time period, <i>T</i> .
L _{max}	L _{max} is the maximum sound pressure level recorded over the period stated. L _{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L _{eq} noise level.
L _{smax}	L _{smax} is the maximum sound pressure level recorded over the period stated where the meter has a slow response (1 second) as opposed to a fast response which is usually set to 0.125 seconds
L _p	Sound Pressure Level (SPL) is the sound pressure relative to a standard reference pressure of 2 x 10 ⁻⁵ Pa. This level varies for a given source according to a number of factors (including but not limited to: distance from the source; positioning; screening and meteorological effects).
L _w	Sound Power Level (SWL) is the total amount of sound energy inherent in a particular sound source, independent of its environment. It is a logarithmic measure of the sound power in comparison to a specified reference level (usually 10 ⁻¹² W).

Appendix B

Time History Graphs

Aylesham Centre

Position 1

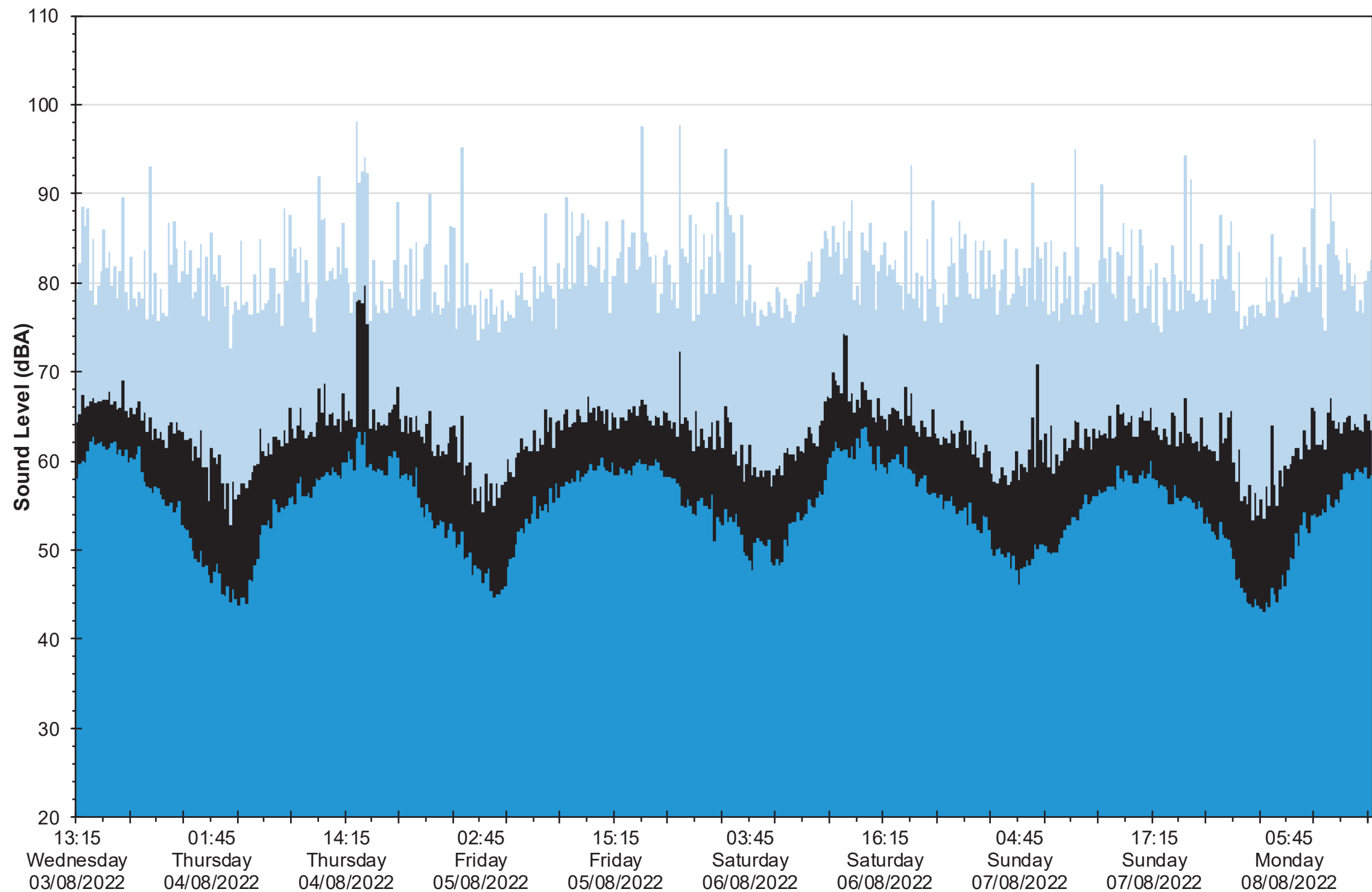
L_{eq} , L_{max} and L_{90} Noise Levels

Wednesday 3 August 2022 to Monday 8 August 2022

■ L_{max}

■ L_{eq}

■ L_{90}



Date and Time

29263/TH1

Aylesham Centre

Position 2

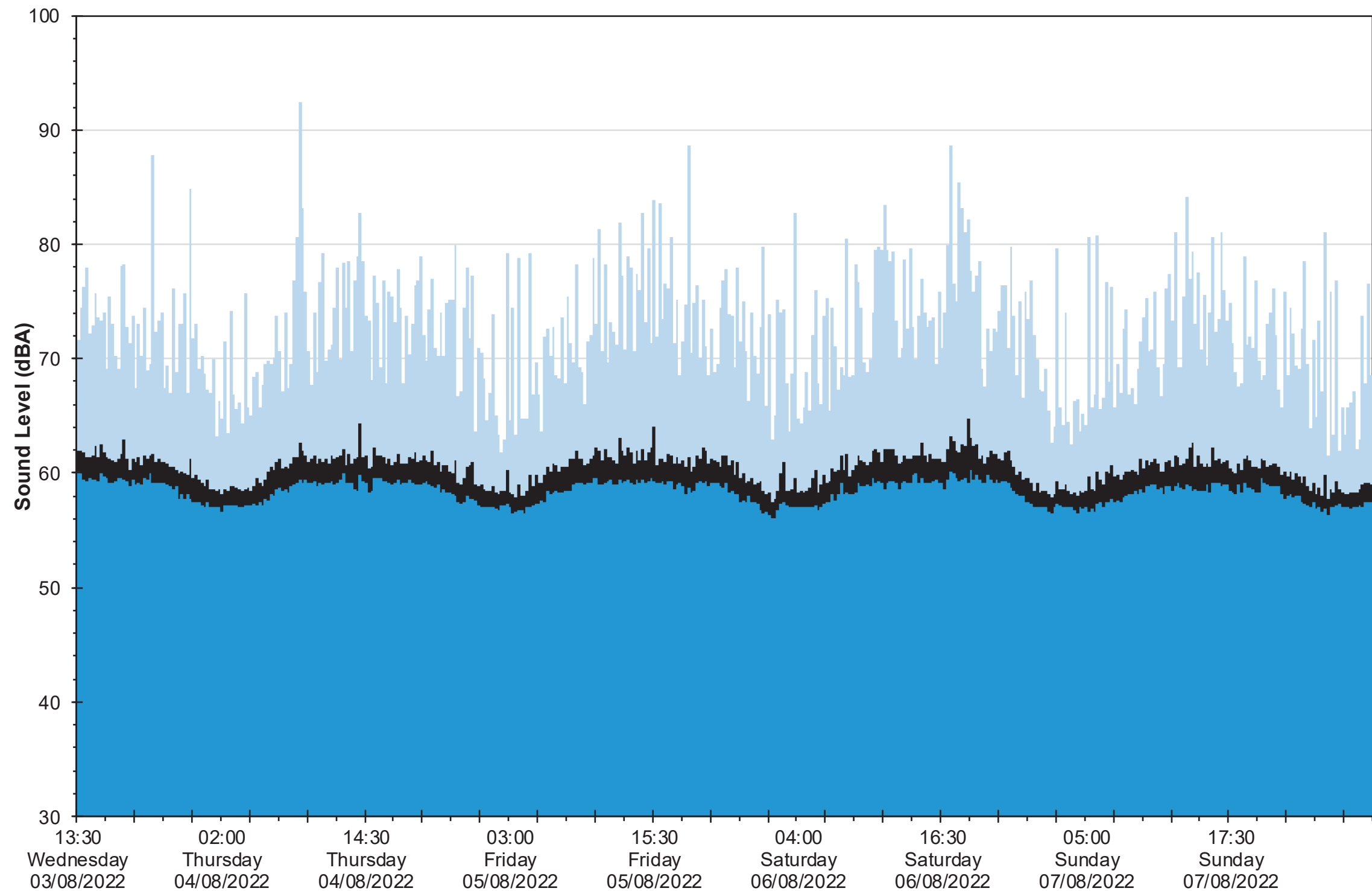
L_{eq} , L_{max} and L_{90} Noise Levels

Wednesday 3 August 2022 to Monday 8 August 2022

■ L_{max}

■ L_{eq}

■ L_{90}



Date and Time

29263/TH2

Aylesham Centre

Position 3

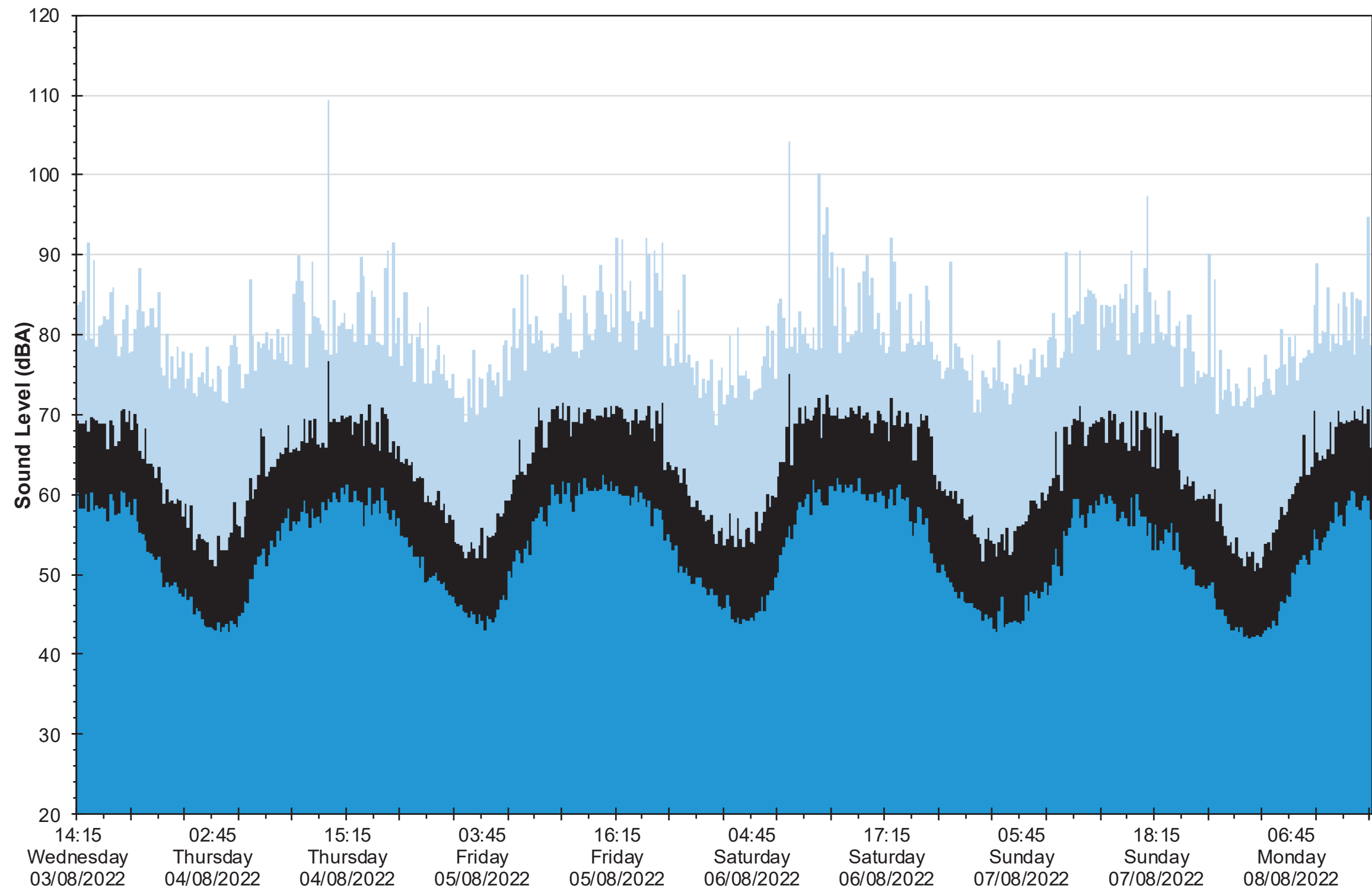
L_{eq} , L_{max} and L_{90} Noise Levels

Wednesday 3 August 2022 to Monday 8 August 2022

■ L_{max}

■ L_{eq}

■ L_{90}



Date and Time

29263/TH3

Aylesham Centre

Position 4

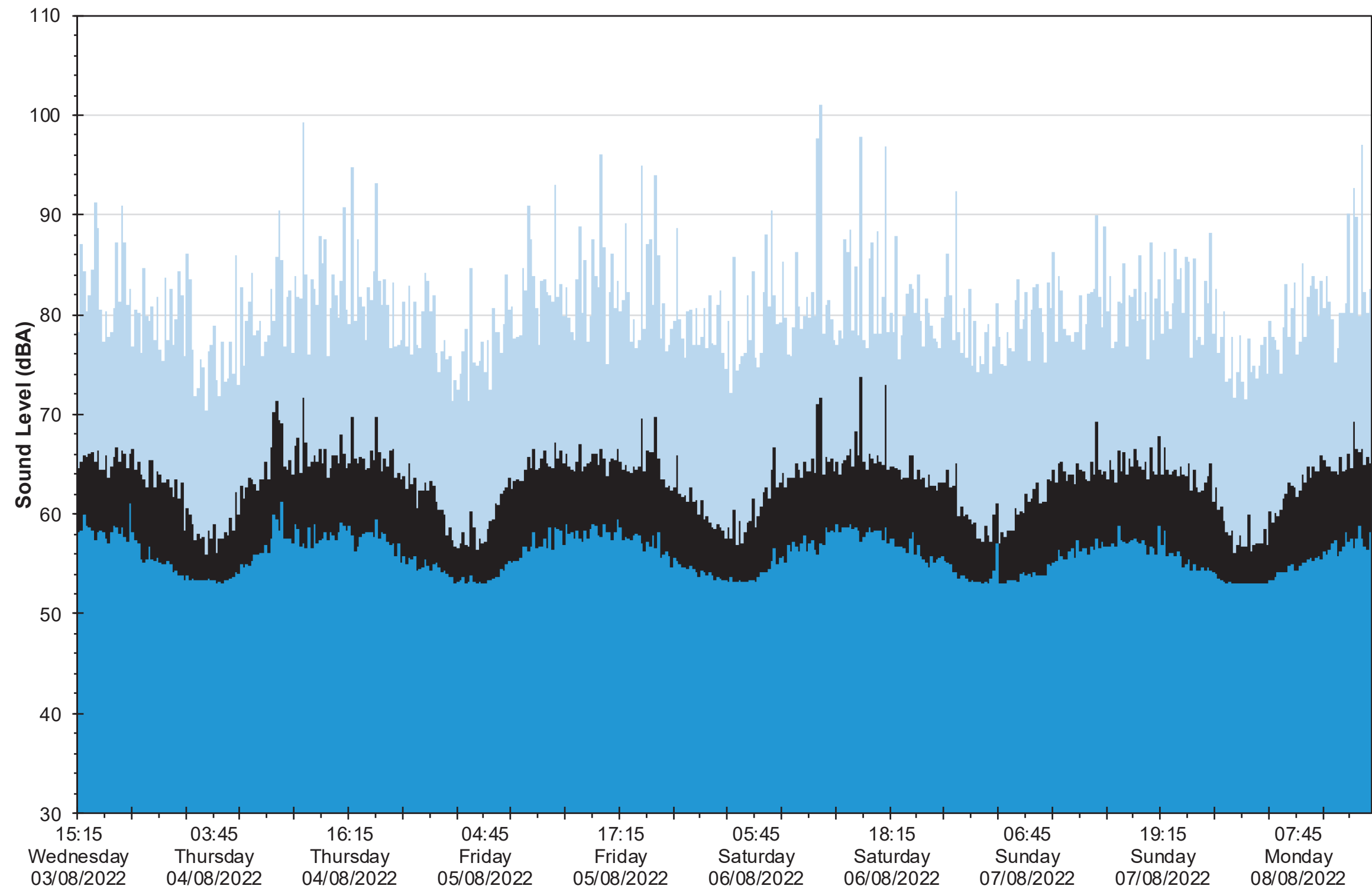
L_{eq} , L_{max} and L_{90} Noise Levels

Wednesday 3 August 2022 to Monday 8 August 2022

■ L_{max}

■ L_{eq}

■ L_{90}



Date and Time

29263/TH4

Appendix: Noise and Vibration

Annex 1: Acoustic Terminology

Annex 2: Relevant Acoustic Standards, Policies & Legislation

Annex 3: Environmental Noise Survey Report

Annex 4: Noise Modelling Assumptions

ANNEX 4 – NOISE MODELLING ASSUMPTIONS

Introduction

Hann Tucker have reviewed **ES Volume 1, Chapter 5: Demolition and Construction** and communicated with the design team to formulate an assumed list of fixed and mobile plant items, number of, operational durations and locations during the following key stages and phases:

Phase 1 (Start March 2026 & End March 2030)

Timeslice 1

- Site enabling works, demolition, and piling.

Timeslice 2

- Substructure & superstructure construction and external envelope installation.

Phase 2 (Start July 2030 & End November 2034)

Timeslice 1

- Site enabling works, demolition, and piling.

Timeslice 2

- Substructure & superstructure construction and external envelope installation.

Noise data for the assumed plant equipment has been derived from the sound level data set out in Annex C of ‘BS 5229-1 Code of practice for noise and vibration control on construction and open sites’.

The table overleaf presents the plant items and associated noise data considered in predictive noise modelling for each timeslice.



Phase 1 & Phase 2								
Timeslice	Activity	Equipment	No.	% Operating Time (of the 10hr Working Day)	BS5228 Ref	SWL	L _{Aeq} @10m	Mins (On)
1	Enabling Works, Demolition & Piling	9T Dumper	1	15	C.1.19	97	69	90
		Tracked Excavator (breaking rubble)	2	60	C.1.12	110	82	360
		Tracked Excavator	2	50	D.3.108	97	69	300
		Mobile Crane	1	50	C.4.45	110	82	300
		Tower Crane	1	60	C.4.49	105	77	360
		Diamond Core Drill	1	50	C.4.69	113	85	300
		Hand Held Breaker	1	50	C.1.6	111	83	300
		Angle Grinder cutting concrete	1	40	C.4.73	115	84	240
		Hand Tools	4	40	C.1.19	97	69	240
		HGV Delivery trucks	1	20	C.6.21	108	80	120
		Muck Wagons Away	1	40	C.2.27	109	81	240
		Fork lift trucks	2	50	D.7.93	104	76	300
		Concrete Pump	2	50	C.4.28	103	75	300
		Concrete Mixer	2	50	D.6.7	104	76	300
		CFA Rig	2	50	C.3.21	107	79	300
		Diesel Generator	2	100	D.7.98	102	74	600
2	Substructure & Superstructure Construction / External Envelope Installation	Tower Crane	3	60	C.4.49	105	77	360
		Cherry picker	6	60	C.4.53	105	77	360
		Hand Tools	8	40	C.1.19	97	69	240
		Concrete Pump	2	50	C.4.28	103	75	300
		Concrete Mixer	2	50	D.6.7	104	76	300
		Muck Wagons Away	1	40	C.2.27	109	81	240
		HGV Delivery trucks	2	20	C.6.21	108	80	120
		Fork lift trucks	3	50	D.7.93	104	76	300
		Diesel Generator	2	100	D.7.98	102	74	600