

Appendix: Noise and Vibration

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Annex 1: Construction Noise Assessment – BS 5228 Plant Noise Levels

Table 8A.1 Noise levels used in the construction noise assessment

Activity	Plant	BS 5228 Reference	Sound Power Level (dB L _{WA})	BS 5228 Table Reference	No.
Demolition & Enabling Works	Breaker/cutter	Breaker mounted on excavator	118	Table C.3	1
	Mini skid-steer loader	Clearing site - Wheeled backhoe loader	96	Table C.2	1
	Mobile floorlight	Power for lighting - Diesel generator	98	Table C.4	3
	Passenger/goods hoist	Caged material hoist (electric)	104	Table C.4	6
	Tipper Lorry	Loading lorry	111	Table C.2	2
	Mobile access equipment	Diesel scissor lift	109	Table C.4	2
	Fork lift	Site fork lift truck	107	Table D.7	2
		Cumulative Sound Power Level from Workzone	120		
Substructure & Basement	Mobile floorlight	Power for lighting - Diesel generator	93	Table C.4	3
	Passenger/goods hoist	Caged material hoist (electric)	96	Table C.4	6
	Mobile access equipment	Diesel scissor lift	106	Table C.4	2
	CFA piling rig	Crawler mounted rig	108	Table C.3	1
	Lorry mounted concrete pump	Concrete mixer truck (discharging) & concrete pump (pumping)	103	Table C.4	1
	Concrete vibrator	Poker Vibrator	106	Table C.4	3
	Forklift	Site fork lift truck	104	Table D.7	2
		Cumulative Sound Power Level from Workzone	116		
Superstructure	Mobile floorlight	Power for lighting - Diesel generator	93	Table C.4	3
	Passenger/goods hoist	Caged material hoist (electric)	96	Table C.4	6
	Mobile access equipment	Diesel scissor lift	106	Table C.4	2
	Lorry mounted concrete pump	Concrete mixer truck (discharging) & concrete pump (pumping)	103	Table C.4	1
	Concrete vibrator	Poker Vibrator	106	Table C.4	1
	Forklift	Site fork lift truck (pass-by)	104	Table D.7	2
		Cumulative Sound Power Level from Workzone	113		
Envelope, Roof, Shell and Core	Mobile floorlight	Power for lighting - Diesel generator	93	Table C.4	3
	Passenger/goods hoist	Caged material hoist (electric)	96	Table C.4	6
	Mobile crane	Mobile telescopic crane	105	Table C.4	2
	Mobile access equipment	Diesel scissor lift	106	Table C.4	3
	Lorry mounted concrete pump	Concrete mixer truck (discharging) & concrete pump (pumping)	103	Table C.4	1
	Concrete vibrator	Poker Vibrator	106	Table C.4	3
	Forklift	Site fork lift truck	104	Table D.7	2
		Cumulative Sound Power Level from Workzone	116		
Fit Out and External Work	Mobile floorlight	Power for lighting - Diesel generator	93	Table C.4	3
	Passenger/goods hoist	Caged material hoist (electric)	96	Table C.4	6
	Mobile crane	Mobile telescopic crane	105	Table C.4	2
	Mobile access equipment	Diesel scissor lift	106	Table C.4	3
	Lorry mounted concrete pump	Concrete mixer truck (discharging) & concrete pump (pumping)	103	Table C.4	1
	Concrete vibrator	Poker Vibrator	106	Table C.4	3
	Forklift	Site fork lift truck	104	Table D.7	2
		Cumulative Sound Power Level from Workzone	116		
Fit Out and External Work (Blocks A&B only)	Mobile floorlight	Power for lighting - Diesel generator	93	Table C.4	2
	Passenger/goods hoist	Caged material hoist (electric)	96	Table C.4	4
	Mobile crane	Mobile telescopic crane	105	Table C.4	2
	Mobile access equipment	Diesel scissor lift	106	Table C.4	2
	Lorry mounted concrete pump	Concrete mixer truck (discharging) & concrete pump (pumping)	103	Table C.4	1
	Concrete vibrator	Poker Vibrator	106	Table C.4	2
	Forklift	Site fork lift truck	104	Table D.7	2
		Cumulative Sound Power Level from Workzone	115		
	Mobile floorlight	Power for lighting - Diesel generator	93	Table C.4	1

Activity	Plant	BS 5228 Reference	Sound Power Level (dB L_{wA})	BS 5228 Table Reference	No.
Fit Out and External Work (Block A only)	Passenger/goods hoist	Caged material hoist (electric)	96	Table C.4	2
	Mobile crane	Mobile telescopic crane	105	Table C.4	1
	Mobile access equipment	Diesel scissor lift	106	Table C.4	1
	Lorry mounted concrete pump	Concrete mixer truck (discharging) & concrete pump (pumping)	103	Table C.4	1
	Concrete vibrator	Poker Vibrator	106	Table C.4	1
	Forklift	Site fork lift truck	104	Table D.7	1
		Cumulative Sound Power Level from Workzone	112		
Demolition & Enabling Works, Substructure & Basement, Superstructure	Tower Crane	Tower Crane	105	Table C.4	3

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Annex 2: Glossary of Acoustic Terminology

Table 8A.2 Glossary of Acoustic Terminology

Term	Abbreviation	Description
Decibel	dB	A scale for comparing the ratios of two quantities, including sound pressure and sound power.
A-weighting	dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the change in sensitivity of the human ear at varying frequencies.
Sound Pressure Level	L_{pA}	A measure of the sound pressure at a particular location. Typically expressed in dB(A) referenced to 2×10^{-5} Pascals.
Equivalent Continuous Sound Level	$L_{Aeq,T}$	The steady level of sound over a prescribed period of time which would contain the same total sound energy as the actual fluctuating noise under consideration in the same period of time.
Statistical Sound Levels	L_{A10} and L_{A90}	The level of noise exceeded for a percentage of the time period being sampled, namely 10% or 90% respectively.
Background Sound Level	$L_{A90,T}$	The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of the time period being sampled.
Maximum Sound Level	L_{Amax}	The maximum sound or noise level determined with instrumentation set to either a fast time weighting, L_{AFmax} , or a slow time weighting, L_{ASmax} , as occurring during the time period being sampled.
Sound Power Level	L_{WA}	A measure of the total sound energy radiated from a source. Like sound pressure levels, this is also expressed in dB(A) terms, but it is referenced to 1×10^{-12} W.
Broadband	-	Sound sampled over a wide range of frequencies.
Narrow band	-	Sound sampled over a specific, restricted frequency range. Used to ascertain the amplitude and significant of individual, audible tones, and to assist in identifying particular sources of noise within a complex, multi-source soundscape environment.
Ambient Sound	$L_{eq,T}$	Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, both near and far.
Specific Sound Level	$L_{eq,T}$	The Equivalent Continuous A-Weighted Sound Level at an assessment position produced by a specific sound over a given reference time interval, T_r
Rating Level	L_{Ar,T_r}	The Specific Sound Level plus any adjustment for the acoustic characteristic features of the noise (e.g. intermittency, tones etc.).
Residual Noise	$L_{Aeq,T}$	The ambient sound remaining at given position in a given situation, when the specific sound source is suppressed to such an extent that it no longer contributes to the ambient sound.
Sound Reduction Index	SRI	The reduction in sound energy when transmitted through a panel or similar planar element, typically used in relation to single octave or one-third octave frequency band values.
Weighted Sound Reduction Index	R_w	The Sound Reduction Index expressed as a single figure, as expressed against a reference curve.
Dynamic Insertion Loss	DIL	Reduction in acoustic energy resulting from the insertion of a noise control element (e.g. an attenuator, acoustic enclosure etc.).
Free Field	-	Noise measuring location that is free from the presence of sound reflecting objects (except the ground), usually taken to mean being at least 3.5 metres distance from reflective surface(s) or greater.

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Annex 3: Legislation, Planning Policy and Guidance

8.1 A review of UK legislation, planning policy and guidance relevant to the proposals is presented in the following section.

Legislative Framework

8.2 The applicable legislative framework is summarised as follows:

Control of Pollution Act 1974, Part III

8.3 Sections 60 and 61 of the Control of Pollution Act 1974¹ provide the local authority special powers for controlling noise arising from construction and demolition works, regardless of whether a statutory nuisance has been caused or is likely to be caused. These powers may be exercised either before works start or after they have started.

Environmental Protection Act 1990, Part III

8.4 Section 79 of the Environmental Protection Act 1990² (as amended) declares a number of matters to be statutory nuisances, one of which is noise, the term being defined to include vibration. Under the provisions of the Act, the local authority is required to inspect its area periodically to detect any nuisance and, where a complaint of a statutory nuisance is made by a person living within its area, to take such steps as are reasonably practicable to investigate the complaint. Should it be satisfied of the existence of a statutory nuisance, the local authority is obliged to serve an abatement notice.

Planning Policy

National Policy

National Planning Policy Framework (2023)

8.5 The updated National Planning Policy Framework (NPPF)³ sets out the Government's requirements for the planning system. Paragraph 174 (previously paragraph 170) advises:

8.6 "Planning policies and decisions should contribute to and enhance the natural and local environment by; preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of... noise pollution... Development should, wherever possible, help to improve local environmental conditions..."

8.7 With specific regard to noise, paragraph 185 (previously paragraph 180) states that:

8.8 "Planning policies and decisions should aim to...mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

8.9 "...identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason".

Noise Policy Statement for England (2010)

8.10 The Noise Policy Statement for England (NPSE)⁴ was published in March 2010 and 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:

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

8.12 That vision is supported by the following aims which are reflected in the aims for planning policies and decisions in Paragraph 123 of the NPPF (see Paragraph 6.2.5 above):

8.13 "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."

8.14 The Explanatory Note to the NPSE introduces three concepts to 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 Observed 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."

8.15 None of these levels is defined numerically in the NPSE 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 a SOAEL for noise is acknowledged and the NPSE asserts that not stating specific SOAEL levels provides policy flexibility in the period until there is further evidence and guidance.

¹ Environmental Agency, (1974). Control of Pollution Act.

² Environmental Agency, (1990). Environmental Protection Act.

³ Department for Communities and Local Government, (2023). National Planning Policy Framework, DCLG.

⁴ Department of Environment, Food and Rural Affairs, (2010). Noise Policy Statement for England. DEFRA.

- 8.16** The Observable Adverse Effect Level terms presented in the NPSE are adopted in the Government's Planning Practice Guidance on noise (PPG-N) which presents a table of example outcomes to help characterise the level of effect as is repeated in the following Table.

Table 8A.3 Noise exposure hierarchy based on likely average response

	Perception	Examples of outcomes	Increasing effect level	Action
← increasing noise level →	Not noticeable	No effect	No observed effect	No specific measures required
	No Observed Effect Level (NOEL)			
	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 (LOAEL)			
	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. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed adverse effect	Mitigate and reduce to minimum
	Significant Observed Adverse Effect Level (SOAEL)			
	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
	Unacceptable Adverse Effect Level (UAEL)			
	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 harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

Local Policy

Reading Borough Local Plan 2019

- 8.17** The Reading Borough Local Plan 2019⁵ sets the local authority's development plan for Reading and has been developed to address the key issues the local authority consider need addressing for new development. The relevant policies that are relevant to noise and vibration are as follows:

CC8: Safe Guiding Amenity

- 8.18** "Development will not cause a detrimental impact on the living environment of existing residential properties or unacceptable living conditions for new residential properties, in terms of: ...

- Noise and disturbance;
- Vibration...

- 8.19** ...The position of habitable rooms, windows and outdoor living spaces will be particularly important. A back-to-back distance of 20 metres between dwellings is usually appropriate, although the circumstances on individual sites may enable dwellings to be closer without a detrimental effect on privacy.

- 8.20** As well as immediate impacts, other aspects to which this policy applies will include matters such as hours of operation of businesses, and effects of traffic movements, particularly of heavy goods vehicles (HGVs). Proposals which would generate regular movements of HGVs on residential roads will not be acceptable."

EN17: Noise Generating Equipment

- 8.21** "Where noise generating equipment is proposed, the noise source specific level (plant noise level) should be at least 10dBA below the existing background level as measured at the nearest noise sensitive receptor."

CR6: Living in Central Reading

- 8.22** "Proposals for residential development within the central area will be assessed against the following criteria:
- ii) Proposals for new residential development within the central area will be required to demonstrate how the issue of potential noise disturbance from neighbouring land uses and other sources, and air quality implications of residential development, have been considered and if necessary, mitigated. New residential development should not be located next to existing town centre uses where those uses would give rise to unacceptable levels of noise and disturbance to the occupiers of the new scheme, unless this can be mitigated."

Building Regulations

Approved Document O (2021)

- 8.23** Approved Document O (ADO)⁶ aims to protect the health and welfare of occupants of buildings by reducing the occurrence of high indoor temperatures. In practice, the requirements of ADO are met by limiting solar gains and providing adequate means of removing excess heat from dwellings.
- 8.24** Section 3 of ADO states that it should be ensured that the overheating mitigation strategy is useable and thus if the overheating strategy is to rely on open windows, suitable noise conditions within bedrooms at night should be achieved under such conditions:
- 8.25** "...the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).
- 8.26** Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits:
- 40dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am).
 - 55dB L_{AFmax} , more than 10 times a night (between 11pm and 7am)."

⁵ Reading Borough Council, (2019). Reading Borough Local Plan Adopted November 2019.

⁶ HM Government, (2021). The Building Regulation 2010: Approved Document O. RIBA Publishing.

Guidance

BS 8233:2014

- 8.27 BS 8233:2014 ‘Guidance on sound insulation and noise reduction for buildings’⁷ provides appropriate criteria for acceptable levels of noise ingress within various spaces.
- 8.28 Section 7.2.2 of the Standard, entitled ‘Internal ambient noise levels in dwellings’ states that ‘... In general, for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guideline values in Table 4 [of BS 8233]’ as duplicated below in Table 5:

Table 8A.4 Internal ambient noise level requirements as per BS 8233

BS 8233:2014 – Indoor ambient noise levels for dwellings			
Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35dB $L_{Aeq,16hr}$	-
Dining	Dining room / area	40dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35dB $L_{Aeq,16hr}$	30dB $L_{Aeq,8hr}$

- 8.29 Note 7 of BS 8233:2014 states that: ‘... Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed up to 5dB and reasonable internal conditions still achieved.’
- 8.30 No specific performance recommendation is given within BS 8233:2014 regarding maximum (L_{Amax}) intrusive noise levels within bedrooms. ProPG expands on the guidance presented in BS 8233:2014.
- 8.31 Section 2.31 states that ‘... In noise sensitive rooms at night (e.g. bedrooms) individual noise events (from all sources) should not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night as this represents a threshold below which the effects of individual noise events on sleep can be regarded as negligible.’
- 8.32 Regarding outdoor amenity spaces, BS 8233:2014 states the following:
- 8.33 ‘... 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 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$...
- 8.34 ... 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.
- 8.35 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.
- 8.36 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.’
- 8.37 In summary therefore, the “upper guideline” noise level for external amenity spaces, as recommended by the Standard, is 55dB $L_{Aeq(16\text{ hour})}$, albeit it is duly recognised that this may be exceeded for urban developments and is not applicable to “small balconies” and should ultimately not prohibit development if exceeded in other external amenity areas.

BS 4142:2014+A1:2019

- 8.38 BS 4142:2014+A1:2019 ‘Method for rating and assessing industrial and commercial sound’⁸ is intended to be used to assess noise of a commercial nature such as that arising from commercial premises.
- 8.39 The procedure contained in BS 4142 for assessing environmental noise impact is to compare the measured or predicted noise level from the source in question, the “Specific Sound Level” immediately outside the noise sensitive premises, with the corresponding representative “Background Sound Level”. Where the noise contains attention attracting characteristics such as tonal, impulsive and/or intermittent elements, it may be appropriate to apply a correction to the Specific Sound Level to obtain the “Rating Level”.
- 8.40 BS 4142 states that the significance of sound arising from 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 also the context in which the sound occurs:
- a) Typically, the greater this difference, the greater the magnitude of the impact.
 - b) A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.
 - c) A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.
 - d) 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.
- 8.41 For the daytime, the assessment is carried out over a one-hour period, and over a 15-minute period at night. The daytime and night time periods are defined as occurring between 07:00 hours to 23:00 hours, and 23:00 hours to 07:00 hours, respectively.

⁷ British Standards Institution, (2014). BS 8233 Guidance on sound insulation and noise reduction for buildings, BSI Standards

⁸ British Standards Institution, (2019). BS 4142 Method for rating and assessing industrial and commercial sound, BSI Standards

BS 5229-1:2009+A1:2014

8.42 BS 5228:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Part 1: Noise'⁹ provides recommendations for basic methods of noise control relating to construction sites where work activities/operations generate significant noise levels. The annexes provide information on the following:

- relevant legislation (Annex A);
- typical noise sources and advice on mitigating them (Annex B);
- sound level data for use in the prediction methods described in the standard (Annex C and D);
- assessing the significance of noise effects (Annex E);
- the estimation of noise levels (Annex F); and
- how to implement noise monitoring (Annex G).

8.43 BS 5228:2009 – Part 2 'Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration' provides recommendations for basic methods of vibration control relating to construction and open sites where work activities / operations generate significant vibration levels, including industry-specific guidance. The annexes provide information on the following:

- relevant legislation (Annex A);
- assessing the significance of vibration effects (Annex B);
- measured vibration levels for piling (Annex C and D); and
- the prediction of vibration levels (Annex E).

Calculation of Road Traffic Noise (1988)

8.44 Calculation of Road Traffic Noise (CRTN)¹⁰ describes procedures for predicting and measuring noise from road traffic in terms of the LA10 and is suitable for environmental assessments of schemes where road traffic noise may have an effect.

Design Manual for Roads and Bridges (DMRB), Volume 11 Environmental Assessment

8.45 Design Manual for Roads and Bridges (DMRB), Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 7 Noise and Vibration¹¹. This advice note prepared by the Highways Agency, provides guidance on the assessment of the effects on noise and vibration that a road project might have. Where appropriate, this advice may be applied to existing roads.

⁹ British Standards Institution, (2014). BS 5228 Code of practice for noise and vibration control on construction and open sites Parts 1 and 2, BSI Standards

¹⁰ Department of Transport Welsh Office, (1988). Calculation of Road Traffic Noise. HMSO.

¹¹ The Highways Agency, (2008). Design Manual for Roads and Bridges (DMRB), Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 7 Noise and Vibration. Stationary Office.

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Annex 4: Baseline Noise Survey

LOCATION

Broad Street Mall, Reading

DATES & TIMES

13 January to 20 January 2023

WEATHER CONDITIONS

Weather conditions were understood to be typically dry with light winds with the exception of the following periods which were understood to contain some rainfall and strong wind:

13/01/2023 17:00 to 20:30 hours;

14/01/2023 04:00 to 15/01/2023 18:00 hours;

The above time periods have been excluded from the assessment.

PERSONNEL PRESENT DURING MEASUREMENTS

Dan Reeves AMIOA – Sol Acoustics Ltd

INSTRUMENTATION

01dB Cube Sound Level Meter (serial no. 11114)

01dB Cube Sound Level Meter (serial no. 14027)

01dB Cube Sound Level Meter (serial no. 12068)

CAL21 Acoustic Calibrator (serial no. 34375244)

METHODOLOGY

Before and after the measurements the sound level meters were checked and calibrated to an accuracy of ±0.4dB using the 01dB CAL 21 Calibrator. The calibrator produces a sound pressure level of 94 dB re 2x10⁻⁵ Pa @ 1kHz.

MEASUREMENT RESULTS

Graphs A1 - A4 summarise the results obtained from the noise survey at Measurement Position LP1, LP2, LP3 and SP2, respectively.

The results for SP1 and SP3 are shown in Tables A1 and A2 below. The results of the short-term plant noise measurements are shown in Table A3 and measurement positions are presented in Figure A1.

Table 8A.5 Measurement results for SP1

Period Start	L _{Aeq,15mins} (dB)
19.01.2023 18:49	64
19.01.2023 19:04	64
19.01.2023 19:19	64
19.01.2023 19:34	63
19.01.2023 19:49	65
19.01.2023 20:04	63
19.01.2023 20:19	64
19.01.2023 20:34	62
19.01.2023 20:49	62
19.01.2023 21:04	64
19.01.2023 21:19	63
19.01.2023 21:30	62
19.01.2023 21:45	62
19.01.2023 22:00	64

Table 8A.6 Measurement results for SP3

Period Start	L _{Aeq,1min} (dB)	L _{A90,1min} (dB)	L _{AFmax} (dB)	L _{A10,1min} (dB)
20/01/2023 11:55	63	56	72	67
20/01/2023 11:56	64	61	68	65
20/01/2023 11:57	64	61	73	66
20/01/2023 11:58	66	61	76	68
20/01/2023 11:59	63	61	68	66
20/01/2023 12:00	65	62	75	67
20/01/2023 12:01	63	61	70	64
20/01/2023 12:02	63	56	73	67
20/01/2023 12:03	61	55	71	65
20/01/2023 12:04	57	54	68	60
20/01/2023 12:05	63	56	74	66
20/01/2023 12:06	62	61	67	62
20/01/2023 12:07	64	61	68	66
20/01/2023 12:08	67	62	74	71
20/01/2023 12:09	61	55	75	63
20/01/2023 12:10	61	55	72	64
20/01/2023 12:11	62	57	78	64
20/01/2023 12:12	60	56	74	62
20/01/2023 12:13	62	58	71	65
20/01/2023 12:14	62	58	74	65
20/01/2023 12:15	60	56	75	61
20/01/2023 12:16	63	54	72	67
20/01/2023 12:17	63	55	75	67
20/01/2023 12:18	69	62	78	73
20/01/2023 12:19	69	59	84	72
20/01/2023 12:20	66	57	83	69
20/01/2023 12:21	67	57	84	71
20/01/2023 12:22	66	57	77	70
20/01/2023 12:23	66	57	80	69
20/01/2023 12:24	62	58	73	65
20/01/2023 12:25	60	56	68	62
20/01/2023 12:26	64	60	74	66
20/01/2023 12:27	65	56	77	67

Period Start	$L_{Aeq,1min}$ (dB)	$L_{A90,1min}$ (dB)	L_{AFmax} (dB)	$L_{A10,1min}$ (dB)
20/01/2023 12:28	62	58	72	66
20/01/2023 12:29	64	60	76	65
20/01/2023 12:30	65	58	74	69
20/01/2023 12:31	63	57	72	67
20/01/2023 12:32	64	57	72	68
20/01/2023 12:33	61	57	70	63
20/01/2023 12:34	64	60	84	64
20/01/2023 12:35	63	61	69	65
20/01/2023 12:36	65	61	77	67
20/01/2023 12:37	66	61	74	70
20/01/2023 12:38	65	59	79	68
20/01/2023 12:39	63	58	72	69
20/01/2023 12:40	62	56	73	65
20/01/2023 12:41	59	56	71	62
20/01/2023 12:42	66	58	82	68
20/01/2023 12:43	59	56	69	61
20/01/2023 12:44	58	55	66	60
20/01/2023 12:45	60	56	69	63
20/01/2023 12:46	63	56	77	66
20/01/2023 12:47	67	64	72	69
20/01/2023 12:48	66	58	78	70
20/01/2023 12:49	64	62	71	67
20/01/2023 12:50	62	56	71	65
20/01/2023 12:51	76	55	91	76
20/01/2023 12:52	75	58	94	67
20/01/2023 12:53	61	55	76	64
20/01/2023 12:54	63	56	74	66

Table 8A.7 Plant noise spot measurement results

Location	Approximate Distance from Plant (m)	Sound Pressure Level, $L_{eq,T}$ (dB)								$L_{Aeq,T}$ (dB)
		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
A	3.5	73	70	69	64	60	57	52	46	67
B	3.5	72	70	68	67	64	59	53	47	69
C	3.5	68	68	65	64	62	59	56	56	67
D	1	80	81	73	74	71	69	64	54	77
E	7.5	69	66	62	61	58	54	47	40	63
F	7.5	68	64	64	62	58	53	47	40	64
G	7.5	69	68	66	62	58	54	49	41	64
H	7	71	64	59	54	54	49	40	33	58
I	10	60	56	54	54	54	46	44	39	57

Figure 8A.1 Plant noise spot measurement locations

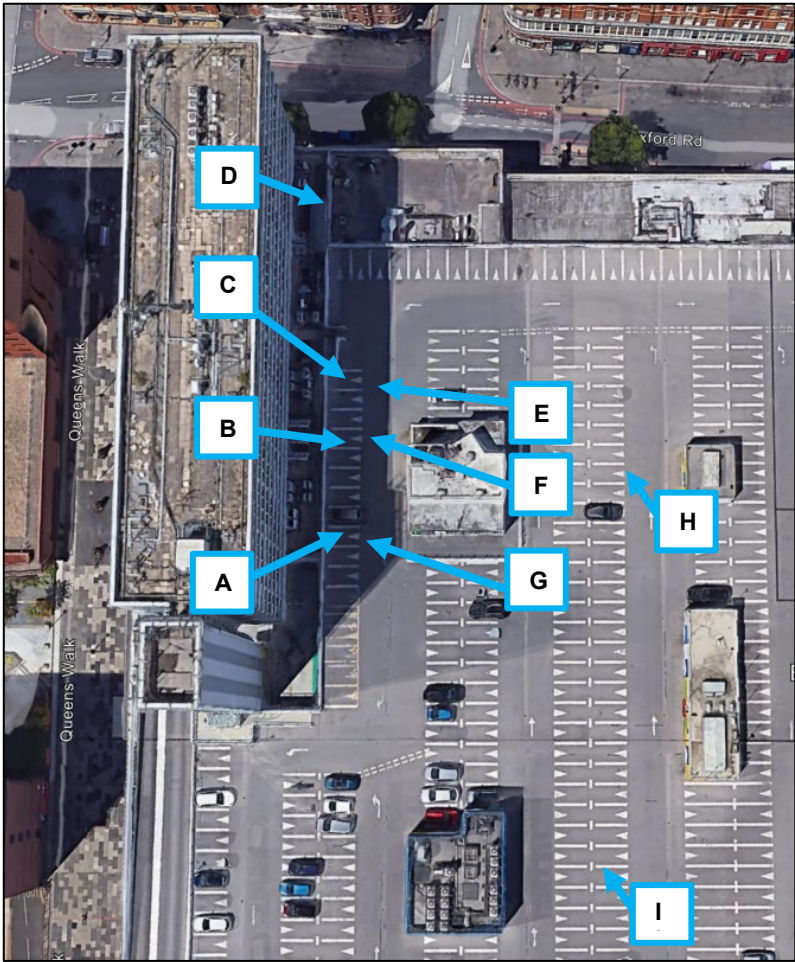


Figure 8A.2 Graph showing measured environmental noise levels as measured at Measurement Position LP1

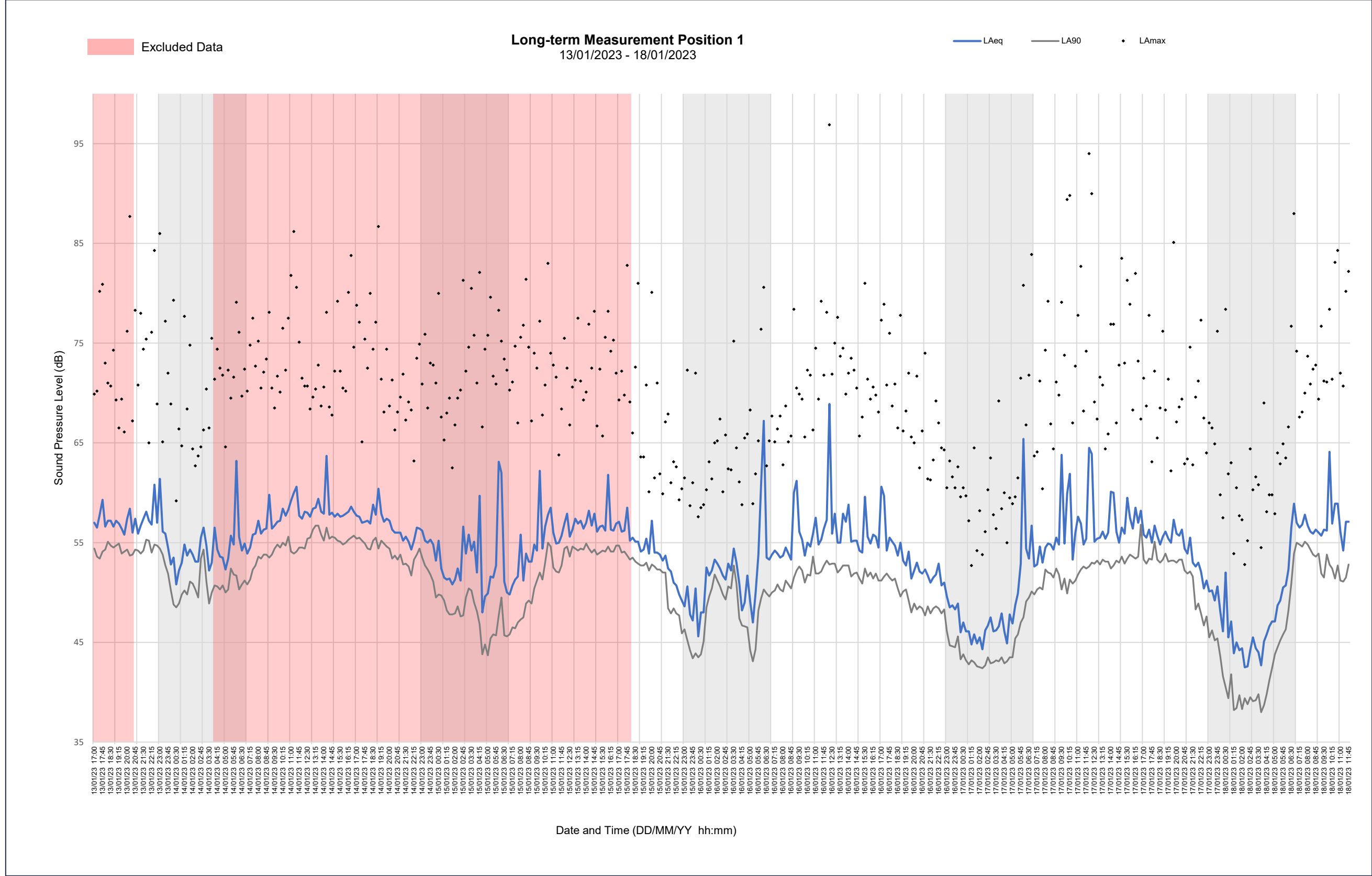


Figure 8A.3 Graph showing measured environmental noise levels as measured at Measurement Position LP2

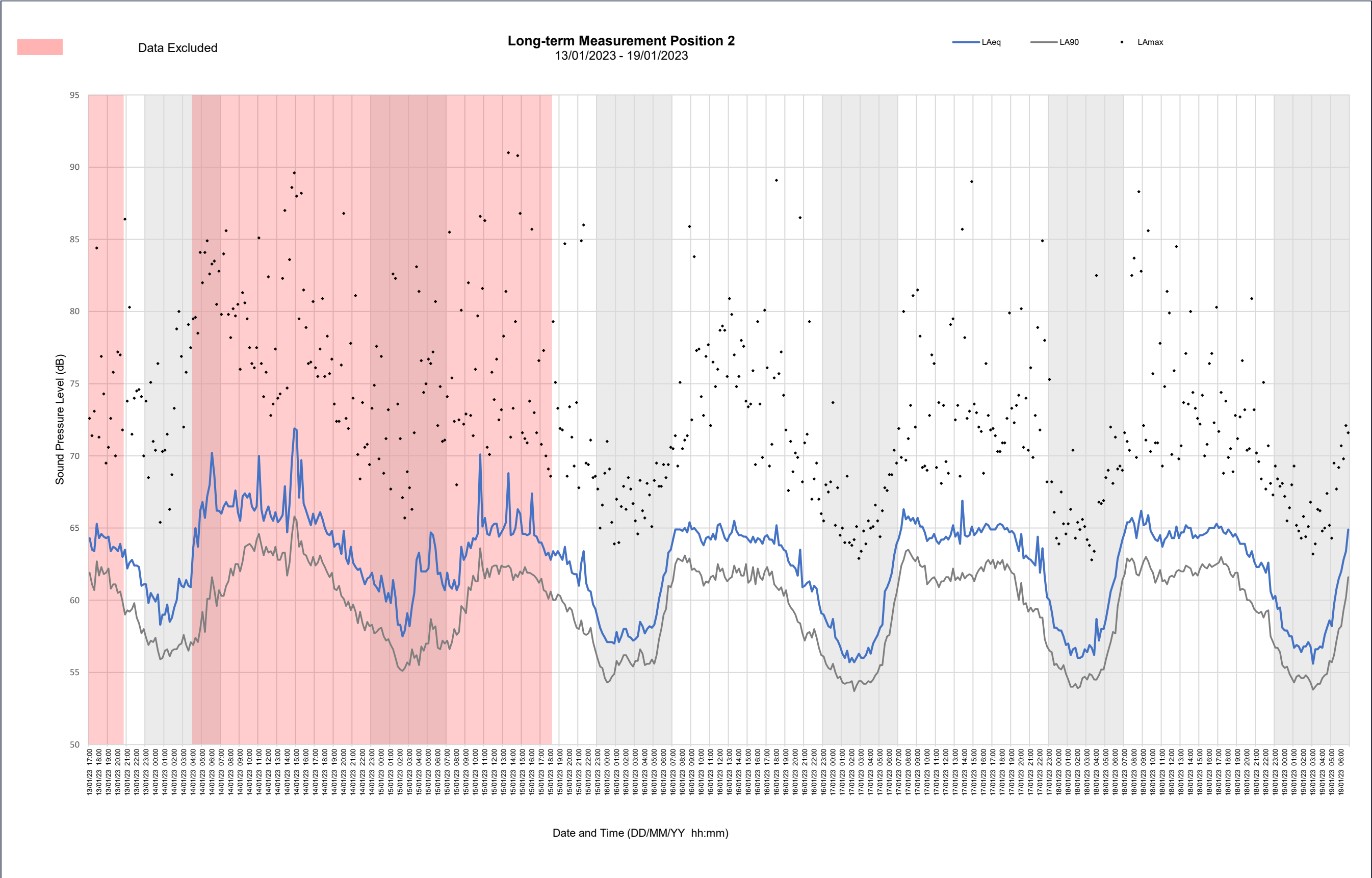


Figure 8A.4 Graph showing measured environmental noise levels as measured at Measurement Position LP3

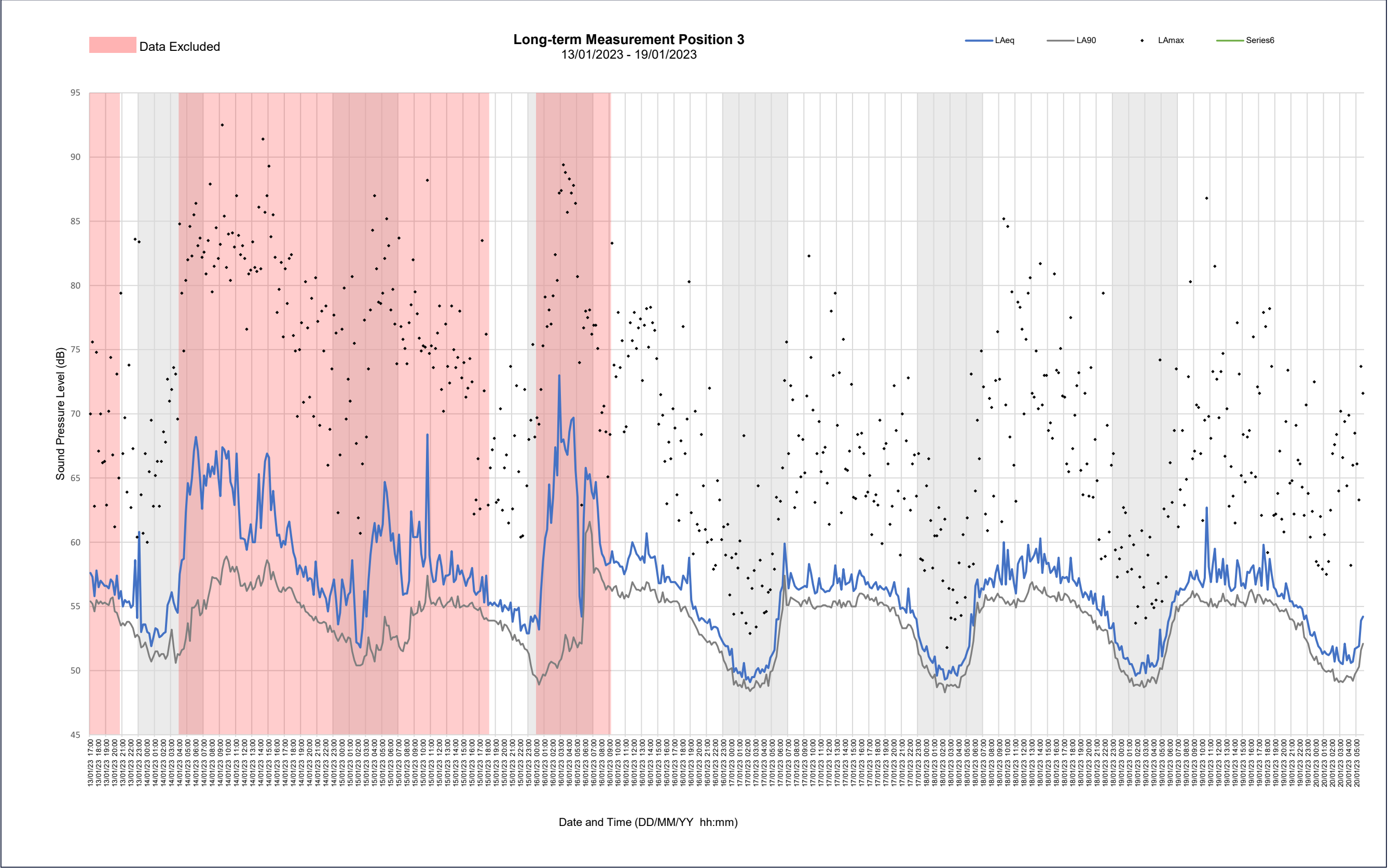


Figure 8A.5 Graph showing measured environmental noise levels as measured at Measurement Position SP3

