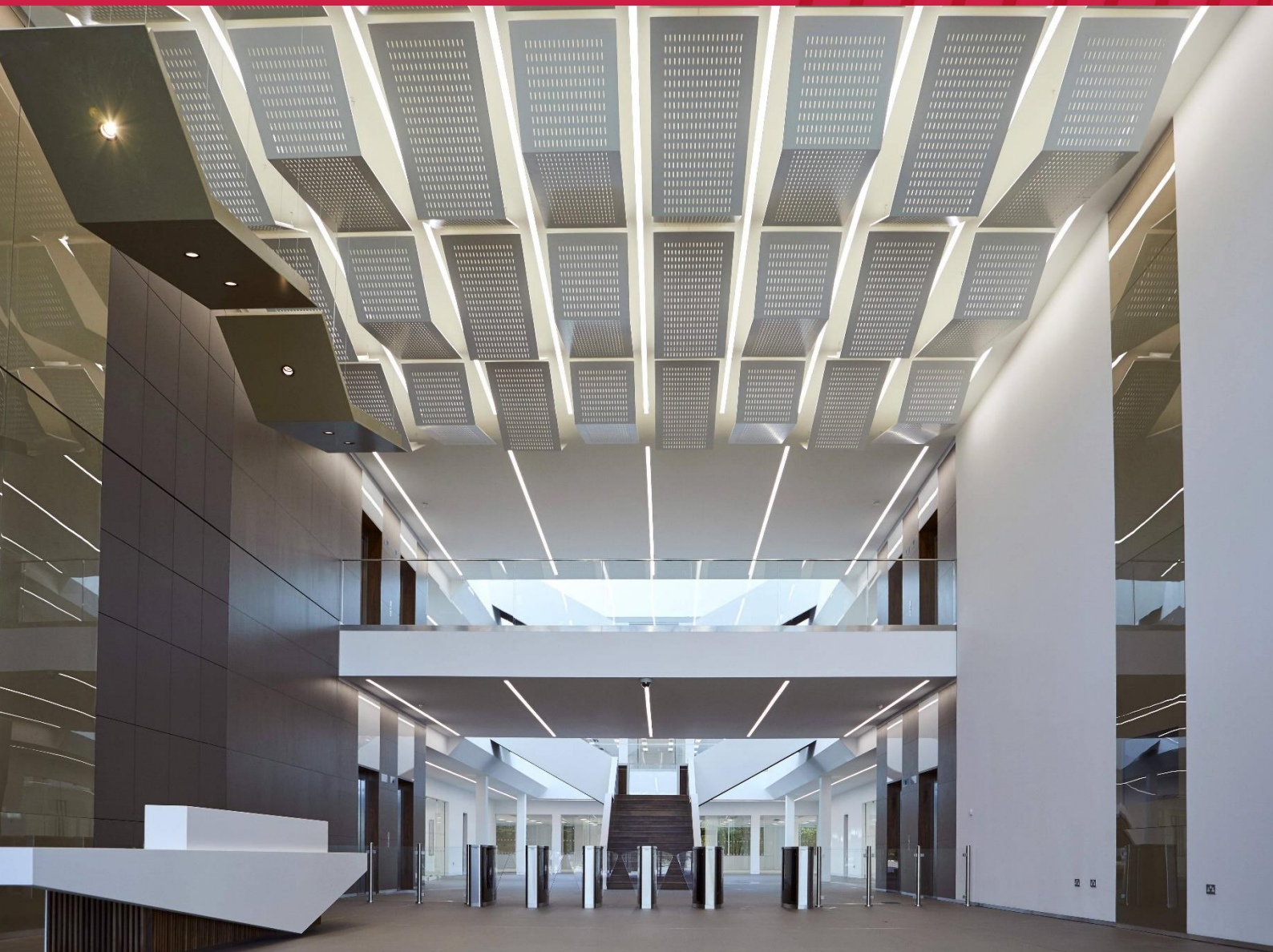


1 CASTLE YARD, RICHMOND

Planning Application Report –
Acoustics



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Contents

1.	Introduction	3
2.	Site Description	4
3.	Assessment Policy & Guidance.....	5
3.1	Introduction	5
3.2	Local Authority Guidance	5
3.3	British Standards	6
3.3.1	BS 4142:2014+A1:2019 Methods of Rating and Assessing Industrial and Commercial Sound	6
3.3.2	BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings.....	8
4.	Environmental Noise Survey	9
4.1	Methodology	9
4.1.1	Measurement Locations	9
4.1.2	Observations.....	10
4.2	Survey Results.....	10
4.2.1	Unattended Measurements (24-hour).....	10
4.2.2	Attended Measurements (Short-term).....	11
4.2.3	Meteorological Conditions	11
5.	Plant Noise Emission Limits	12
5.1	Introduction	12
5.2	Nearest Noise Sensitive Receptors	12
5.3	Noise Emission Limits	13
6.	Conclusion	15
	Appendices	16
	Appendix A – Glossary of Acoustic Terminology.....	17
	Appendix B – Environmental Noise Survey Results	19
	Appendix C – Equipment Used During the Survey	20
	Appendix D - Limitations to this Report.....	21

1. INTRODUCTION

MZA Acoustics has been appointed by Peveril Securities Ltd. to provide an acoustic report to support the submission of the planning application for the site at 1 Castle Yard, Richmond.

The existing site is currently occupied by a three-storey office building (ground plus two floors above ground), with plant located in a compound at roof level.

The proposal is for the internal renovation and reconfiguration of the existing building; external alterations including two-storey roof extension with terraces to accommodate additional commercial floorspace (Class E), plant enclosure, remodelled entrance with ramp, associated refuse and cycle storage and public realm improvements.

This report presents the results of a baseline noise survey undertaken at the site, which has been used to provide limiting noise levels for the noise emissions from building services plant and equipment.

This report occasionally employs technical language. To assist the reader, a glossary of acoustic terminology is presented in Appendix A.

2. SITE DESCRIPTION

The site is located in Castle Yard, which is towards the west of Richmond Town Centre and the surrounding area is a mix of commercial and residential uses.

The existing commercial use building is three storeys in height (ground plus two floors above ground) with a screened plant enclosure at roof level.

The building is bound:

- To the north by Castle Yard with the rear of the Odeon cinema directly north and office buildings to the northwest;
- To the east by Lewis Road, with residential buildings opposite;
- To the south by the adjoining Glovers Lodge residential building; and
- To the west by the rear of commercial use buildings (primarily retail and catering), with possible residential use properties above.

The contextual site location is presented in Figure 1, with an approximate red line boundary and the nearest noise sensitive (residential) receptors shaded in blue.



Figure 1 - Site location with red line boundary and nearest residential receptors (blue)

3. ASSESSMENT POLICY & GUIDANCE

3.1 Introduction

This section sets out the policy and guidance which will inform the assessment which follows.

The assessment is, primarily, led by the requirements of the local planning authority – London Borough of Richmond upon Thames – but reference to other applicable guidance documents and British Standards are also made.

3.2 Local Authority Guidance

The London Borough of Richmond upon Thames provides guidance for noise emissions from ‘new noise generating industrial and commercial development’ (noise generating development, NGD) in their ‘Development Control for Noise Generating and Noise Sensitive Development’ SPD, 2018.

The following objective targets are provided for planning for new noise generating development, based on the assessment approach of BS 4142 (summarised below).

Table 1 - LB Richmond upon Thames SPD 2018 guidance on noise levels from new noise generating development

Noise Significance Risk	BS4142 Outcome	Planning Advice
Minimal	$L_{Ar,Tr} - L_{A90,T}$ $i_s \leq -5$	Where the rating level of noise is below the background noise level by at least 5dB, this indicates that the proposed NGD is likely to be acceptable from a noise perspective. The Borough will seek this level of compliance in most noise sensitive areas and/or where there is a requirement to mitigate creeping background effects
Low	$L_{Ar,Tr} - L_{A90,T}$ $i_s > -5 \ \& \ \leq 0$	Where the rating level of noise is equal to, or below the background noise level by up to 5dB, this indicates that the proposed NGD may be acceptable from a noise perspective but will be more context dependent, i.e. extent and effect on noise sensitive receivers (externally and internally). Compliance within this range is more applicable to less sensitive sites or where there is no requirement to mitigate creeping background effects.
Medium	$L_{Ar,Tr} - L_{A90,T}$ $i_s > 0 \ \& \ \leq +5$	Where the rating level of noise is equal to, or above the background noise level by up to 5dB, this indicates that the proposed NGD is less likely to be acceptable from a noise perspective and will be context dependent, i.e. extent and effect on noise sensitive receivers (externally and internally). Compliance within this range is typically only applicable to non-sensitive sites or where there are overriding other reasons why development should be considered. It will typically be necessary for the applicant to confirm how adverse impacts from the NGD will be mitigated and minimised. It is less likely that planning consent will be granted.

Noise Significance Risk	BS4142 Outcome	Planning Advice
High	$L_{Ar,Tr} - L_{A90,T}$ is $> +5$	Where the rating level of noise is above the background noise level by more than 5dB, this indicates that the proposed NGD is unlikely to be acceptable from a noise perspective and planning consent is likely to be refused on noise grounds.

The document also recommends that reference may also be made to the criteria for internal noise levels within dwellings that is provided in BS 8233:2014.

3.3 British Standards

3.3.1 BS 4142:2014+A1:2019 Methods of Rating and Assessing Industrial and Commercial Sound

BS4142:2014+A1:2019 primarily provides a numerical method by which to determine the significance of sound of an industrial nature (i.e. the 'specific sound' from the proposed development and/or existing source) at residential NSRs. The specific sound level may then be corrected for the character of the sound, if appropriate, and this is then termed the 'rating level' (denoted as $L_{Ar,Tr}$), whether or not a rating penalty is applied.

With regard to the rating correction, paragraph 9.2 of BS4142:2014+A1:2019 suggests the following subjective methods for the determination of the rating penalty for tonal, impulsive and/or intermittent specific sounds.

Table 2 – BS 4142 – Significant of Impact

Character	Significance of Impact
Tonality	For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 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	A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.
Intermittency	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.
Other sound characteristics	Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied."

BS4142:2014+A1:2019 requires that the background sound levels adopted for the assessment be representative for the period being assessed. The Standard recommends that the background sound level should be derived from continuous measurements of normally not less than 15-minute intervals, which can be contiguous or disaggregated. However, the Standard states that there is no 'single' background sound level that can be derived from such measurements. The accompanying note to paragraph 8.1.4 states that:

"A representative level should account for the range of background sound levels and should not automatically be assumed to be either the minimum or modal value."

Estimating Impact

An initial estimate of the impact of the specific sound is obtained by subtracting the measured background sound level from the rating level of the specific sound. In the context of the Standard, adverse impacts include, but are not limited to, annoyance and sleep disturbance.

Typically, the greater this difference, the greater the magnitude of the impact, while 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.

BS4142:2014 recommends the following scale to estimate the impact.

Table 3 – BS 4142 – Significance of Impact

Level Difference ($L_{Ar,Tr}$ vs $L_{AF90,T}$)	Significance of Impact
+10 dB	A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on context.
+5 dB	A difference of around +5 dB is likely to be an indication of an adverse impact, depending on context.
0 dB	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.

Whilst there is a relationship between the significance of impacts determined by the method contained within BS4142:2014+A1:2019 and the significance of effects described in the PPG-N, there is not a direct link. It is not appropriate to ascribe numerical rating / background level differences to LOAEL and SOAEL because this fails to consider the context of the sound which is a key requirement of the Standard.

The significance of the effect of the noise in question (i.e. whether above or below SOAEL and LOAEL) should be determined on the basis of the initial estimate of impact significance from the BS4142:2014 assessment with reference to the examples of outcome described within the PPG-N and after having considered the context of the sound. It is necessary to consider all pertinent factors, including:

- the absolute level of the sound;

- the character and level of the residual sound compared to the character and level of the specific sound; and
- 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:
 - façade insulation treatment;
 - ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and
 - acoustic screening.

3.3.2 BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

BS 8233:2014 Guidance on sound insulation and noise reduction for buildings provides guidance for the control of noise in and around buildings. Through providing appropriate criteria and limits for internal and external noise levels it can be used to guide the design of new buildings (or refurbished buildings undergoing a change of use).

Guidance pertaining to indoor noise levels for residential spaces is summarised in the table below.

Table 4 – BS 8233 – Indoor ambient noise levels in spaces when unoccupied

Activity	Location	Daytime 07:00 – 23:00	Night-time 23:00 – 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

4. ENVIRONMENTAL NOISE SURVEY

4.1 Methodology

An environmental noise survey has been undertaken at the site in order to establish the existing noise climate, specifically in relation to the background noise levels against which noise emissions from proposed plant would be assessed.

Measurements were taken at a number of locations around the site between approximately 15:00 on Wednesday 17th November to 16:00 on Thursday 18th December.

4.1.1 Measurement Locations

Measurements were taken at the following locations:

- LT1 – Long-term (24-hour) monitoring location in the central courtyard of the adjoining Glovers Lodge.
- ST1 – Short-term monitoring location on the southwest corner of Castle Yard.
- ST2 – Short-term monitoring location outside residential properties on Lewis Road, to the east of the proposed development.

The measurement locations are illustrated on the map in Figure 2.

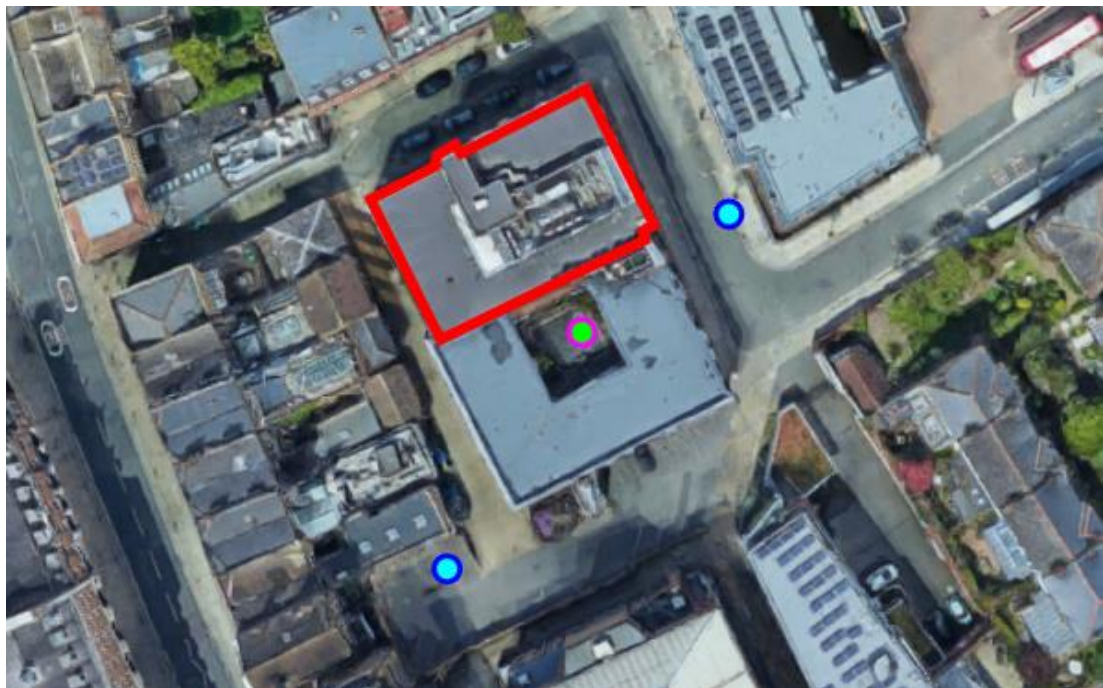


Figure 2 - Environmental noise survey monitoring locations: Long term (Pink/Green); and short-term (Blue/Cyan)

4.1.2 Observations

Observations of the noise climate at the site were made during installation of the long-term monitor, and during the short-term measurements.

The noise climate generally consisted of a mixture of environmental sources (constant road traffic on the local road network, with frequent plane flyovers overhead) and commercial noise from plant associated with nearby buildings.

The bus garage to the east carries frequent buses on Lewis Road, past the proposed development site.

To the west of the site a number of plant items (kitchen extract fans, air conditioning units) were audible from the gym under the Glovers Lodge building, and to the rear of the retail units which front onto Hill Street, approx. 20 m from the proposed development.

4.2 Survey Results

4.2.1 Unattended Measurements (24-hour)

The results of the 24-hour survey are summarised in Table 5, whereby a whole daytime period has been calculated by prepending the morning data from the 18th November to the afternoon/evening data from 17th November.

Table 5 - Noise survey results (dB, free-field)

Location	Period	Equivalent Continuous Sound Level (dB, L _{Aeq,T})	Background Sound Level (dB, L _{AF90,T})
LT1 – Glovers Lodge Courtyard	Daytime 07:00 – 23:00	54	41
	Night-time 23:00 – 07:00	50	31

There was an intermittent (with an on/off cycle of around 2 hours) item of plant that was very audible at location LT1, which was not part of the existing development site (and, therefore, would exist in the future after the proposed development were in place. This is clearly visible in the L_{AF90,15min} graph included in Appendix B. The background noise level presented above is that in the absence of the plant operating.

When this plant item was not operational, the ambient noise climate was dominated by regular plane flyovers, and distant road traffic noise.

There was influence from occasional activity from occupants of Glovers Lodge, however these were not considered likely to significantly affect the background noise levels measured during the survey.

4.2.2 Attended Measurements (Short-term)

Short term measurements were undertaken at ST1 and ST2 during both the daytime and night-time while the long-term monitor was running.

The results of the short-term measurements are presented in Table 6.

Table 6 - Noise survey results (dB, free-field)

Location	Start (18/11/2021)	End (18/11/2021)	Equivalent Continuous Sound Level (dB, L_{Aeq,T})	Background Sound Level (dB, L_{AF90,T})
ST1 – Castle Yard	00:03:00	00:18:30	48	44
	00:36:42	00:52:01	47	41
	12:42:19	13:45:00	59	50
ST2 – Lewis Road	00:20:16	00:35:30	61	40
	00:53:12	01:08:40	59	38
	13:47:15	14:50:51	66	52

Noise levels at ST2 (Lewis Road) are generally higher than those measured at ST1 (Castle Yard) as they are more exposed to surrounding road traffic and noise from the nearby bus station.

Background noise levels at both the unattended and attended monitoring locations are considered to be driven by the same sources – that being (primarily) nearby commercial equipment and distant road traffic.

Therefore, the noise limits that are derived for the receptors outside the development are based on the measured difference between the concurrent unattended and attended measurements – with the difference applied to the typical background sound level derived at the unattended position.

4.2.3 Meteorological Conditions

Wind was generally from the west or south throughout the survey, with windspeeds below 5 m/s.

There was no rain throughout the survey period.

5. PLANT NOISE EMISSION LIMITS

5.1 Introduction

This section presents the noise emissions limits for mechanical services plant associated with the development.

At this stage, final plant selections have not been made and, therefore, a detailed assessment has not been undertaken at this stage. Nonetheless, it is recommended that these limits inform selections for plant at the design stages.

5.2 Nearest Noise Sensitive Receptors

The nearest noise sensitive receptors, to which noise emissions should be controlled, are presented in Figure 3, and summarised as follows:

- Glovers Lodge, immediately adjacent to the south.
- Residential properties above commercial premises fronting Hill St, to the west.
- Properties on Lewis Road, to the east.



Figure 3 - Nearest residential receptors (blue)

5.3 Noise Emission Limits

The noise emissions limits are based on the results of the environmental noise survey and the guidance provided by Richmond.

Limits at the receptors to the west and east have been calculated by taking the difference between the unattended measurement (taken in the Glovers Lodge courtyard) and the concurrent attended measurements taken at these receptors.

This difference has then been applied to the typical noise level determined at the unattended position in order to calculate a background sound level at the receptors to the east and west.

The typical differences between the unattended and attended positions are summarised as follows:

- **ST1:** +8 dB during the daytime; +8 dB during the night-time
- **ST2:** +8 dB during the daytime; +5 dB during the night-time

The appropriateness of the rating noise limit set should consider not only the noise level relative to the existing background, but also the absolute noise level and the context in which that level is received.

Where the initial estimate of the impact needs to be modified due to the context, BS 4142 recommends taking all pertinent factors into consideration, including:

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.

In addition to this, BS 4142:1997 recommends;

...background noise levels below about 30 dB and rating levels below about 35 dB are considered to be very low.

The consequence of meeting such onerous limits would be to impose schemes of noise control on building services plant that are expensive to install and run, reduce the efficiency of the plant (increasing environmental impact), and create visual impacts where mitigation measures add height in the form of barriers, enclosures, or other industrial noise attenuation

In context of the residential receivers facing the courtyard of Glovers Lodge, designing to a level that is at least 5 dB below the prevailing background would result in a significantly onerous rating level that does not exceed 36 dBA and 26 dBA during the daytime and night-time, respectively.

During the daytime, this level is around 14-19 dB below the recommended guidance for external amenity space (that might be enjoyed during the day) and 18 dB below the existing ambient noise level at the site – implying a low probability of adverse impact during the daytime.

Such night-time noise levels externally are already 4 dB lower than the typically recommended internal ambient noise level target of a bedroom. Were an open window to be used for ventilation (assumed to provide 15 dB outside to inside level difference, they would be around 19 dB lower – thus would be considered very unlikely to cause disturbance to a resident.

On the basis of the above, the plant noise emission limits in Table 7 are, therefore, proposed.

Table 7 - Noise emissions limits in accordance with BS 4142

Location	Period	Background Sound Level dB LA90 (Measured/calculated as described above)	Noise Emission Limit dB LAeq,T
Glovers Lodge Courtyard	Daytime (07:00 – 23:00)	41	36
	Night-time (23:00 – 07:00)	31	31 ¹
Receptors to the West	Daytime (07:00 – 23:00)	49	44
	Night-time (23:00 – 07:00)	39	39 ¹
Receptors to the East	Daytime (07:00 – 23:00)	49	44
	Night-time (23:00 – 07:00)	36	36 ¹
¹ Noise emission limit equal to, or lower than the prevailing background noise level due to low absolute levels. Such external levels at night would lead to internal levels that are significantly lower than the typical ambient noise level design targets in a bedroom – thus would be considered very unlikely to cause disturbance to a resident. Refer to text above this table for discussion. In line with LB Richmond upon Thames SPD 2018 guidance, a level that does not exceed the background presents a low noise significance risk.			

The above levels apply to the cumulative noise emitted from all mechanical plant serving the development and, therefore, individual plant items will need to be designed to lower noise levels than those presented above.

6. CONCLUSION

MZA Acoustics has been appointed by Peveril Securities Ltd. to provide an acoustic report to support the submission of the planning application for the site at 1 Castle Yard, Richmond.

A baseline environmental noise survey has been undertaken at various locations around the site considered to be representative of the nearest identified noise sensitive receptors. The measured surey data has been used to set cumulative plant noise emission limits, which have been determined in accordance with the guidance from the London Borough of Richmond upon Thames' 'Development Control for Noise Generating and Noise Sensitive Development' SPD 2018.

This report is suitable for submission to the Local Planning Authority to agree operational plant noise limits.

The limitations of this report are presented in Appendix D.

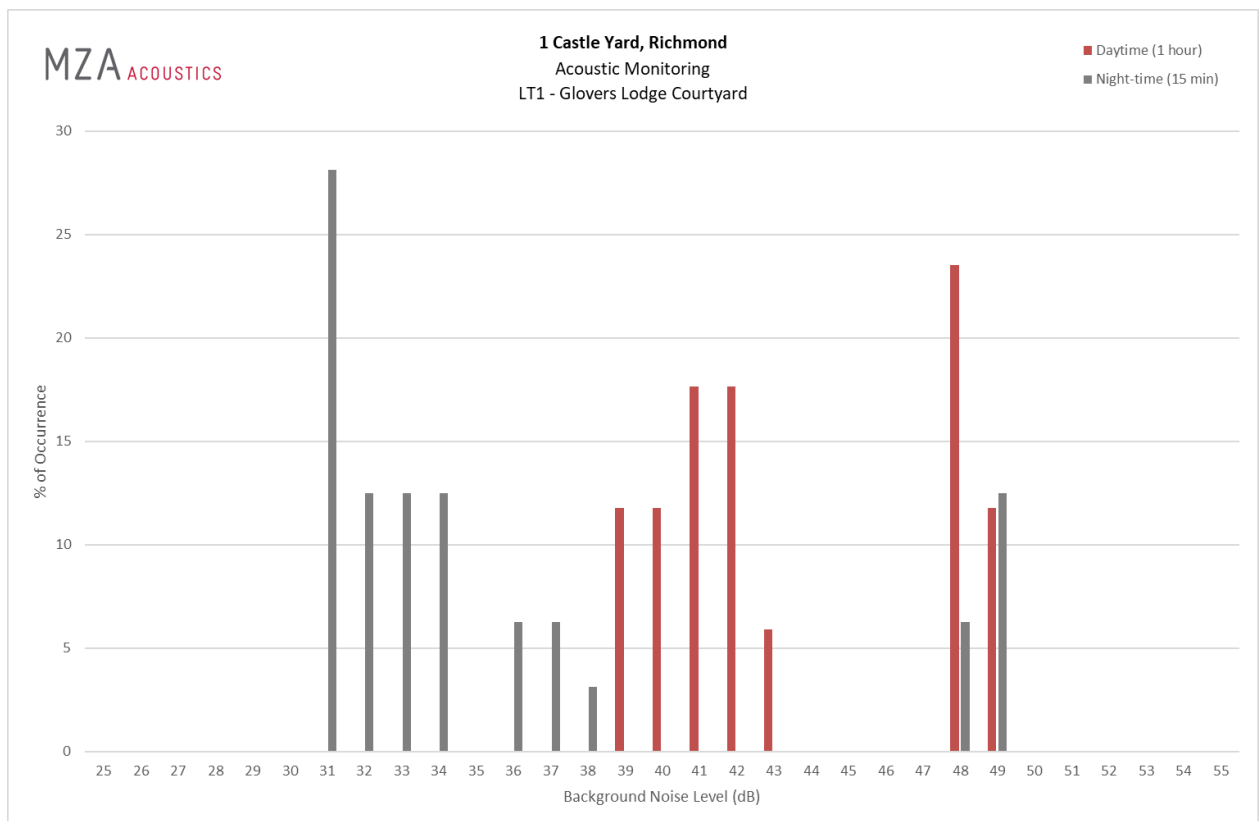
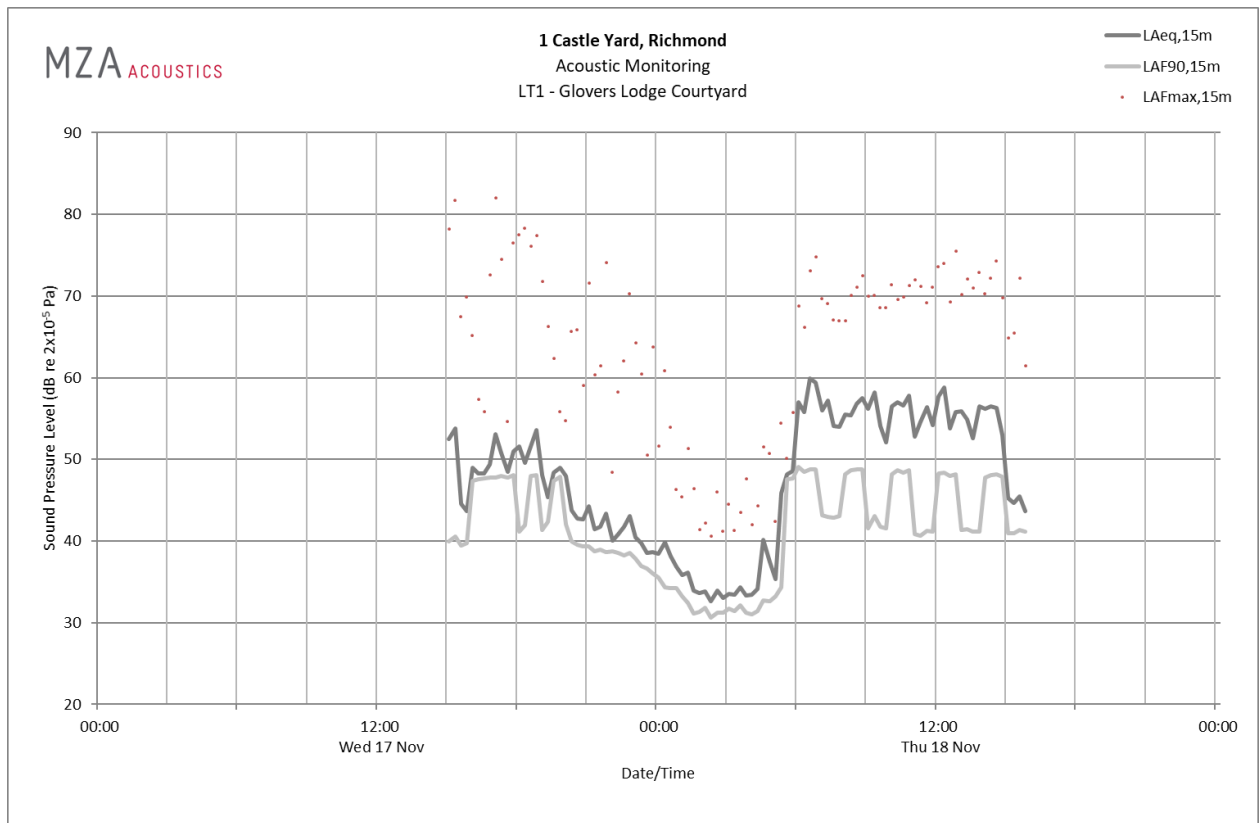
Appendices

Appendix A – Glossary of Acoustic Terminology

Airborne Sound	Sound that reaches the point of interest by propagation through air.
Ambient Sound:	Sound from all sources at any given time, from both near and far. Usually measured in terms of L_{Aeq} .
A-Weighting	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Background Sound Level	The A-weighted sound pressure level that can be considered the baseline in the absence of any noise from a specific source of sound under assessment. Measured in terms of $L_{A90, T}$.
Calibration	The measurement system/ chain should be periodically calibrated, within a laboratory, against traceable calibration instrumentation, to either National Standards or as UKAS-Accredited, as required. The calibration of the system should also be checked in the field using a portable calibrator before and after each short-term measurement, and periodically for longer term monitoring.
Class 1	The Class of a sound level meter describes its accuracy as defined by the relevant international standards – Class 1 is more accurate than Class 2. The older standard IEC 60651 referred to the grade as "Type", whereas the new standard IEC 61672 refers to it as the "Class". The most accurate meters used in the field (as opposed to a laboratory) are Class 1. Class 2 meters can be used in some instances; however, MZA use Class 1 (or Type 1) meters by default, as required by BS 4142:2014, for example.
Decibel	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds (s_1 and s_2) is given by $20 \log_{10}(s_1/s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20 Pa.
Fast time Weighting (F)	Averaging time used in sound level meters. Defined in BS EN 61672-2:2013 Electroacoustics. Sound level meters. Pattern evaluation tests.
Free-field / Façade	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5 m away.
IoA	The Institute of Acoustics is the UK's professional body for those working in acoustics, noise and vibration. It was formed in 1974 from the amalgamation of the Acoustics Group of the Institute of Physics and the British Acoustical Society (a daughter society of the Institution of Mechanical Engineers). It is a nominated body of the Engineering Council, offering registration at Chartered and Incorporated Engineer levels. MZA is a Sponsor Member of the Institute of Acoustics, and all our consultants/ engineers are individual Members.
$L_{AF90, T}$	The A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T,

	measured using time fast time-weighting (F). Generally used to describe the 'background' sound conditions.
L_{AFmax}	The maximum A-weighted sound pressure level during a given time period. L _{max} is sometimes used for the assessment of occasional loud sounds, which may have little effect on the overall L _{eq} noise level but could still affect the sound environment. Unless described otherwise, it is measured using the fast time-weighting (F).
L_{eq, T}	A sound level index called the equivalent continuous sound level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded. Where the value is A-weighted, it will be presented 'L _{Aeq,T} ' or 'dBA L _{eq,T} ', otherwise it should be an un-weighted (or linear) value.
L_p	See Sound Pressure Level.
Noise	Related to human response to sound. Unwanted sound, or sound that is considered undesirable or disruptive.
Octave Band	Frequency ranges in which the upper limit of each band is twice the lower limit. Octave bands are identified by their geometric mean frequency, or centre frequency.
Line Source	An idealised way of modelling a sound source, consisting of a uniform, flat plane.
Point Source	An idealised way of modelling a sound source, consisting of an infinitesimally small point, radiating sound equally in all dimensions
Sound Level Metrics	Sound levels usually fluctuate over time, so it is often necessary to consider an average or statistical sound level. This can be done in several ways, so a number of different metrics have been defined, according to how the averaging or statistics are carried out.
Sound Power	In a specified frequency band, the rate at which acoustic energy is radiated from a source. In general, the rate of flow of sound energy, whether from a source, through an area, or into an absorber.
Sound Power Level	Of airborne sound, ten times the common logarithm of the ratio of the sound power under consideration of the standard reference power of 1 pW. Expressed in decibels.
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level	The sound level is the sound pressure relative to a standard reference pressure of 20 Pa (20x10 ⁻⁶ Pascals) on a decibel scale.
Specific Sound	The sound source being assessed in a BS 4142:2014 assessment.
UKAS	United Kingdom Accreditation Service, recognised by government to assess organisations that provide certification, testing, inspection and calibration services against internationally agreed standards.

Appendix B – Environmental Noise Survey Results



Appendix C – Equipment Used During the Survey

Equipment	Type	Serial Number	Calibration Due Date
LT1 (Glovers Lodge Courtyard)			
Sound Level Meter	01dB Metravib FUSION	11703	14/06/2022
Pre-amplifier	01dB Metravib PRE22	1707134	
Microphone	GRAS 40CD 1/2" Pre-polarised free-field	331704	
Calibrator	01dB Metravib CAL31	82793	17/05/2022
ST1 and ST2			
Sound Level Meter	01dB Metravib FUSION	14087	22/06/2023
Pre-amplifier	Integrated with meter	N/A	
Microphone	GRAS 40CD 1/2" Pre-polarised free-field	446548	
Calibrator	01dB Metravib CAL31	82793	17/05/2022

Appendix D - Limitations to this Report

This report has been prepared for the titled project or named part thereof and should not be used in whole or part and relied upon for any other project without the written authorisation of MZA Acoustics Limited. MZA Acoustics Limited accepts no responsibility or liability for the consequences of this document if it is used for a purpose other than that for which it was commissioned. Persons wishing to use or rely upon this report for other purposes must seek written authority to do so from the owner of this report and/ or MZA Acoustics Limited and agree to indemnify MZA Acoustics Limited for any and all loss or damage resulting therefrom. MZA Acoustics Limited accepts no responsibility or liability for this document to any other party other than the person by whom it was commissioned.

The findings and opinions expressed are relevant to the dates of the site works and should not be relied upon to represent conditions at substantially later dates. Opinions included therein are based on information gathered during the study and from our experience. If additional information becomes available which may affect our comments, conclusions or recommendations MZA Acoustics Limited reserve the right to review the information, reassess any new potential concerns and modify our opinions accordingly.

MZA ACOUSTICS

4th Floor, 10 Philpot Lane,
London, EC3M 8AA

M: +44 (0)7741 974890

T: +44 (0)203 096 0659

kdemetriou@mzaconsult.co.uk

www.mza-acoustics.co.uk

