

Report

Unit 7, Millars Business Park, Wokingham

Environmental Noise
Assessment

Document History

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1.0 Introduction

1.1 Brief

Clear Acoustic Design has been appointed to carry out a noise impact assessment in relation to the proposed mechanical plant installation at Unit 7, Millars Business Park, Wokingham RG41 2TZ.

Proposals are for the installation of three air conditioning outdoor units.

A noise impact assessment has been requested in order to safeguard the amenity of the surrounding receptors. The noise impact assessment is in line with BS 4142: 2014 + A1: 2019 *Methods for Rating and Assessing Industrial and Commercial Sound*. These criteria are seen to be appropriate in assessing and mitigating noise impact from this source.

1.2 Report Summary

The report will show that the noise level from mechanical plant will not exceed 5dB below the existing background noise level at the nearest noise sensitive receptor. This is considered an acceptable outcome, in line with the local authority requirements and BS 4142: 2014 + A1: 2019. It is deemed that noise should not impact the decision outcome of the proposal.

1.3 Credentials

This report has been approved and issued by Stefan Hannan of Clear Acoustic Design. Stefan is a Company Director with 17 years of acoustic consulting experience. Stefan is also a full corporate member of the Institute of Acoustics (MIOA).

1.4 Glossary

A supporting glossary of acoustic terms can be found in Appendix C.

2.0 Legislative and Policy Framework

2.1 National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these are expected to be applied. The NPPF provides a framework within which local people and their council can produce their own distinctive local and neighbourhood plans. With explicit reference to noise, the NPPF states that "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 ... noise pollution".

2.2 Noise Policy Statement for England (NPSE)

The NPPF refers to the Noise Policy Statement for England (NPSE), which applies to most forms of noise including environmental noise. The NPSE sets out the long-term vision of Government 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.". It aims that "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 use of the terms "significant adverse" and "adverse" are key phrases within the NPSE. The guidance establishes the concept of how the level of adverse effect on health and quality of life can be referenced including:

- NOEL – No Observed Effect Level - This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the 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.

Under the first aim of the NPSE (“avoid significant adverse impacts on health and quality of life”), an impact in line with SOAEL should be avoided. Under the second aim (“mitigate and minimise adverse impacts on health and quality of life”), where the impact lies somewhere between LOAEL and SOAEL, requiring that all reasonable steps are taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development, but does not mean that such adverse effects cannot occur.

2.3 Planning Practice Guidance on Noise (PPG-N)

The Planning Practice Guidance on Noise (PPG-N) is part of a suite of web-based guidance which is intended to support the implementation of the policies in the NPPF and the NPSE. It aids in expanding on the definitions from the NPSE of NOEL, LOAEL and SOAEL, by linking these terms to ‘examples of outcomes’, i.e. changes in behaviour and/or attitude to noise. The table below summarises the guidance from PPG-N in this regard.

Perception	Examples of outcomes	Increasing effect level	Action
NOEL - No Observed Effect Level ¹			
Not noticeable	No Effect	No Observed Adverse 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.		
LOAEL - 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 the 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 a minimum
SOAEL - Significant Observed Adverse Effect Level			
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 a change in the 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 the 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

¹ This line is an assumption of the adverse effect level and is not explicitly referenced by PPG-N, though this appears to be a safe assumption.

Table 2.1: Noise exposure hierarchy based on the likely average response – adapted from PPG-N

2.4 BS 4142: 2014 + A1: 2019

BS 4142: 2014 + A1: 2019 *Methods for Rating and Assessing Industrial and Commercial Sound*, also referred to as "BS 4142", is a method of assessing the noise impact of sources of industrial and/or commercial noise on sensitive receptors such as residential buildings. This is done by comparing the rating level of the industrial noise ($L_{A,rT}$) against the existing level of background noise (L_{A90}), depending on the context.

The background sound level is an underlying level of sound over a period, T , and might in part be an indication of relative quietness at a given location. It does not reflect the occurrence of transient and/or higher sound level events and is generally governed by continuous or semi-continuous sounds.

BS 4142 uses the term 'low' to describe an acceptable impact of commercial/industrial noise at a receptor. This is typically applicable when the rating level does not exceed the existing background noise level.

The BS 4142: 2014 + A1: 2019 Technical Note, dated March 2020, produced by the Acoustic & Noise Consultants Working Group (ANC), looks to address any content regarded as ambiguous in the original standard by contextualising the information within it. It also states that, there are many instances in the application of BS 4142 where professional judgement is required and where a range of interpretations is possible.

2.5 Local Authority Requirements

Wokingham Borough Council have made the following requirements for this development:

"The noise assessment must show that there is a negligible effect on the nearby residential premisses, we would ask that 5dB below background is achieved to allow for uncertainty"

"The background should be measured according to BS4142 with no artificial noise from the proposed site or a surrogate location should be used as per BS4142 guidelines.

Any mitigation measures required such as acoustic screening should be clearly specified and robust and sustainable."

3.0 Environmental Noise Survey

3.1 Proposal

The proposal involves the installation of three Mitsubishi PUZ-M200YKA air conditioning units which are to be located at the back of the warehouse unit, at ground level.

Proposed plans of the location of the unit can be seen in Appendix B.

In order to meet the local authority's requirements, the noise level from the air conditioning units at the nearest receptors should not exceed 5 dB below the existing background noise level.

3.2 Identification of Receptors

In order to assess the impact of the proposed noise source on the existing noise levels, an environmental noise survey has been undertaken by Clear Acoustic Design at a location representative of the nearest noise sensitive receptors. The survey was conducted at a time when no commercial noise from the site was present, and the units have not yet been installed.

The closest noise sensitive receptor to the proposed mechanical plant location is deemed to be the façade of Alexandra Grand Luxury Care Home, on Oaklands Drive. This receptor is approximately 16 metres from the proposed noise source. This receptor is known as R1.

The next closest noise sensitive receptor to the proposed mechanical plant location is deemed to be the façade of No. 1, Oaklands Drive. This receptor is approximately 20 metres from the proposed noise source. This receptor is known as R2.

The survey location which representative of these receptors is marked as F1 in figure 3.1 below.



Figure 3.1 Aerial view of site with survey location (F1), nearest receptor façades (R1, R2), and proposed A/C location (red)

3.3 Noise Monitoring Position and Methodology

Noise levels were measured between 06/05/25 and 08/05/25 using a single noise monitor, known as F1.

A sound level meter was attached to a tripod and positioned 2 metres above ground level in a location as possible to the identified receptor at least 3.5 metres from any reflective façades.

This location is seen to be representative of the ambient and background noise levels at the identified noise sensitive receptor façades of R1 and R2.

Due to distances and screening, compliance at these receptors will guarantee compliance at all other receptor locations.

3.4 Measurement Equipment and Environmental Conditions

The weather was dry and overcast for the duration of the survey with a high temperature of 16°C during the day and a low of 2°C during the night.

Wind speeds were below 5m/s⁻¹ for the duration of the noise surveying periods.

The conditions were seen to be good for conducting noise measurements.

The following noise measurement equipment as seen in table 3.2 was used for the survey.

Equipment	Serial Number	Calibration Date
Svantek SV 971A Type 1 Sound Level Meter	154269	22/07/24
Svantek SV 18A Preamplifier	154269	22/07/24
ACO 7152 Microphone	92781	15/07/24

Table 3.2 Measuring Equipment Used for Survey

3.5 Fixed Noise Monitoring Graph – F1

Figure 3.3 below provides a graph of the measured noise levels at survey position F1. The ambient (L_{Aeq}) and background (L_{A90}) noise levels are shown.

Measurements were taken over 15-minute periods.

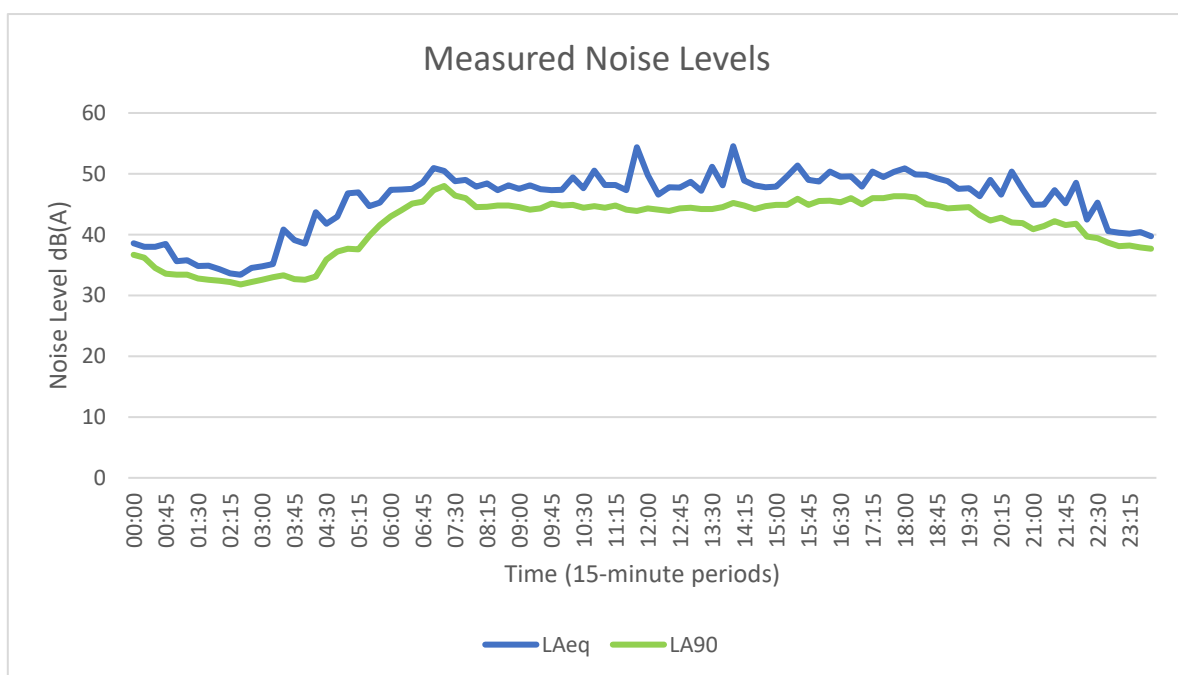


Figure 3.3 Long Term Measurement Graph – F1

3.6 Measured Noise Levels from Survey

To conduct an assessment in line with BS 4142, it is necessary to extrapolate the lowest typical representative background noise levels from the long-term survey data.

It is understood that the unit will operate during daytime hours, in line with the operating hours of the commercial premises. Therefore, the daytime background noise levels are deemed to be appropriate and reflective of the acoustic environment for this assessment.

These background daytime and night-time noise levels are presented in table 3.4 below.

Measurement Time Period	Assessment Background Noise Level, L_{A90} , dB
Day (07:00-23:00)	44
Night (23:00-07:00)	32

Table 3.4 Survey Noise Levels – Receptors R1, R2

The local authority requires a noise level that does not exceed a noise level that is 5 dB(A) below the existing background noise level.

The noise level from the heat pump should therefore not exceed 39 dB(A) at the receptor.

4.0 BS 4142: 2014 + A1: 2019 Noise Impact Assessment

4.1 Noise Source - Mitsubishi PUZ-M200YKA

The proposed installation is of three Mitsubishi PUZ-M200YKA air conditioning outdoor units.

The sound pressure level of one Mitsubishi PUZ-M200YKA unit operating at full capacity, based on the manufacturer's datasheet, is presented in table 4.1 below.

The spectrum is based on similar units as the spectrum has not been made available by the manufacturer. The unit is assumed to be measured at 1 metre distance, as is typical for the noise measurements of such units.

Noise Source	Octave Band Frequency							Lp, dB(A) 1.0m
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	
Mitsubishi PUZ-M200YKA	63	64	59	56	55	52	51	60

Table 4.1: Full capacity operation - Noise Source, Sound Pressure Level, dB

4.2 Rating Penalties

BS 4142: 2014 + A1: 2019 states that penalties can be applied to the rating level if acoustic features that increase the significance of the noise impact are present.

Rating penalties are determined based on tonality, impulsivity, and intermittency. The unit's frequency spectrum is generally broadband in nature and is not deemed to be tonal.

The noise from the unit is not deemed to be readily distinguishable against the existing acoustic environment, as determined by the assessment outcome below, as the rating level will be significantly below the background noise level. Furthermore, the unit will generally operate without impulse or intermittency that would be perceivable at the receptor.

Therefore, it does not incur any rating penalties in this assessment.

4.3 Source Directivity

Based on the installation site of the plant against the wall and ground, the noise from the unit will radiate in a semi-hemispherical pattern. To account for this type of acoustic propagation, a source directivity correction of 6dB (or radiation directivity index of 4) has been added to the final calculations.

4.4 Screening Correction

As a general rule, a barrier which removes the line of sight from the receptor to the noise source provides at least 10 dB of attenuation to the noise. This is in line with guidance from the Association of Noise Consultants (ANC) for this type of assessment. Where a receptor does not have a direct line of sight to a noise source behind a building or noise barrier that has a surface density of around 15kg/m^2 , such as closed-boarded timber fencing or wall, a screening correction can be applied to the calculation. The existing timber fence and building structure is seen to meet these criteria and will screen the receptor from the unit due to the unit's positioning (at back of the site). This fence will provide approximately 10 dB of screening to either receptor. This has been factored into the calculation. The fence must be maintained in its current condition in order to provide such a screening loss.



Figure 4.3: Site photo showing screening loss

4.5 Assessment Outcome

Calculations have been undertaken to determine the noise level of the proposed A/C installation at full capacity during the daytime period at the receptor in its proposed position.

Calculations show that when the mechanical plant is operational in its proposed location the rating level at the receptor R1 will be 36 dB(A).

Calculations show that when the mechanical plant is operational in its proposed location the rating level at the receptor R2 will be 35 dB(A).

The results are summarised in table 4.4 below. Supporting calculations can be seen in Appendix A.

The noise from the proposed units is 8 dB below the background noise level at the worst affected receptor (R1).

The noise from the proposed units is 9 dB below the background noise level at receptor R2.

In line with the guidance from BS 4142: 2014 + A1: 2019 and the local authority requirements, the noise from the proposal is therefore deemed to be acceptable.

Receptor	Assessment Background Noise Level (Daytime), LA90, dB	Target Rating Level (-5 dB below background noise level), LA90, dB	Rating Level at Receptor, LA _{r,Tr} , dB	Difference between Rating Level and Target Rating Level, dB
R1	44	39	36	-3
R2	44	39	35	-4

Table 4.4: Results of Assessment to BS 4142 – 100% capacity (proposed location)

5.0 Conclusion

5.1 Summary

Clear Acoustic Design has been appointed to carry out a noise impact assessment in relation to the proposed mechanical plant installation at Unit 7, Millars Business Park, Wokingham RG41 2TZ.

Proposals are for the installation of three air conditioning outdoor units.

The noise survey has been conducted to obtain the existing background noise level at the nearest noise sensitive receptor.

BS 4142: 2014 + A1: 2019 states that a rating level that does not exceed the existing background noise level is considered to have a low noise impact. This is typically deemed an acceptable outcome. The local authority requires a rating level that is 5 dB below the existing background noise level.

5.2 Outcome

Calculations have been undertaken to determine the noise level of the proposed mechanical plant at the façade of the nearest receptors.

The noise level from the mechanical plant will not exceed a noise level of 5 dB(A) below the background noise level, during the daytime period at the nearest noise sensitive receptor. The results are summarised in table 4.4 and full calculations can be found in Appendix A.

The noise impact at the nearest receptor is deemed to be 'low', as the rating level from the proposed plant does not exceed the existing background noise level.

This is an acceptable outcome in line with guidance from the local authority and BS 4142: 2014. BS 4142: 2014 + A1: 2019.

Appendix A – Calculations

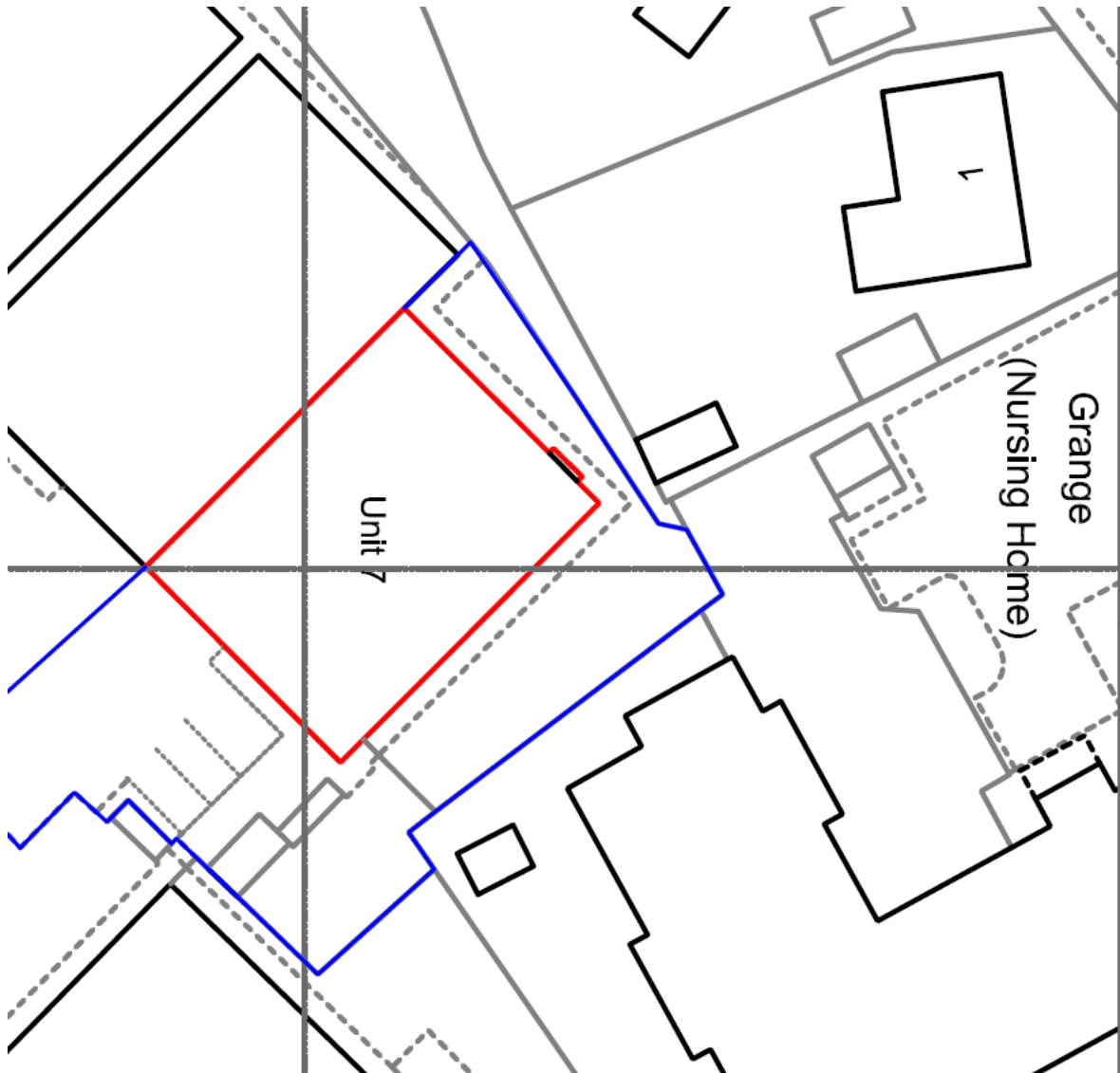
		Octave Band Centre Frequencies, Hz							dB(A)
		63	125	250	500	1000	2000	4000	
Lp from Mitsubishi PUZ-M200YKA		63.0	64.0	59.0	56.0	55.0	52.0	51.0	60.0
Distance measured at source (m)		1	1	1	1	1	1	1	
Source directivity correction (dB)		6	6	6	6	6	6	6	
Louvre loss		0	0	0	0	0	0	0	
Screening loss		10	10	10	10	10	10	10	
Distance to receptor (m)		17	17	17	17	17	17	17	
Lp at receptor		34.4	35.4	30.4	27.4	26.4	23.4	22.4	31.3
		Octave Band Centre Frequencies, Hz							dB(A)
		63	125	250	500	1000	2000	4000	
Lp from Mitsubishi PUZ-M200YKA		63.0	64.0	59.0	56.0	55.0	52.0	51.0	60.0
Distance measured at source (m)		1	1	1	1	1	1	1	
Source directivity correction (dB)		6	6	6	6	6	6	6	
Louvre loss		0	0	0	0	0	0	0	
Screening loss		10	10	10	10	10	10	10	
Distance to receptor (m)		17	17	17	17	17	17	17	
Lp at receptor		34.4	35.4	30.4	27.4	26.4	23.4	22.4	31.3
		Octave Band Centre Frequencies, Hz							dB(A)
		63	125	250	500	1000	2000	4000	
Lp from Mitsubishi PUZ-M200YKA		63.0	64.0	59.0	56.0	55.0	52.0	51.0	60.0
Distance measured at source (m)		1	1	1	1	1	1	1	
Source directivity correction (dB)		6	6	6	6	6	6	6	
Louvre loss		0	0	0	0	0	0	0	
Screening loss		10	10	10	10	10	10	10	
Distance to receptor (m)		17	17	17	17	17	17	17	
Lp at receptor		34.4	35.4	30.4	27.4	26.4	23.4	22.4	31.3
Combined SPL @ Receptor		39.2	40.2	35.2	32.2	31.2	28.2	27.2	36.1

Figure 1: Calculated rating level at receptor R1 (proposed location) – 100% capacity

	Octave Band Centre Frequencies, Hz							dB(A)
	63	125	250	500	1000	2000	4000	
Lp from Mitsubishi PUZ-M200YKA	63.0	64.0	59.0	56.0	55.0	52.0	51.0	60.0
Distance measured at source (m)	1	1	1	1	1	1	1	
Source directivity correction (dB)	6	6	6	6	6	6	6	
Louvre loss	0	0	0	0	0	0	0	
Screening loss	10	10	10	10	10	10	10	
Distance to receptor (m)	20	20	20	20	20	20	20	
Lp at receptor	33.0	34.0	29.0	26.0	25.0	22.0	21.0	29.9
	Octave Band Centre Frequencies, Hz							dB(A)
	63	125	250	500	1000	2000	4000	
Lp from Mitsubishi PUZ-M200YKA	63.0	64.0	59.0	56.0	55.0	52.0	51.0	60.0
Distance measured at source (m)	1	1	1	1	1	1	1	
Source directivity correction (dB)	6	6	6	6	6	6	6	
Louvre loss	0	0	0	0	0	0	0	
Screening loss	10	10	10	10	10	10	10	
Distance to receptor (m)	20	20	20	20	20	20	20	
Lp at receptor	33.0	34.0	29.0	26.0	25.0	22.0	21.0	29.9
	Octave Band Centre Frequencies, Hz							dB(A)
	63	125	250	500	1000	2000	4000	
Lp from Mitsubishi PUZ-M200YKA	63.0	64.0	59.0	56.0	55.0	52.0	51.0	60.0
Distance measured at source (m)	1	1	1	1	1	1	1	
Source directivity correction (dB)	6	6	6	6	6	6	6	
Louvre loss	0	0	0	0	0	0	0	
Screening loss	10	10	10	10	10	10	10	
Distance to receptor (m)	20	20	20	20	20	20	20	
Lp at receptor	33.0	34.0	29.0	26.0	25.0	22.0	21.0	29.9
Combined SPL @ Receptor	37.8	38.8	33.8	30.8	29.8	26.8	25.8	34.7

Figure 2: Calculated rating level at receptor R2 (proposed location) – 100% capacity

Appendix B – Site Plans



Appendix C – Glossary

Acoustic environment

Sound from all sound sources as modified by the environment.

Ambient sound

Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far. Note: the ambient sound comprises the residual sound and the specific sound when present.

Decibel (dB)

A relative unit for the measurement of sound. The dB is a logarithmic ratio between the measured level and a reference (threshold) level of 0dB.

dB(A)

The 'A' weighted sound pressure level, denoted as dB(A), is frequency filtering system which approximates under defined conditions the frequency response of the human ear. This weighting has been shown to correlate with a human's subjective response to noise.

Free field

The sound pressure level away from any reflecting surfaces. Measurements made 1.5m above the ground and at least 3m away from other reflecting surfaces are usually regarded as free field.

Hertz (Hz)

The frequency (or pitch) of a sound. 1 Hz = 1 cycle per second, 1 kHz = 1000 Hz, 2 kHz = 2000 Hz, etc.

$L_{Aeq,T}$ or 'ambient sound level'

The equivalent continuous sound level is a notional steady state level which over a quoted time period would have the same acoustic energy content as the actual fluctuating noise measured over that period. $L_{Aeq,16hour}$ (07:00 to 23:00 hours) and $L_{Aeq,8hour}$ (23:00 to 07:00 hours) are used to qualify daytime and night-time noise levels. Also known as the ambient noise level.

$L_{Ar,Tr}$ or 'rating level'

The 'rating level', as described in BS 4142: 2014 + A1: 2019 is the specific noise source plus any adjustment for the characteristic features of the sound.

L_{A90} or 'background noise level'

The A-weighted sound level which is exceeded for 90% of the measurement period. i.e. The level exceeded for 54 minutes of a 1 hour measurement – used as a measure of the 'background noise level'.

Maekawa formula

A method for predicting the barrier attenuation arising from diffraction, developed by Maekawa, based on path difference.

Residual sound level

The ambient sound level when the specific sound is not operational.

Specific sound level

Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval.

Specific sound source

The sound or noise source that is being assessed.

Sound pressure level (L_p)

A logarithmic measure of the effective pressure of a sound relative to a reference value, defined in dB (decibel). Sound pressure is the local deviation from the ambient air pressure caused by a sound wave. As the pressures to which the human ear responds can range from 20 μ Pa to 200 Pa, a linear measurement of sound levels would involve many orders of magnitude. Consequently, the pressures are converted to a logarithmic scale and expressed in decibels (dB) as follows:

$$L_p = 20 \log_{10}(p/p_0)$$

Where L_p = sound pressure level in dB; p = RMS sound pressure in Pa; and p_0 = reference sound pressure (20 μ Pa).

Sound power level (L_w)

The total sound energy radiated by a sound source. This is a property of the noise-emitting object itself and does not change depending on where you are in relation to said object.

Source directivity

A measure of the directional characteristic of a sound source. It is often expressed as a Directivity Index in decibels, or as a dimensionless value of Q . The directional characteristics of a sound source are highly influenced by nearby reflecting surfaces.