Sound Licensing Ltd.
Suite 4, Broxbourne Business Centre
New River Trading Estate
Cheshunt
Herts EN8 0NL

T: +44 (0) 20 7096 1555
www.soundlicensing.co.uk
enquiries@soundlicensing.co.uk

NOISE IMPACT ASSESSMENT REPORT – MECHANICAL PLANT

152A AGAR GROVE, LONDON NW1 9TY

FOR

MR R BEQIRI

ISSUE STATUS: FINAL
DATE OF ISSUE: 18/01/2021
AUTHOR: L ANKERS DIP ACOUSTICS
CHECKED: M LAUEZZARI, MIOA MIOL
APPROVED: M LAUEZZARI, MIOA MIOL

Contents Page

1. EXECUTIVE SUMMARY

The Client intends to seek planning approval for the installation of mechanical plant (4 No. Air Conditioning Units) to service the premises at 152A Agar Grove, London NW1 9TY.

Sound Licensing has undertaken an environmental noise survey at the site in order to determine prevailing background noise levels that are representative of the nearest noise sensitive properties, which have been identified as the second-floor residential premises at 152B Agar Grove and the residential premises at 154 Agar Grove.

The results of the noise survey are considered reasonable given the location of the measurement position and the existing noise sources in the local vicinity.

Noise calculations of the mechanical plant have been undertaken using all available details and plans provided by the client and obtaining manufacturers' specifications wherever possible. The data and information form the basis of the assessment.

Noise break-out limits for the mechanical plant have been proposed based on the methodologies of British Standard (BS) 4142:2014 and in accordance to Local Authority policy. A robust, worst-case assessment of the noise levels associated to the proposed mechanical plant has been undertaken.

In accordance with BS 4142:2014 guidance, the predicted noise impact due to the operation of the mechanical plant ***"is an indication of the specific sound source having a low impact"***. The predicted noise level of the mechanical plant inside the nearest noise sensitive properties is considered to comply with BS8233:2014 internal/external noise guidelines and the London Borough of Camden Council's policy.

2. INTRODUCTION

The client is proposing to install 4 (No.) new air conditioning units, 2 (No.) located at the front and 2 (No.) located at the rear of 152A Agar Grove, London NW1 9TY, the noise from which could have the potential to affect existing noise sensitive properties nearby.

The purposes of this report are:

- To determine prevailing environmental noise levels affecting surrounding properties due to nearby noise sources (e.g. road traffic, aircraft etc);
- Based on the above, to present noise emission limits in accordance with the requirements of BS 4142:2014 and Local Authority policy, and
- To undertake an assessment to demonstrate compliance with the Local Authority noise requirements.
- To demonstrate compliance with BS8233:2014/WHO external and internal guidelines.

3. SITE DESCRIPTION

Planning permission is being sought for the installation of 4 (No.) air conditioning units to service the premises at 152A Agar Grove, London NW1 9TY (hereafter referred to as 'the site'). The property is a traditionally built four-storey terraced building in the London Borough of Camden. It is located in a mainly residential area with some commercial units to the east. Also east of the site is the busy junction of the A5200 and Agar Grove.

The nearest sensitive residential receptors were noted to be the ground-floor windows located on the rear façade of 154 Agar Grove and the second-floor windows located on the front façade of 152B Agar Grove. At approximate distances of:

154 Agar Grove Rear Façade: 3m
152B Agar Grove Front Façade: 7m

The nearest sensitive receptors are identified in figure 3.1. If the noise impact assessment details that there is an indication of the specific sound source having a low impact at these premises then it can be safely assumed it will be met at other properties of equal distance and/or those further away.

Figure 3.1 shows the site highlighted in **blue** with the nearest noise sensitive premises highlighted in **red**.

Figure 3.1 Site Location and Surrounding Land Use

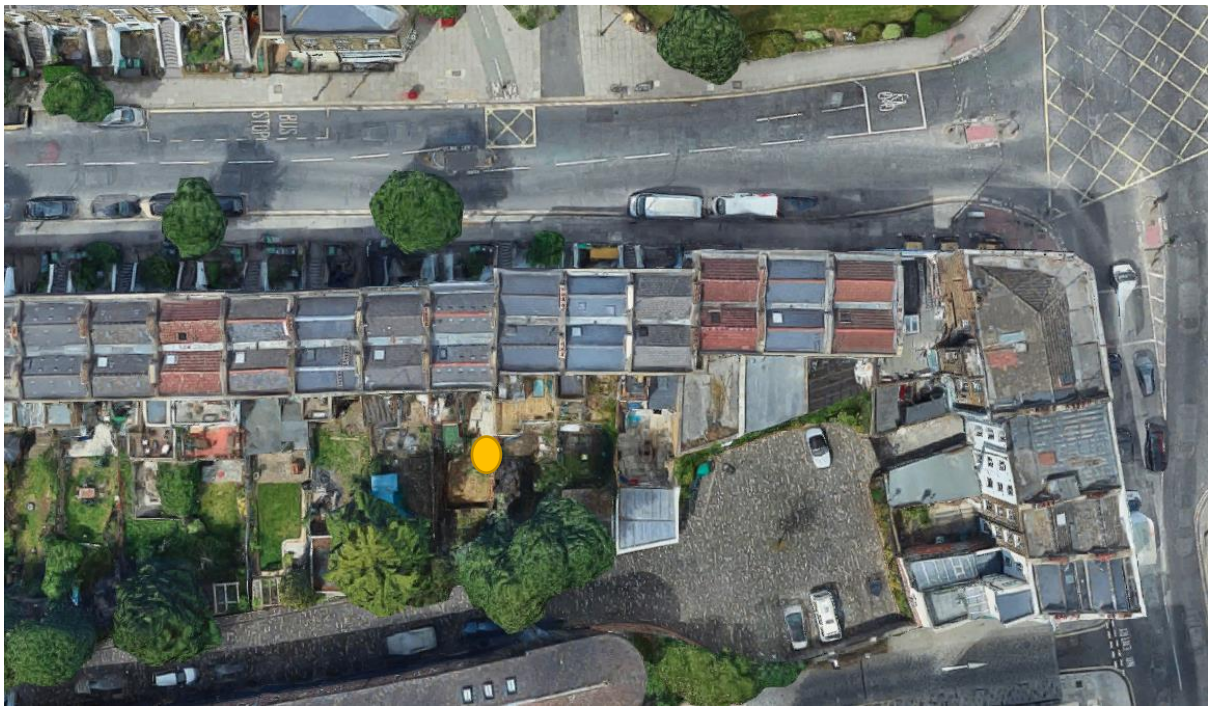
Source: Google Maps

4. ENVIRONMENTAL NOISE SURVEY METHODOLOGY

An unmanned environmental noise survey was undertaken at a single measurement location at ground-floor level to the rear of the site. The survey was undertaken between 12:00 hours on the 11th January and 11:15 hours on the 13th January 2020. A survey at this time covers the most sensitive period of time in which the mechanical plant may be operational.

Ambient, background and maximum noise levels (L_{Aeq}, L_{A90} and L_{Amax} respectively) were measured throughout the noise survey in continuous 15-minute periods. The approximate measurement position is indicated in **orange** on Figure 4.1 below.

Figure 4.1 Site Plan Showing Approximate Location of Measurement Position



Source: Google Maps

The sound level meter microphone was positioned on a tripod at a height of 2 metres, 4 metres from the rear façade of the building at ground floor level. The position is considered to be in free-field and therefore no façade correction will be applied. The monitoring position is considered representative of background noise levels at the nearest identified noise sensitive properties. The monitoring position was chosen for equipment security reasons also.

The equipment used for the noise survey is summarised in Table 4.1.

Table 4.1 Description of Equipment used for Noise Survey

Equipment	Description	Quantity	Serial Number
Larson Davis Sound Expert LxT	Type 1 automated logging sound level meter	1	0004720
Larson Davis 377B02	½" microphone	1	159605
Larson Davis	Pre-amplifier	1	042612
Larson Davis CAL200	Class 1 Calibrator	1	12245

The noise survey and measurements were conducted in accordance with BS7445-1:2003 '*Description and measurement of environmental noise. Guide to quantities and procedures'*.

Weather conditions throughout the entire noise survey period were noted to be cold (approx. 0-10° Celsius), broken clouds (0 to 70% cloud cover approximately) with a light wind (<5m/s) and some precipitation on 13/01/2021. These weather conditions were checked against and confirmed by the use of the Met Office mobile application available on smart phone technology. These conditions were maintained throughout the majority of the survey period and are considered reasonable for undertaking environmental noise measurements.

The noise monitoring equipment was field calibrated before and after the noise survey period. No significant drift was recorded (±0.3 dB). Equipment calibration certificates can be provided upon request.

5. NOISE SURVEY RESULTS AND OBSERVATIONS

5.1 Results

A summary of the measured ambient and background noise levels during the proposed operational hours are shown in Table 5.1 below (full monitoring data can be found in Appendix C).

Table 5.1 Measured ambient and typical background sound pressure levels

Date / Period (hours)	Ambient Sound Pressure Level, dB $L_{Aeq,T}$	Typical Background Sound Pressure Level, dB $L_{A90,T}$
11/01/2021(12:00 to 23:00)	**48-52**	**47**
11/01/2021 – 12/01/2021 (23:00 to 07:00)	**45-53**	**42**
12/01/2021(07:00 to 23:00)	**46-61**	**43**
12/01/2021 – 13/01/2021 (23:00 to 07:00)	**41-49**	**38**
13/01/2021(07:00 to 11:30)	**48-49**	**45**

Day Time 1-hour measurements and Night-Time 15-minute measurements

The lowest typical background noise level at the measurement position during the survey, at the time in which the plant could be operational, is **38dB** $L_{A90,15min}$.

5.2 Observations

Given that the noise survey was unmanned, noise sources could not be identified. However, at the beginning and end of the survey background noise was dominated by noise from the vehicles on the local road network. After analysis of the data no significant abnormal noise source(s) were identifiable. It is considered that the measured noise levels are reasonable given the location of the measurement position.

6. EXTERNAL NOISE EMISSION LIMITS

6.1 Local Authority Requirements

The site lies within the jurisdiction of the Local Authority, Camden Borough Council. The following requirements for commercial plant have previously been requested by the Local Authority:

"Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion."

For the purposes of this report, an assessment has been undertaken in line with BS 4142:2014. A design criterion of achieving a minimum 10dB(A) below the background noise level has been adopted in line with the Local Authorities policy. Taking the noise monitoring data in Section 5 and Local Authority requirements above, the following design target has been adopted for mechanical plant as provided in Table 6.1.

Table 6.1 Maximum noise emission design target at residential premises

Date / Period (hours)	Lowest Typical Background Sound Pressure Level, dB $L_{A90,15min}$	Rating noise level at nearest residential facade, dB $L_{Aeq,T}$
12/01/2021 – 13/01/2021 (23:00 to 07:00)	**38**	**28**

6.2 BS 4142:2014

BS 4142:2014 "Methods for rating and assessing industrial and commercial sound" presents a method for assessing the significance and possible adverse impact due to an industrial noise source, based on a comparison of the source noise levels and the background noise levels, both of which are measured or predicted at a noise sensitive receiver e.g. a residential property.

The specific noise level due to the source is determined, with a series of corrections for tonality, impulsivity, intermittency or other unusual characteristic. The rating level is then compared to the background noise level and the significance of the new noise source likelihood of any adverse impact is determined in accordance with the following advice:

"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 occur. A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context. A difference of around +5 dB 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."

6.3 BS 8233:2014

This report will demonstrate that the maximum noise emission from the proposed mechanical plant will meet BS 8233:2014 and World Health Organisation guideline noise values.

Local Authorities usually stipulate internal and external noise criteria for residential uses based on British Standard 8233:2014 'Guidance on Sound Insulation and noise reduction for buildings'. BS 8233:2014 provides references and guideline values for desirable indoor ambient noise levels for dwellings as shown in Table 6.2 below.

Table 6.2 BS 8233:2014 Desirable Internal Ambient Noise Levels for Dwellings

Activity	Location	07:00 to 23:00	23:00 to 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 $L_{Aeq,8hour}$

The table is noted to apply to external noise as it affects the internal acoustic environment from sources without a specific character. BS 8233:2014 states that '*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 an upper guideline value of 55dB* L_{Aeq}'. The BS 8233:2014 standards are considered to be consistent with the principle aims of Hammersmith and Fulham's planning policies and the National Planning Policy Framework.

The World Health Organisation's 'Guidelines for Community Noise' (1996) provides critical health effects for outdoor living spaces: the onset of serious annoyance is 55dB L_{Aeq} daytime and evening hours (07:00 – 23:00 hours), and the onset of moderate annoyance is 50dB L_{Aeq} daytime and evening hours (07:00 – 23:00 hours). WHO also provides critical health effects for internal living spaces: to not interrupt speech intelligibility and onset moderate annoyance, noise levels should not exceed 35dB L_{Aeq} daytime and evening hours (07:00 – 23:00 hours). For inside bedrooms, to avoid sleep disturbance, noise levels should not exceed 30dB L_{Aeq} daytime and evening hours (23:00 – 07:00 hours).

7. PROPOSED AIR CONDITIONING UNITS AND ASSOCIATED NOISE LEVELS

It is proposed to install the following items of plant at the front and rear of the premises.

Table 7.0 Proposed Air Conditioning Units

External Plant Item	Make	Model	Quantity	Reference Noise Level* $L_{W(A)}$
Air Conditioning Units	Mitsubishi	SRC35ZSP-W	4	60dB(A)

*Reference sound power levels. Manufacturer's specifications are provided in Appendix B.

In reference to section 6 of this report, a penalty addition (+3dB) has been applied for intermittency as the units will switch on & off as and when required. Penalty additions have not been applied for tonality as manufacturers' data shows no significant characteristics, or for impulsiveness as it is considered that these characteristics will not be perceptible sufficient to attract attention at the noise receptors. Penalty additions have not been applied for any other sound characteristics as mechanical plant of this type generally do not demonstrate such features.

7.1 Partial Enclosure

The units will be placed inside partial enclosures. The enclosures will have an opening on one side to allow for access and maintenance. Due to this there will be no line of site to the units from any sensitive receptor. The path difference due to the enclosure at the front of the property provides the attenuation shown in table 7.1 below.

Table 7.1 Front Façade Barrier Attenuation

63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
5.7	6.5	7.7	9.5	11.7	14.2	17.0	19.8

7.2 Rear Façade Attenuation (Partial Enclosure and Building Screening)

Due to the positioning of the air conditioning units at the rear, there will also be significant building screening, due to the close boarded fence next to the unit's enclosure, from the nearest residential receptor so there will be no direct line of sight, therefore attenuation due to barrier loss has also been considered (calculations are provided in Appendix D).

Table 7.2 Rear Façade Barrier Attenuation

63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
10.4	12.8	15.4	18.3	21.2	24.1	27.1	30.1

8. NOISE IMPACT ASSESSMENT

This section presents calculations to predict the noise impact of the proposed air conditioning units, located at the site, at the nearest noise sensitive properties.

8.1 Proposed Operational Hours and Background Noise Levels

The air conditioning units will operate as required 24 hours-a-day, 7 days-a-week.

The lowest typical background noise level at the measurement position during the survey is **38dB** $L_{A90,15min.}$ The design range is **28dB** $L_{Aeq,T}$ at the façade of the nearest residential premises.

8.2 Nearest Noise Sensitive Properties

The nearest sensitive residential receptors were noted to be the ground-floor windows located on the rear façade of 154 Agar Grove and the second-floor windows located on the front façade of 152B Agar Grove. At approximate distances of:

154 Agar Grove Rear Façade: 3m
152B Agar Grove Front Façade: 7m

8.3 Description of Calculation Process

In accordance with the methodologies of BS 4142:2014, calculations have been undertaken to predict noise levels in which the air conditioning units could be operational at their maximum level. Given the distances between the noise sources and the noise sensitive receptors, point source calculations have been used.

8.4 Noise Level Predictions

Calculations to predict the noise of the air conditioning units operating at the facade of the residential properties is given below. Full calculations are provided in Appendix D.

The rating noise level at 154 Agar Grove, with the mechanical plant operating, is predicted to be **31dB** $\mathbf{L_{Aeq,T}}$ which is **7dB(A) below** the lowest typical background noise level (38dB $L_{A90,\ 15min}$).

The rating noise level at the 152B Agar Grove, with the mechanical plant operating, is predicted to be **30dB** $\mathbf{L_{Aeq,T}}$ which is **8dB(A) below** the lowest typical background noise level (38dB $L_{A90,\ 15min}$).

In accordance with BS 4142:2014 guidance, noise from the mechanical plant ***"is an indication of the specific sound source having a low impact"***. *The lower the rating level is relative to the measured background level, the less likely it is that the specific sound source will have an adverse impact.*

8.5 Reasonable Mitigation

The London Borough of Camden Council's Policy sometimes accepts applications between 5 and 10dB below the measured background level with mitigating circumstances. Due to the low measured night-time level and design criterion, it is considered that BS8233:2014 provides more suitable guidelines.

Table C: Noise levels applicable to proposed industrial and commercial developments (including plant and machinery)

Existing Noise sensitive receptor	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings**	Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)	Day	'Rating level' 10dB* below background	'Rating level' between 9dB below and 5dB above background	'Rating level' greater than 5dB above background
Dwellings**	Outside bedroom window (façade)	Night	'Rating level' 10dB* below background and no events exceeding 57dBL_{Amax}	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dB L_{Amax}	'Rating level' greater than 5dB above background and/or events exceeding 88dBL_{Amax}

The greatest predicted external noise level at the nearest residential receptor is 31dB $L_{Aeq,T}$ and below the level in which the WHO states that the onset of moderate and serious annoyance from external noise begins. The predicted external noise level is also below the upper guideline value of 55dB $L_{Aeq,16hour}$ (07:00 – 23:00 hours) of BS 8233:2014 desirable external noise levels.

BS 8233:2014 states that attenuation provided by a slightly open window is 15dB. Taking this into account, the greatest predicted internal noise level, with the units in normal operation, inside the residential premises under assessment would be 16dB $L_{Aeq,T}$ which does not exceed the desirable internal noise level provided in BS 8233:2014 for daytime & night-time periods. The predicted internal noise level is also below the guideline values of 35dB $L_{Aeq,16hour}$ (07:00 – 23:00 hours) & 30dB $L_{Aeq,8hour}$ (23:00 – 07:00 hours) at which the WHO guidance states that critical health effects begin.

In accordance with BS 4142:2014 guidance, the rating noise, with the recommended mitigation measures installed, ***"is an indication of the specific sound source having a low impact"***. *The lower the rating level is relative to the measured background level, the less likely it is that the specific sound source will have an adverse impact*.

8.6 Vibration

In addition to the control of airborne noise transfer, it is important to consider the transfer of noise as vibration to adjacent properties as well as any sensitive areas of the same building. Vibration from the units are not expected, however, as a precaution plant should wherever possible be installed on suitable type isolators.

Uncertainty

The levels of uncertainty in the data and calculations are considered to be low given the robust exercise undertaken in noise monitoring and the confidence in the data statistical analysis. Manufacturers' data for the plant is highly likely to be robust. Detailed calculations and resultant noise levels at the residential location are considered to be confidently predicted.

9. CONCLUSION

Sound Licensing has undertaken an environmental noise survey at the site in order to determine prevailing background noise levels that are representative of the nearest noise sensitive properties. The operation of the air conditioning units, in accordance with BS 4142:2014 guidance, indicates to creating a low impact. All worst-case scenarios have been applied to the assessment. The predicted cumulative operating noise level of the air conditioning units is demonstrated to comply with BS8233:2014 and the London Borough of Camden Council's policy.

APPENDIX A – Acoustic Terminology

Parameter	Description
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
Ambient sound level, La = LAeq,T	Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T
Background sound level, LA90,T	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 weighting F and quoted to the nearest whole number of decibels
Decibel (dB)	A logarithmic scale representing the sound pressure or power level relative to the threshold of hearing ($20x10^{-6}$ Pascals).
Equivalent continuous A-weighted sound pressure level, LAeq,T	Value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, T = t2 – t1, has the same mean-squared sound pressure as a sound that varies with time
Measurement time interval, Tm	Total time over which measurements are taken
Rating level, LAr,Tr	Specific sound level plus any adjustment for the characteristic features of the sound
Reference time interval, Tr	Specified interval over which the specific sound level is determined
Residual sound	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound
Residual sound level, Lr = LAeq,T	Equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T
Specific sound level, Ls = LAeq,Tr	Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, Tr
Specific sound source	Sound source being assessed

References:

BS 4142:2014 'Methods for rating and assessing industrial and commercial sound'
BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings'

APPENDIX B – Data Sheets and Figures

Mitsubishi SRC35ZSP-W Data Sheet

Product Data sheet for SRK35ZSP-W / SRC35ZSP-W — Single Split RAC - Wall Mounted

MITSUBISHI HEAVY INDUSTRIES AIR CONDITIONING EUROPE

SRK35ZSP-W / SRC35ZSP-W

3.2(0.9~3.7)

Indoor Unit : SRK35ZSP-W

Outdoor Unit : SRC35ZSP-W

Specifications

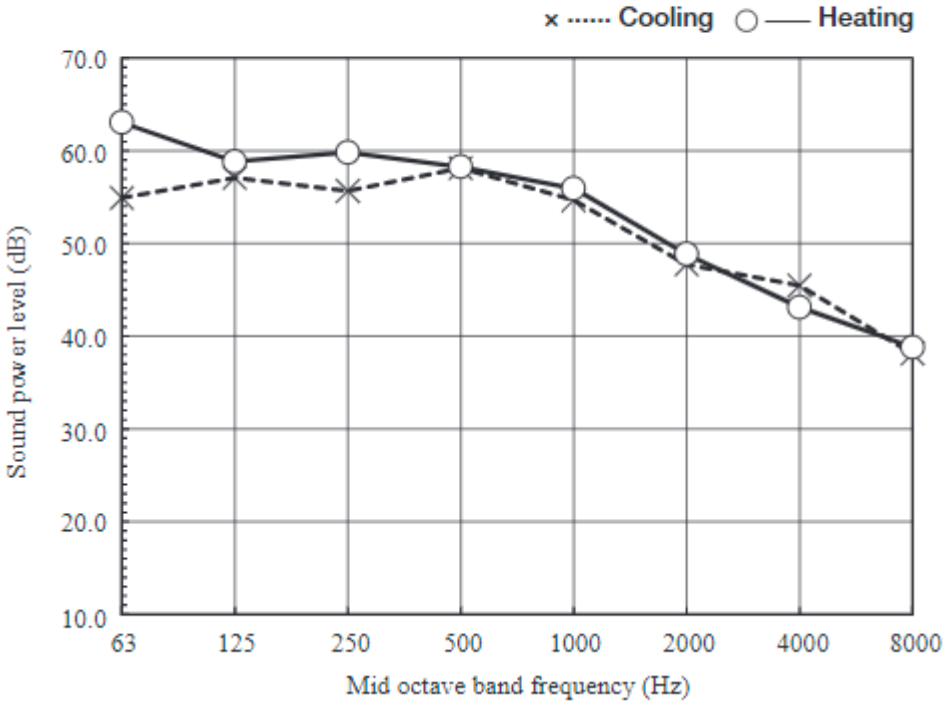
Indoor unit				SRK35ZSP-W
Outdoor unit				SRC35ZSP-W
Power source				1 Phase, 220 - 240V, 50Hz
Nominal cooling capacity (Min~Max)			kW	3.2(0.9~3.7)
Nominal heating capacity (Min~Max)			kW	3.6(1.0~4.6)
Power consumption		Cooling/Heating	kW	0.910 / 0.930
EER/COP		Cooling/Heating		3.52 / 3.87
Max. running current			A	9
Sound power level	Indoor	Cooling/Heating	dB(A)	58 / 58
	Outdoor	Cooling/Heating		59 / 60
Sound pressure level	Indoor	Cooling (Hi/Me/Lo/Ulo)		45 / 36 / 23
		Heating (Hi/Me/Lo/Ulo)		44 / 36 / 28
	Outdoor	Cooling/Heating		48 / 48
Air flow	Indoor	Cooling (Hi/Me/Lo/Ulo)	m3/min	9.5 / 6.8 / 4.2
		Heating (Hi/Me/Lo/Ulo)		9.6 / 7.4 / 5.5
	Outdoor	Cooling/Heating		22.8 / 22.0
Exterior Dimensions	Indoor	Height x Width x Depth	mm	267 x 783 x 210
	Outdoor			540 x 645(+57) x 275
Net weight	Indoor / Outdoor		kg	7.0 / 28.5
Refrigerant		Type/GWP		R32 / 675
Refrigerant		Charge	kg/TCO2Eq	0.68 / 0.459
Refrigerant piping size		Liquid/Gas	ø mm	6.35(1/4") / 9.52(3/8")
Refrigerant line (one way) length			m	Max. 15
Vertical height differences		Outdoor is higher/lower	m	Max. 10 / Max. 10
Outdoor operating temperature range		Cooling	°C	-15~46
		Heating		-15~24
Clean filter				-
Energy Class (Cooling/Heating)				A++/A+
SEER				7.30
SCOP (Average climate)				4.40
Pdesign (cooling/heating(@-10°C))			kW	3.20/3.00
Annual Electricity Consumption (cooling/heating)			kWh/a	155/955
Designated Heating Season				Average

• The data is measured under the following conditions(ISO-T1, H1). Cooling: Indoor temp. of 27°CDB, 19°CWB, and outdoor temp. of 35°CDB. Heating: Indoor temp. of 20°CDB, and outdoor temp. of 7°CDB, 6°CWB.
• Sound level indicates the value in an anechoic chamber. During operation these values are somewhat higher due to ambient conditions.
• 'tonne(s) of CO2 equivalent' means a quantity of greenhouse gases- expressed as the product of the weight of the greenhouse gases in metric tonnes and of their global warming potential.
*SEER/SCOP are based on EN14825:2016 and Commission regulation (EU) No.2016/2281

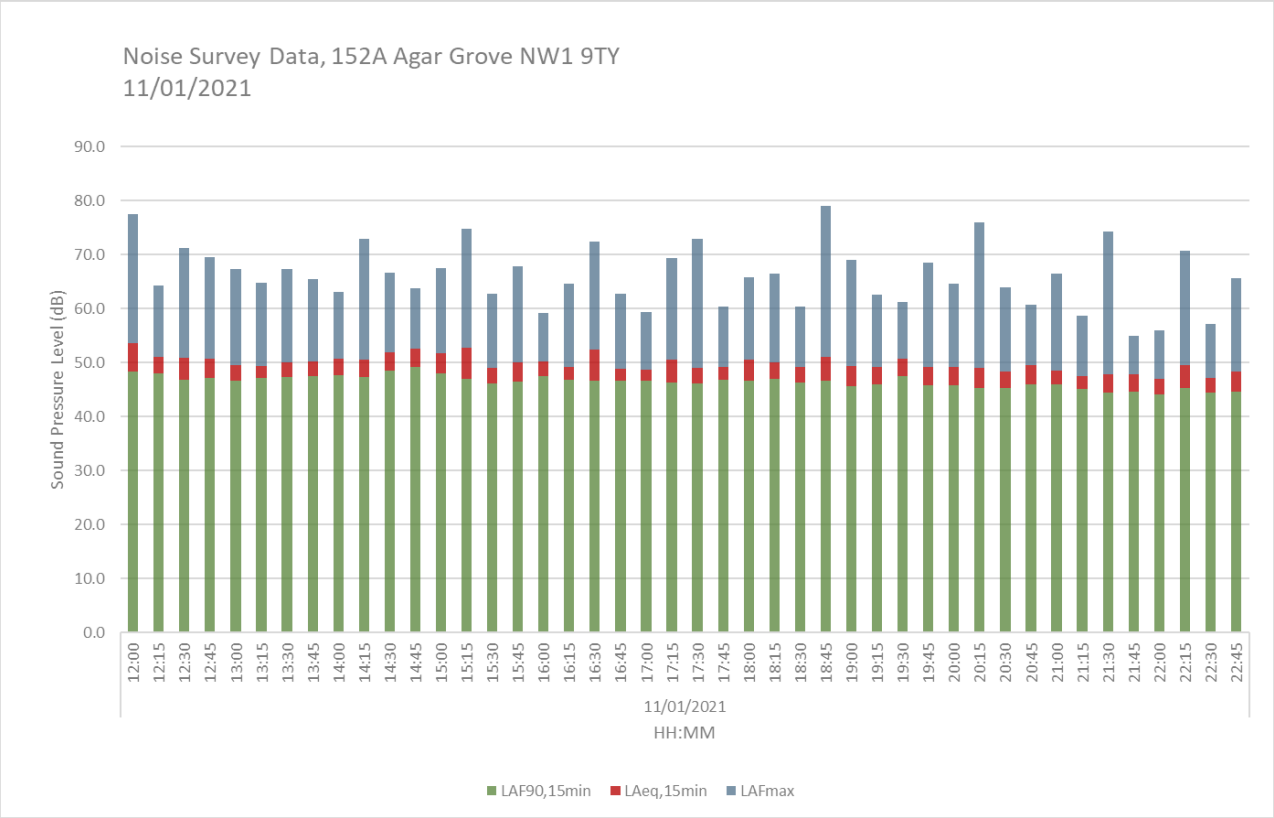
Mitsubishi SRC35ZSP-W Acoustic Data

(Outdoor unit)

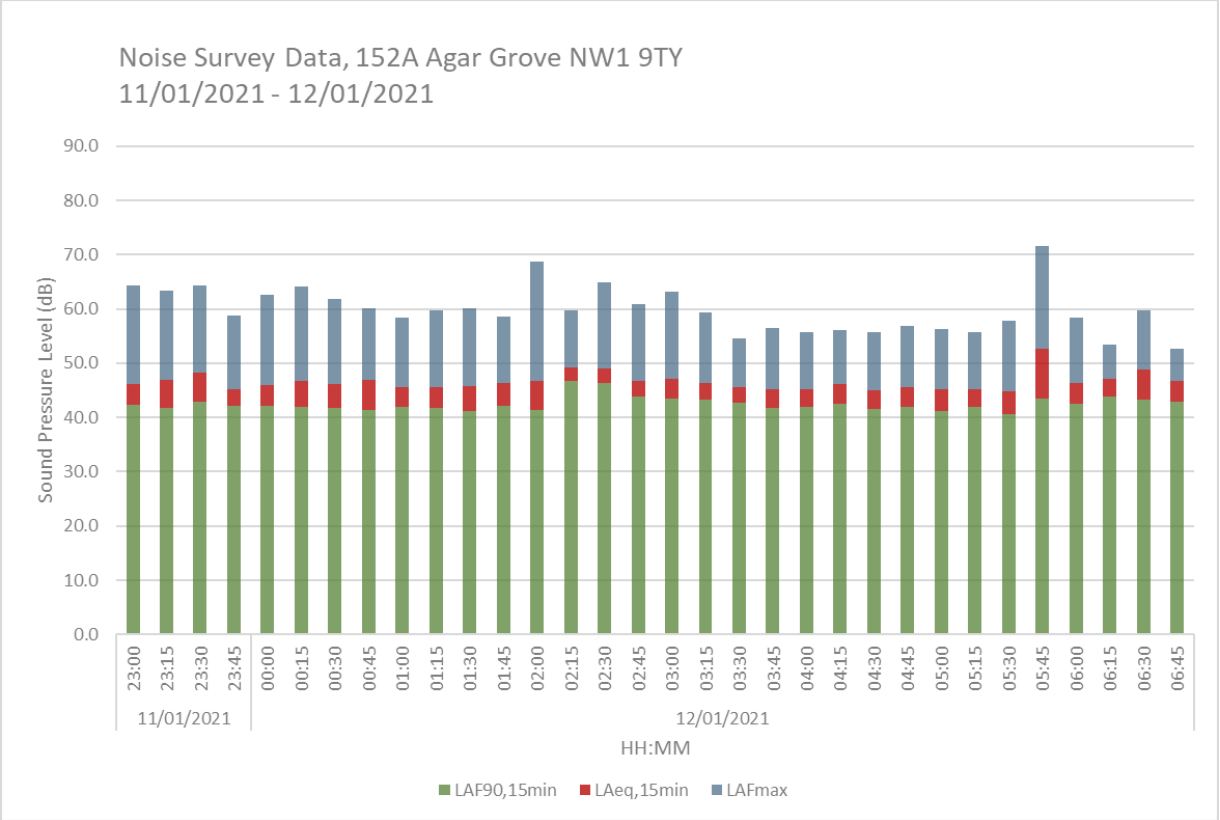
Model	SRC35ZSP-W	
Noise level	Cooling	59 dB(A)
	Heating	60 dB(A)



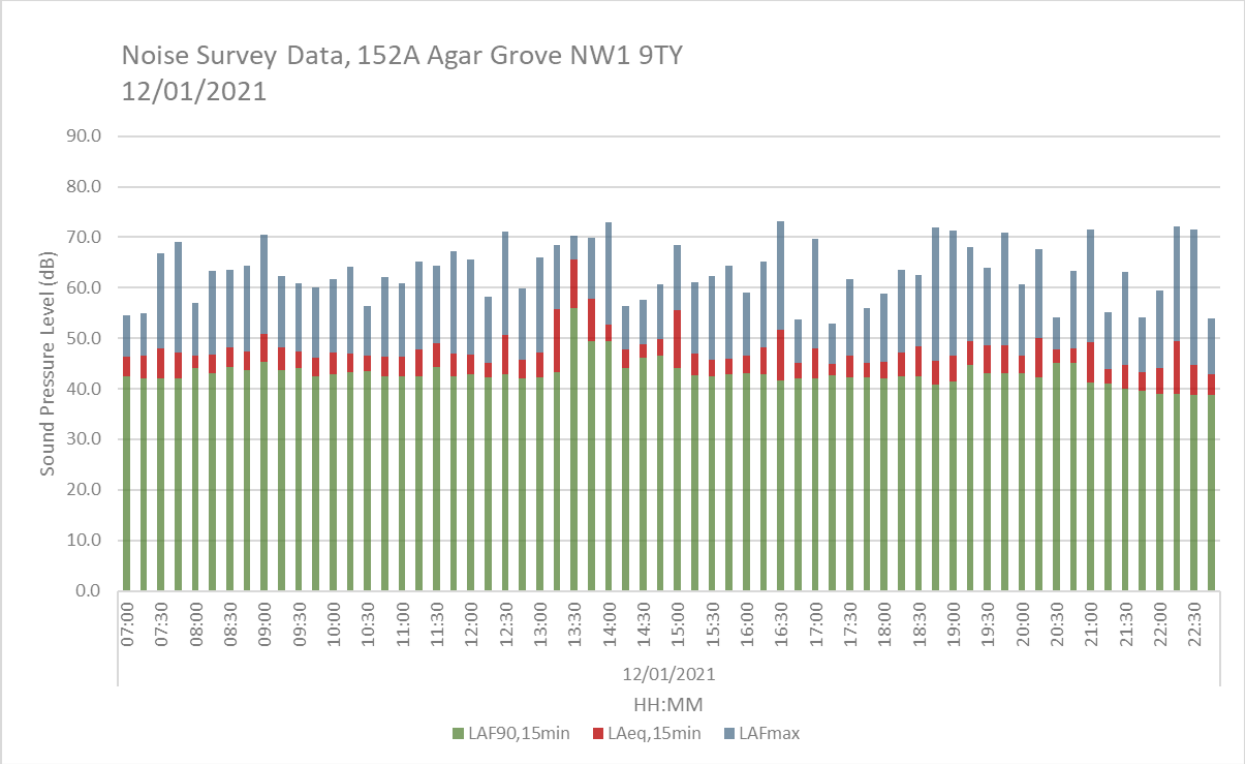
APPENDIX C – Noise monitoring Data



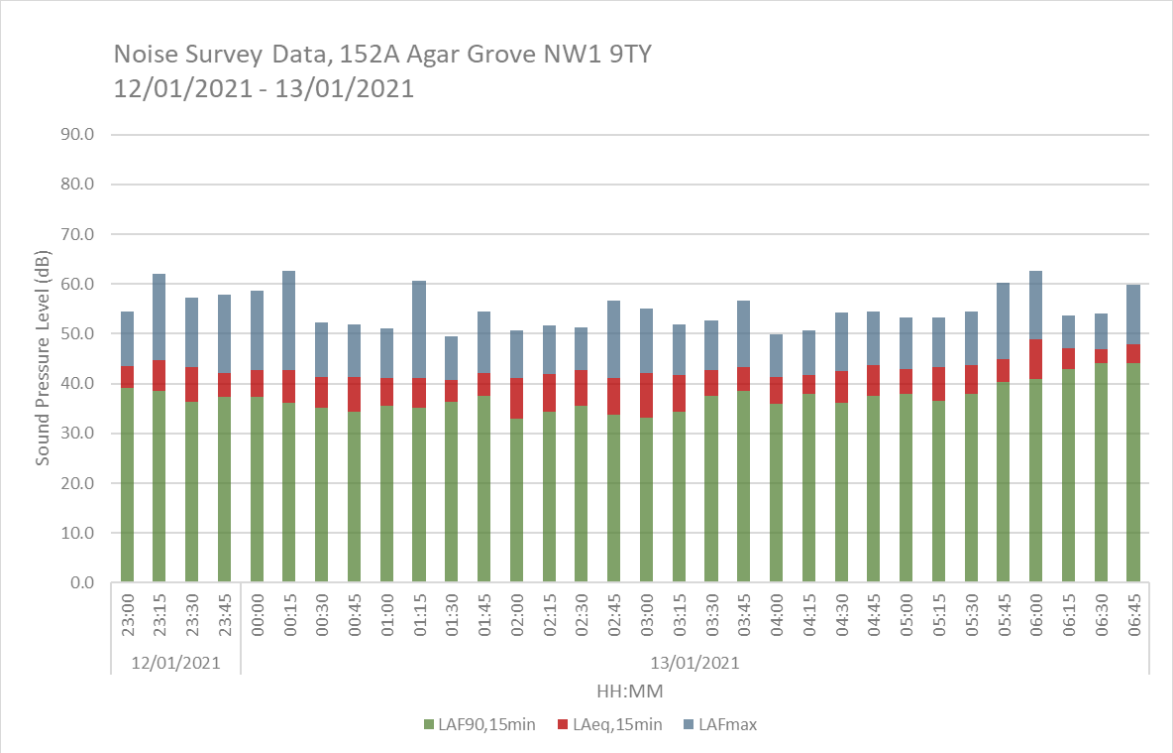
Date	Time	$L_{Aeq,15min}$	L_{AFmax}	$L_{AF90,15min}$	$L_{Aeq,1hour}$	$L_{AF90,1hour}$	Date	Time	$L_{Aeq,15min}$	L_{AFmax}	$L_{AF90,15min}$	$L_{Aeq,1hour}$	$L_{AF90,1hour}$
11/01/2021	12:00	53.6	77.6	48.3	51.8	47.6	11/01/2021	18:00	50.5	65.8	46.7	50.3	46.7
	12:15	51.1	64.3	48.0				18:15	50.1	66.6	47.0		
	12:30	51.0	71.2	46.8				18:30	49.2	60.4	46.3		
	12:45	50.7	69.6	47.2				18:45	51.0	79.0	46.6		
	13:00	49.6	67.3	46.6	49.8	47.2		19:00	49.4	69.0	45.7	49.7	46.3
	13:15	49.3	64.8	47.2				19:15	49.2	62.5	46.0		
	13:30	50.1	67.3	47.3				19:30	50.7	61.2	47.5		
	13:45	50.2	65.6	47.6				19:45	49.2	68.6	45.9		
	14:00	50.7	63.0	47.7	51.5	48.3		20:00	49.3	64.7	45.8	49.0	45.6
	14:15	50.6	72.9	47.3				20:15	49.0	76.0	45.3		
	14:30	52.0	66.6	48.5				20:30	48.3	64.0	45.3		
	14:45	52.5	63.8	49.3				20:45	49.5	60.8	46.0		
	15:00	51.7	67.5	48.1	51.1	47.0		21:00	48.6	66.5	46.0	48.0	45.1
	15:15	52.7	74.8	47.1				21:15	47.5	58.7	45.2		
	15:30	49.1	62.9	46.2				21:30	47.9	74.4	44.4		
	15:45	50.0	67.8	46.5				21:45	47.9	54.9	44.7		
	16:00	50.3	59.2	47.5	50.5	46.9		22:00	47.1	55.9	44.2	48.2	44.6
	16:15	49.2	64.6	46.9				22:15	49.5	70.8	45.3		
	16:30	52.5	72.4	46.7				22:30	47.2	57.3	44.4		
	16:45	48.9	62.7	46.6				22:45	48.4	65.6	44.6		
	17:00	48.8	59.3	46.6	49.5	46.5							
	17:15	50.6	69.4	46.3									
	17:30	49.0	73.0	46.1									
	17:45	49.2	60.4	46.8									



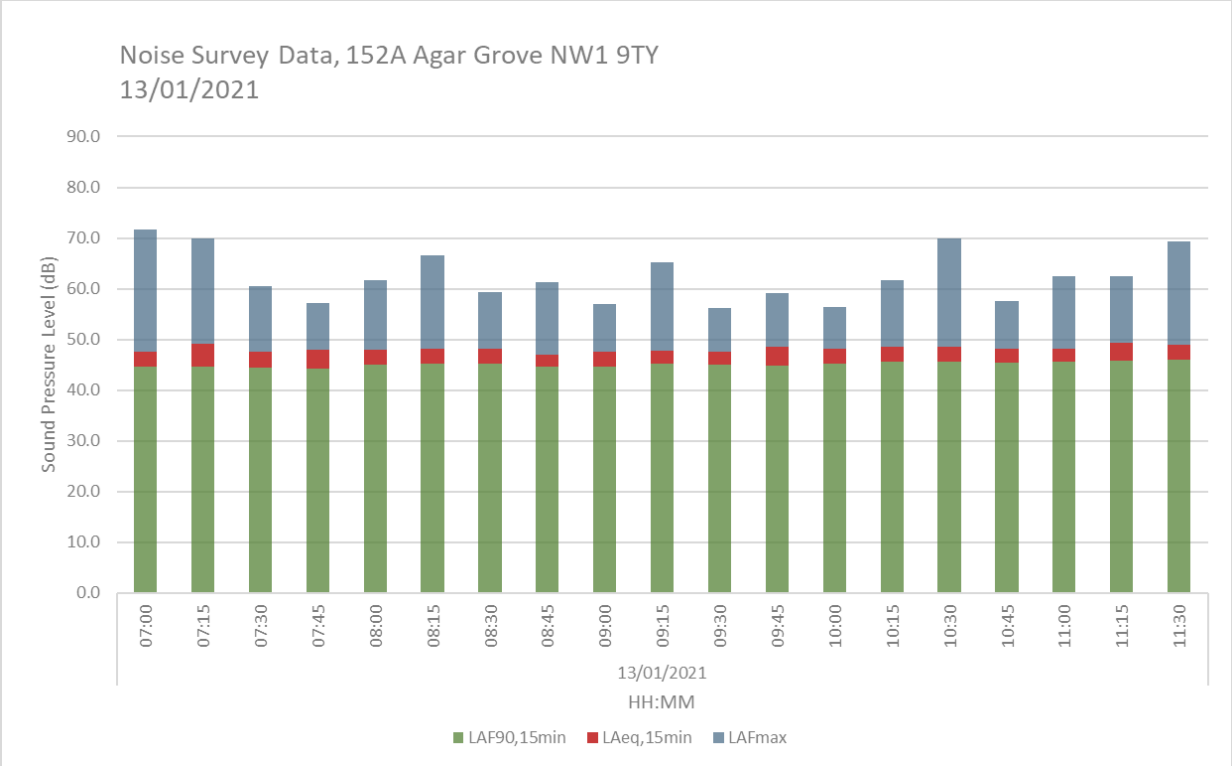
Date	Time	$L_{Aeq,15min}$	L_{AFmax}	$L_{AF90,15min}$
11/01/2021	23:00	46.2	64.3	42.3
	23:15	46.9	63.3	41.8
	23:30	48.2	64.4	42.9
	23:45	45.2	58.7	42.1
12/01/2021	00:00	45.9	62.6	42.2
	00:15	46.7	64.2	41.9
	00:30	46.2	61.9	41.8
	00:45	46.9	60.1	41.4
	01:00	45.6	58.4	41.9
	01:15	45.7	59.7	41.8
	01:30	45.8	60.0	41.1
	01:45	46.3	58.6	42.1
	02:00	46.8	68.7	41.3
	02:15	49.2	59.7	46.7
	02:30	49.1	65.0	46.3
	02:45	46.7	60.9	43.8
	03:00	47.0	63.1	43.5
	03:15	46.4	59.3	43.2
	03:30	45.5	54.5	42.7
	03:45	45.3	56.4	41.8
	04:00	45.3	55.8	41.9
	04:15	46.1	56.0	42.6
	04:30	45.0	55.8	41.5
	04:45	45.6	56.9	42.0
	05:00	45.2	56.3	41.1
	05:15	45.3	55.7	42.0
	05:30	44.9	57.8	40.6
	05:45	52.7	71.5	43.5
	06:00	46.4	58.3	42.5
	06:15	47.2	53.4	43.9
	06:30	48.8	59.7	43.3
	06:45	46.8	52.7	42.9



Date	Time	$L_{Aeq,15min}$	L_{AFmax}	$L_{AF90,15min}$	$L_{Aeq,1hour}$	$L_{AF90,1hour}$	Date	Time	$L_{Aeq,15min}$	L_{AFmax}	$L_{AF90,15min}$	$L_{Aeq,1hour}$	$L_{AF90,1hour}$
12/01/2021	07:00	46.4	54.5	42.4	47.1	42.1	12/01/2021	15:00	55.5	68.4	44.2	50.8	43.1
	07:15	46.6	54.9	42.1				15:15	47.0	61.1	42.7		
	07:30	47.9	66.7	42.0				15:30	45.7	62.3	42.5		
	07:45	47.1	69.0	42.0				15:45	45.9	64.3	42.9		
	08:00	46.6	57.0	44.1	47.3	43.9		16:00	46.6	59.1	43.1	48.6	42.5
	08:15	46.8	63.3	43.1				16:15	48.3	65.2	42.9		
	08:30	48.1	63.6	44.4				16:30	51.6	73.2	41.7		
	08:45	47.5	64.4	43.7				16:45	45.0	53.7	42.0		
	09:00	50.8	70.5	45.3	48.5	44.0		17:00	48.1	69.7	42.1	46.4	42.3
	09:15	48.1	62.3	43.7				17:15	44.9	52.8	42.6		
	09:30	47.4	60.8	44.2				17:30	46.6	61.8	42.2		
	09:45	46.1	60.0	42.4				17:45	45.2	55.9	42.3		
	10:00	47.1	61.7	42.8	46.7	43.0		18:00	45.3	58.9	42.1	46.8	42.0
	10:15	47.0	64.2	43.2				18:15	47.2	63.6	42.5		
	10:30	46.5	56.4	43.5				18:30	48.4	62.5	42.5		
	10:45	46.4	62.0	42.5				18:45	45.5	71.9	40.8		
	11:00	46.3	60.9	42.5	47.7	43.0		19:00	46.5	71.4	41.5	48.4	43.3
	11:15	47.8	65.1	42.4				19:15	49.5	68.1	44.8		
	11:30	49.1	64.4	44.4				19:30	48.6	63.9	43.1		
	11:45	47.0	67.3	42.5				19:45	48.6	70.9	43.1		
	12:00	46.8	65.6	42.9	47.7	42.5		20:00	46.6	60.7	43.1	48.3	44.1
	12:15	45.1	58.2	42.2				20:15	50.1	67.6	42.3		
	12:30	50.6	71.1	42.9				20:30	47.7	54.2	45.2		
	12:45	45.7	59.8	42.0				20:45	47.9	63.4	45.1		
	13:00	47.1	66.0	42.2	60.6	51.2		21:00	49.3	71.5	41.3	46.1	40.6
	13:15	55.7	68.4	43.2				21:15	44.0	55.2	41.0		
	13:30	65.5	70.3	56.0				21:30	44.7	63.2	40.0		
	13:45	57.9	69.9	49.4				21:45	43.3	54.1	39.7		
	14:00	52.8	72.9	49.4	50.3	47.0		22:00	44.2	59.5	39.0	46.1	38.9
	14:15	47.8	56.3	44.0				22:15	49.5	72.2	39.0		
	14:30	48.8	57.5	46.1				22:30	44.6	71.4	38.7		
	14:45	49.9	60.6	46.6				22:45	42.9	54.0	38.8		



Date	Time	$L_{Aeq,15min}$	L_{AFmax}	$L_{AF90,15min}$
12/01/2021	23:00	43.5	54.5	39.2
	23:15	44.7	62.0	38.6
	23:30	43.4	57.3	36.4
	23:45	42.2	57.9	37.3
13/01/2021	00:00	42.8	58.6	37.4
	00:15	42.8	62.5	36.1
	00:30	41.4	52.2	35.2
	00:45	41.3	51.9	34.3
	01:00	41.1	51.1	35.6
	01:15	41.1	60.7	35.1
	01:30	40.7	49.5	36.3
	01:45	42.1	54.5	37.5
	02:00	41.2	50.7	32.9
	02:15	42.0	51.7	34.4
	02:30	42.8	51.3	35.5
	02:45	41.1	56.6	33.8
	03:00	42.1	55.1	33.2
	03:15	41.6	51.9	34.3
	03:30	42.8	52.8	37.5
	03:45	43.3	56.6	38.6
	04:00	41.2	49.9	36.0
	04:15	41.7	50.7	37.9
	04:30	42.5	54.3	36.1
	04:45	43.6	54.6	37.6
	05:00	43.0	53.4	37.9
	05:15	43.4	53.3	36.5
	05:30	43.7	54.4	38.0
	05:45	44.8	60.2	40.4
	06:00	48.9	62.6	40.9
	06:15	47.1	53.7	42.9
	06:30	46.8	54.1	44.1
	06:45	47.9	59.8	44.1



Date	Time	$L_{Aeq,15min}$	L_{AFmax}	$L_{AF90,15min}$	$L_{Aeq,1hour}$	$L_{AF90,1hour}$
13/01/2021	07:00	47.5	71.6	44.6	48.1	44.5
	07:15	49.2	70.0	44.7		
	07:30	47.6	60.5	44.4		
	07:45	47.9	57.3	44.2		
	08:00	48.1	61.7	45.0	47.9	45.0
	08:15	48.2	66.6	45.2		
	08:30	48.2	59.3	45.2		
	08:45	46.9	61.2	44.6		
	09:00	47.7	57.0	44.7	47.9	45.0
	09:15	47.8	65.2	45.3		
	09:30	47.6	56.2	45.1		
	09:45	48.6	59.2	44.8		
	10:00	48.1	56.3	45.2	48.4	45.5
	10:15	48.6	61.8	45.6		
	10:30	48.6	69.9	45.7		
	10:45	48.1	57.5	45.5		
	11:00	48.2	62.5	45.6	48.9	45.8
	11:15	49.4	62.5	45.8		
	11:30	49.0	69.3	46.1		

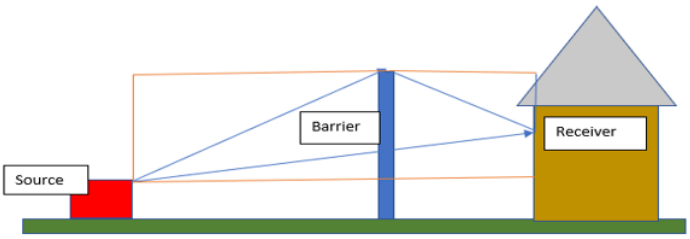
APPENDIX D – Calculations

154 Agar Grove

Building Screening Barrier Attenuation Calculation

Applicable where barrier breaks line of sight between source and receiver

Example Illustration of Barrier Attenuation



		Metres
Source to Barrier 1		0.1
Barrier 1 to Barrier 2		1.5
Receiver to Barrier 2		2.5
Source to Receiver		3

Path Difference	1.1

Frequency Hz	63	125	250	500	1000	2000	4000	8000
Barrier Correction	10.4	12.8	15.4	18.3	21.2	24.1	27.1	30.1

Attenuation per double distance required =				6	dB			Metres	
(6dB for LpA recommended)					Enter Distance =			3	
	Frequency Hz								
	63	125	250	500	1000	2000	4000	8000	Total
	63	59	60	58	57	49	43	39	67.01
Total LW	63.0	59.0	60.0	58.0	57.0	49.0	43.0	39.0	67.01
'A' Weight	26.2	16.1	8.6	3.2	0	-1.2	-1	1.1	
LWA (Power)	36.8	42.9	51.4	54.8	57.0	50.2	44.0	37.9	60.42
LPA at New Dist'	19.29	25.39	33.89	37.29	39.49	32.69	26.49	20.39	42.91
SCREENING	10.4	12.8	15.4	18.3	21.2	24.1	27.1	30.1	
LPA After Insert	**8.84**	**12.59**	**18.44**	**19.02**	**18.31**	**8.55**	**-0.64**	**-9.73**	**24.00**

Sound Pressure Level of 1 Unit @ 3m = 24dB $L_{Aeq,T}$

Adding dB								
	Levels to be added		(Max. of eight)					
Enter values	24	24	0	0	0	0	0	0
	Total =	**27.1** dB						

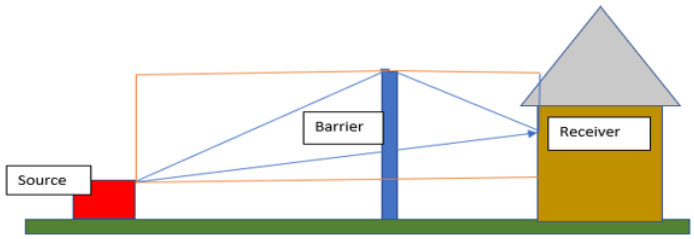
Cumulative Sound Pressure Level @ 154 Agar Grove + Intermittency Correction (3dB) = 30dB $L_{Aeq,T}$

152B Agar Grove

Building Screening Barrier Attenuation Calculation

Applicable where barrier breaks line of sight between source and receiver

Example Illustration of Barrier Attenuation



		Metres
Source to Barrier		0.1
Receiver to Barrier		7
Source to Receiver		7

Path Difference	0.1

Frequency Hz	63	125	250	500	1000	2000	4000	8000
Barrier Correction	5.7	6.5	7.7	9.5	11.7	14.2	17.0	19.8

Attenuation per double distance required = (6dB for LpA recommended)				6	dB			Metres	
					Enter Distance =			7	
	Frequency Hz								
	63	125	250	500	1000	2000	4000	8000	Total
	63	59	60	58	57	49	43	39	67.01
Total LW	63.0	59.0	60.0	58.0	57.0	49.0	43.0	39.0	67.01
'A' Weight	26.2	16.1	8.6	3.2	0	-1.2	-1	1.1	
LWA (Power)	36.8	42.9	51.4	54.8	57.0	50.2	44.0	37.9	60.42
LPA at New Dist'	11.96	18.06	26.56	29.96	32.16	25.36	19.16	13.06	35.58
SCREENING	5.7	6.5	7.7	9.5	11.7	14.2	17.0	19.8	
LPA After Insert	**6.23**	**11.56**	**18.84**	**20.50**	**20.49**	**11.15**	**2.20**	**-6.78**	**25.24**

Sound Pressure Level of 1 Unit @ 7m = 25dB $L_{Aeq,T}$

Adding dB

Levels to be added (Max. of eight)

Enter values	25	25	0	0	0	0	0	0

Total = **28.1** dB

Cumulative Sound Pressure Level @ 152B Agar Grove + Intermittency Correction (3dB) = 31dB $L_{Aeq,T}$