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NOISE IMPACT ASSESSMENT REPORT – MECHANICAL PLANT

47 BLANDFORD ROAD, CHISWICK W4 1EA

FOR

A BERKERY AND A DI LORENZO

ISSUE STATUS: FINAL
DATE OF ISSUE: 11/04/2024
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1. EXECUTIVE SUMMARY

The Client has received planning approval (Planning Reference: 232709FUL) for the installation of mechanical plant (Air Source Heat Pump and Mechanical Ventilation Heat Recovery Unit) to service the premises at 47 Blandford Road, Chiswick W4 1EA. An acoustic related planning condition has been attached to the decision.

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 residential properties at 45 Blandford Road and 49 Marlborough Crescent, W4.

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+A1:2019 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+A1:2019 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 at the nearest noise sensitive properties is considered to comply with the London Borough of Ealing Council's policy.

2. INTRODUCTION

The client is proposing to install a new air source heat pump and a new mechanical ventilation heat recovery system at 47 Blandford Road, Chiswick W4 1EA, 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+A1:2019 and Local Authority policy, and
- To undertake an assessment to demonstrate compliance with the Local Authority noise requirements.

3. SITE DESCRIPTION

Planning permission has been granted for the installation of mechanical plant at 47 Blandford Road, Chiswick W4 1EA (hereafter referred to as 'the site'). The property is a traditionally built two-storey terraced building in the London Borough of Ealing. It is located in a residential area.

The nearest sensitive residential receptors were noted to be the second-floor skylight windows located at the front & the first-floor windows located on the rear façade of 45 Blandford and the ground floor windows located on the rear façade of 49 Marlborough Crescent. At approximate distances of:

Receptor	Distance (m)			
	MVHR Outlet	MVHR Inlet	ASHP Option A	ASHP Option B
45 Blandford Skylight	3*	4.5*	17.5*	7.5*
45 Blandford Rear	6.5*	7*	12	4
47 Marlborough	26.5*	26.5*	8*	19

*No Direct Line of Site. Option A and Option B are indicated on the ground floor plan in Appendix A.

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

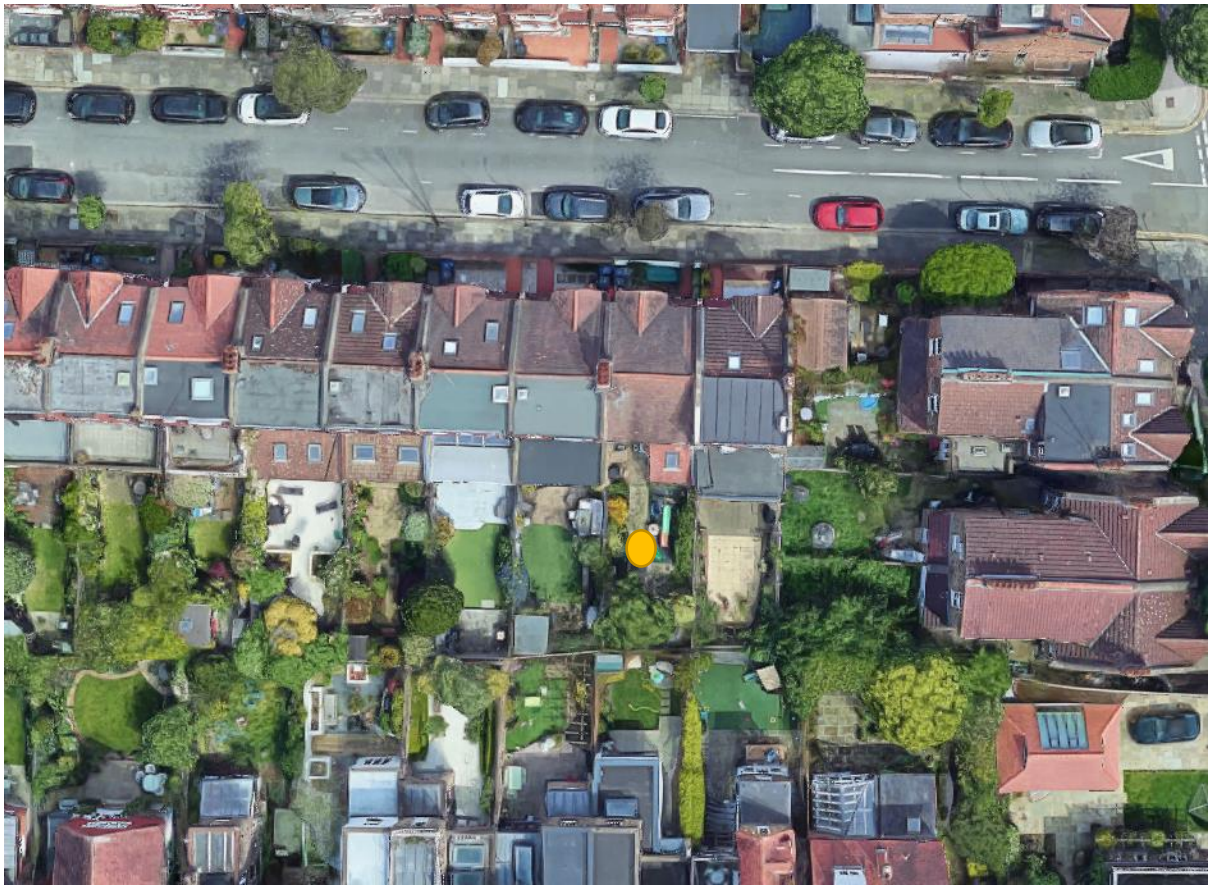
Source: Google Maps

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 14:45 hours on the 28th March and 19:00 hours on the 31st March 2024. A survey at this time covers the most sensitive period of time in which the mechanical plant system 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 2.5 metres, 4 metres from the rear extension 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 mild (approx. 2-16° Celsius), passing clouds (30 to 60% cloud cover approximately) with a light wind (<5m/s). 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 lowest 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 Lowest Background Sound Pressure Levels

Date / Period (hours)	Ambient Sound Pressure Level, dB $L_{Aeq,T}$	Lowest Background Sound Pressure Level, dB $L_{A90,T}$
28/03/2024(14:45 to 23:00)	**49-55**	**46**
28/03/2024 - 29/03/2024 (23:00 to 07:00)	**39-57**	**36**
29/03/2024(07:00 to 23:00)	**45-52**	**43**
29/03/2024 – 30/03/2024 (23:00 to 07:00)	**39-53**	**36**
30/03/2024(07:00 to 23:00)	**41-51**	**35**
30/03/2024 – 31/03/2024 (23:00 to 07:00)	**34-54**	**29**
31/03/2024(07:00 to 19:00)	**43-54**	**35**

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

The lowest background noise level at the measurement position during the survey, at the time in which the plant could be operational, is **29dB** $L_{A90,15min}$.

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 and aircraft. 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 London Borough of Ealing Council. The following acoustic related condition has been attached to the planning permission (Planning Reference: 232709FUL):

6 "Prior to the commencement of the development (excluding initial site clearance demolition and ground works), details shall be submitted to the Local Planning Authority for approval in writing, of plant/ machinery/ equipment/ducting/air in- and outlets/ mechanical installations and their external rating noise level (LAr,Tr), together with mitigation measures as appropriate. The measures shall ensure that the emitted external rating noise level will be lower than the lowest existing background sound level LA90 by 10dBA at the most noise sensitive receiver locations at the development site and at surrounding premises. The assessment shall be made in accordance with BS4142:2014 +A1 2019, with all plant/equipment operating together at maximum capacity. Where required, a post installation sound assessment shall be submitted to the Local Planning Authority for approval in writing. The assessment shall be carried out to confirm compliance with the noise criteria and shall include additional steps to mitigate noise as necessary."

It is stated in BS4142:2014+A1:2019 S11.1:

'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.'

For low background noise level, it is considered that an absolute limit might be more relevant. Therefore, where the background level falls below 30dB $L_{A90,15min}$, it may be considered that a target rating level of not exceeding background level is appropriate for this assessment. This is in line with recommendations on environments with low background noise levels in previous editions of BS4142.

A design criterion of not exceeding the lowest background noise level has been adopted in line with BS4142:2014+A1:2019. 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 Background Sound Pressure Level, dB $L_{A90,T}$	Rating Noise Level at Nearest Residential Facade, dB $L_{Ar,T}$
30/03/2024 – 31/03/2024 (23:00 to 07:00)	**29**	**29**

6.2 BS 4142:2014+A1:2019

BS 4142:2014+A1:2019 "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."

7. PROPOSED MECHANCIAL PLANT AND ASSOCIATED NOISE LEVELS

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

Table 7.0 Proposed Mechanical Plant

External Plant Item	Make	Model	Reference Noise Level*
MVHR	Zehnder	ComfoClime 36 with ComfoAir Q600	Supply 69dB L_W Extract 60dB L_W
Air Source Heat Pump	Daikin	Altherma 3 Monobloc EDLA16D3W1	Heating 49dB L_P Cooling 50dB L_P

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

The MVHR ducting will be 250mm standard circular duct work terminating through the roof of the premises.

In reference to section 6 of this report, no penalty addition has been applied for intermittency as the noise from the mechanical plant will not be readily distinguishable against the residual acoustic environment. 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.

Façade Reflections

Due to the proposed locations of the air source heat pump, there will be 2 reflective façades around the proposed mechanical plant, therefore a correction for façade reflections (+3dB) has been applied.

7.1 Silencers

The intake and exhaust ducting of the MVHR system will be fitted with CP01-M20-090 silencers on the atmosphere side of the fan. The silencer provides the attenuation shown in Table 7.1. All silencers should be Melinex lined.

Table 7.1 Silencer Attenuation

63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
7	9	14	32	39	36	26	15

7.2 Directivity

A directivity correction should be applied as the MVHR duct termini are to terminate approximately 90˚ and 120˚ to the nearest residential windows. A duct opening of 250mm has been used. The levels of attenuation (dB) at each octave frequency band (Hz) is provided in table 7.2 below.

Table 7.2.1 90˚ Directivity Attenuation

63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
0	0	0	2	5	7	12	16

Table 7.2.2 120˚ Directivity Attenuation

63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
0	0	2	5	9	13	17	22

7.3 Building/Barrier Screening

Due to the positioning of the MVHR outlet and inlet, there will be significant building screening, due to the parapet wall and roof line, from the nearest residential properties so there will be no direct line of sight. There will also be no direct line of site from either air source heat pump option location to the front skylight, and ASHP A will be screened from the receptors at Marlborough Crescent, therefore attenuation due to barrier loss has also been considered (calculations are provided in Appendix D).

A barrier will be installed between ASHP A and the first-floor windows on the rear façade of 45 Blandford Road. The barrier should be constructed of a solid material (minimum mass of 11 kg/m^2) with a layer of weatherproof insulation and no gaps and should be a minimum of 300mm taller than the unit, therefore attenuation due to barrier loss has also been considered (calculations are provided in Appendix D).

7.4 Partial Enclosure

A partial enclosure is to be installed around the ASHP at option location B. The enclosure around the unit should be installed around 4 sides with an opening towards the rear garden for ventilation. The enclosure should be constructed of a solid material (minimum mass of 11 kg/m^2) with a layer of weatherproof insulation and no gaps, other than the specified opening. The enclosures should extend beyond the dimensions of the unit by a minimum of 300mm.

8. NOISE IMPACT ASSESSMENT

This section presents calculations to predict the noise impact of the proposed mechanical plant, located at the site, at the nearest noise sensitive properties.

8.1 Proposed Operational Hours and Background Noise Levels

The mechanical plant may operate as required 24 hours-a-day, 7 days-a-week.

The lowest background noise level at the measurement position during the survey is **29dB** $L_{A90,15min.}$ The design range is **29dB** $L_{Ar,T}$ at the façade of the nearest residential premises.

8.2 Nearest Noise Sensitive Properties

The nearest sensitive residential receptors were noted to be the second-floor skylight windows located at the front & the first-floor windows located on the rear façade of 45 Blandford and the ground floor windows located on the rear façade of 49 Marlborough Crescent. At approximate distances of:

Receptor	Distance (m)			
	MVHR Outlet	MVHR Inlet	ASHP Option A	ASHP Option B
45 Blandford Skylight	3*	4.5*	17.5*	7.5*
45 Blandford Rear	6.5*	7*	12	4
47 Marlborough	26.5*	26.5*	8*	19

*No Direct Line of Site. Option A and Option B are indicated on the ground floor plan in Appendix A.

8.3 Description of Calculation Process

In accordance with the methodologies of BS 4142:2014+A1:2019, calculations have been undertaken to predict noise levels in which the mechanical plant could be operational at its 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 mechanical plant operating at the facade of the residential property is given below. Full calculations are provided in Appendix D.

ASHP Option A

The rating noise level at the second-floor front sky light of 45 Blandford Road, with the mechanical plant operating, is predicted to be **28dB $L_{Ar,T}$** which is **1dB(A) below** the lowest background noise level (29dB $L_{A90,15min}$).

The rating noise level at the first-floor rear window of 45 Blandford Road, with the mechanical plant operating, is predicted to be **23dB $L_{Ar,T}$** which is **6dB(A) below** the lowest background noise level (29dB $L_{A90,15min}$).

The rating noise level at the ground-floor rear window of 47 Marlborough Crescent, with the mechanical plant operating, is predicted to be **21dB $L_{Ar,T}$** which is **8dB(A) below** the lowest background noise level (29dB $L_{A90,15min}$).

In accordance with BS 4142:2014+A1:2019 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.*

ASHP Option B

The rating noise level at the second-floor front sky light of 45 Blandford Road, with the mechanical plant operating, is predicted to be **28dB $L_{Ar,T}$** which is **1dB(A) below** the lowest background noise level (29dB $L_{A90,15min}$).

The rating noise level at the first-floor rear window of 45 Blandford Road, with the mechanical plant operating, is predicted to be **28dB $L_{Ar,T}$** which is **1dB(A) below** the lowest background noise level (29dB $L_{A90,15min}$).

The rating noise level at the ground-floor rear window of 47 Marlborough Crescent, with the mechanical plant operating, is predicted to be **27dB $L_{Ar,T}$** which is **2dB(A) below** the lowest background noise level (29dB $L_{A90,15min}$).

In accordance with BS 4142:2014+A1:2019 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 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 system is 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/medium 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 mechanical plant, in accordance with BS 4142:2014+A1:2019 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 mechanical plant is considered to comply with the London Borough of Ealing Council's policy.

APPENDIX A – Acoustic Terminology

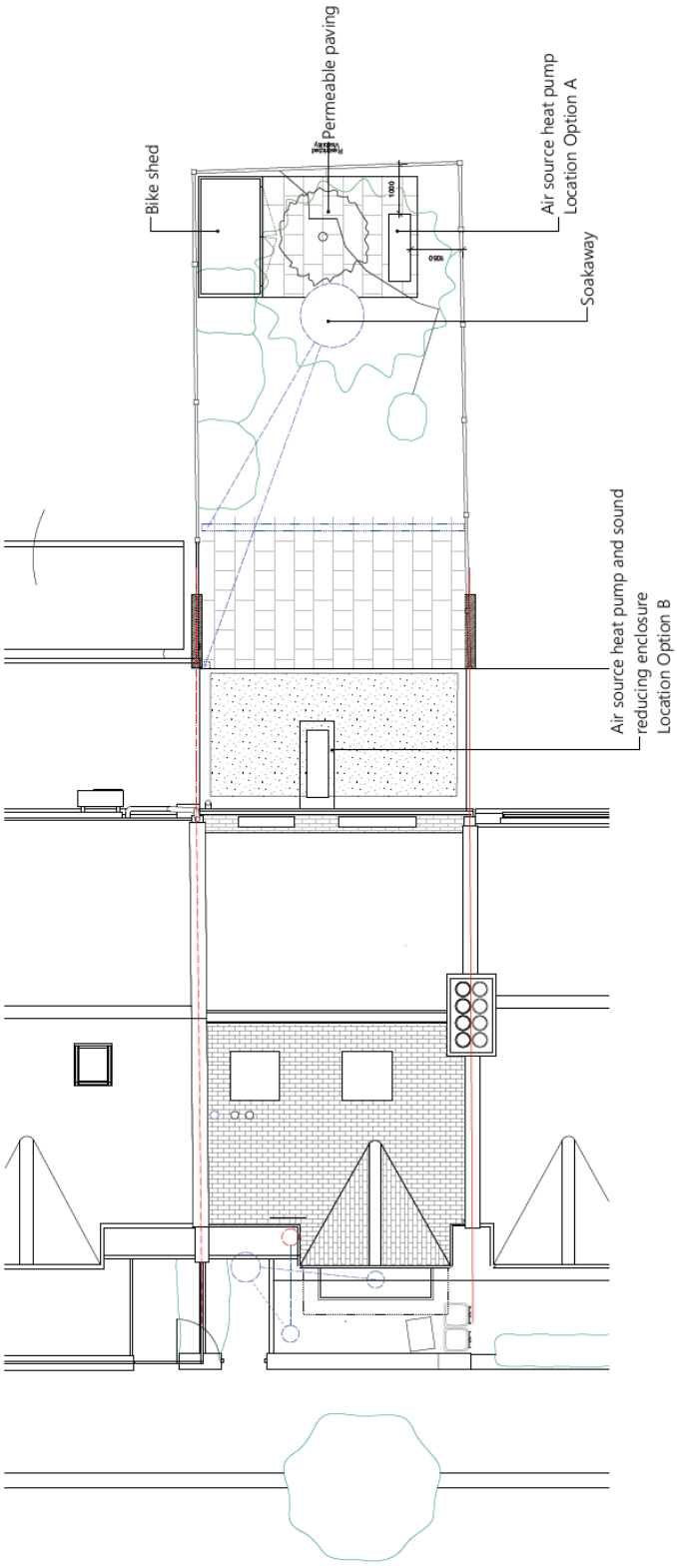
Parameter	Description
Acoustic environment	Sound from all sound sources as modified by the environment
Ambient sound	Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far
Ambient sound level, La = LAeq,T	Equivalent continuous A-weighted 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+A1:2019 ‘Methods for rating and assessing industrial and commercial sound’

APPENDIX B – Data Sheets and Figures

Proposed Site Plan with Mechanical Plant Location



Zehnder ComfoClime 36 with ComfoAirQ600 – MVHR System

Zehnder ComfoClime 36 with ComfoAirQ600 Acoustic Data

Sound Data

Speed	Test area	Octave Band (Hz) Sound Power Level, dB								dB(A) @ 3 m
		63	125	250	500	1000	2000	4000	8000	
20%	Casing ComfoClime on	34.0	43.9	49.1	35.1	28.6	22.4	12.9	16.3	24.0
	Supply ComfoClime off	53.4	45.7	47.7	40.5	29.5	18.4	10.0	11.4	
	Supply ComfoClime on	56.4	48.7	50.7	43.5	32.5	21.4	13.0	14.4	
	Extract ComfoClime on	57.0	45.2	47.3	33.9	21.0	11.8	12.7	19.5	
40%	Casing ComfoClime on	49.0	48.7	52.4	43.9	36.6	31.1	23.2	21.8	28.9
	Supply ComfoClime off	62.3	52.1	54.0	48.9	37.3	27.8	20.7	18.8	
	Supply ComfoClime on	65.3	55.1	57.0	51.9	40.3	30.8	23.7	21.8	
	Extract ComfoClime on	64.6	50.6	51.9	41.8	28.1	20.9	19.8	21.7	
60%	Casing ComfoClime on	63.1	53.2	55.6	52.1	44.2	39.3	32.9	26.9	34.9
	Supply ComfoClime off	70.6	58.1	60.0	56.8	44.7	36.7	30.7	25.7	
	Supply ComfoClime on	73.6	61.1	63.0	59.8	47.7	39.7	33.7	28.7	
	Extract ComfoClime on	71.8	55.6	56.3	49.3	34.9	29.4	26.4	23.7	
80%	Casing ComfoClime on	76.4	57.5	58.6	59.9	51.3	47.1	42.1	31.8	41.5
	Supply ComfoClime off	78.6	63.8	65.6	64.3	51.7	45.1	40.3	32.3	
	Supply ComfoClime on	81.6	66.8	68.6	67.3	54.7	48.1	43.3	35.3	
	Extract ComfoClime on	78.5	60.3	60.4	56.3	41.3	37.4	32.6	25.7	
100%	Casing ComfoClime on	81.0	58.9	59.6	62.6	53.8	49.7	45.3	33.5	44.0
	Supply ComfoClime off	81.3	65.7	67.5	66.9	54.1	48.0	43.6	34.6	
	Supply ComfoClime on	84.3	68.7	70.5	69.9	57.1	51.0	46.6	37.6	
	Extract ComfoClime on	80.9	62.0	61.8	58.8	43.5	40.1	34.8	26.4	

Casing, supply and extract tested according to ISO 3741:2010 showing induct sound power level corrected for end duct reflection according EN 13053:2019. Casing dB(A) @ 3 m given as hemispherical.

Acoustica CP01-M20-090 Silencer Data Sheet

CP01
M Series

ACOUSTICA

CP01 - M20 Silencer

Available in four standard lengths, M-Series Silencers have excellent attenuation properties, achieved with sound absorbing infill retained in the attenuator casing by a perforated galvanised steel liner.

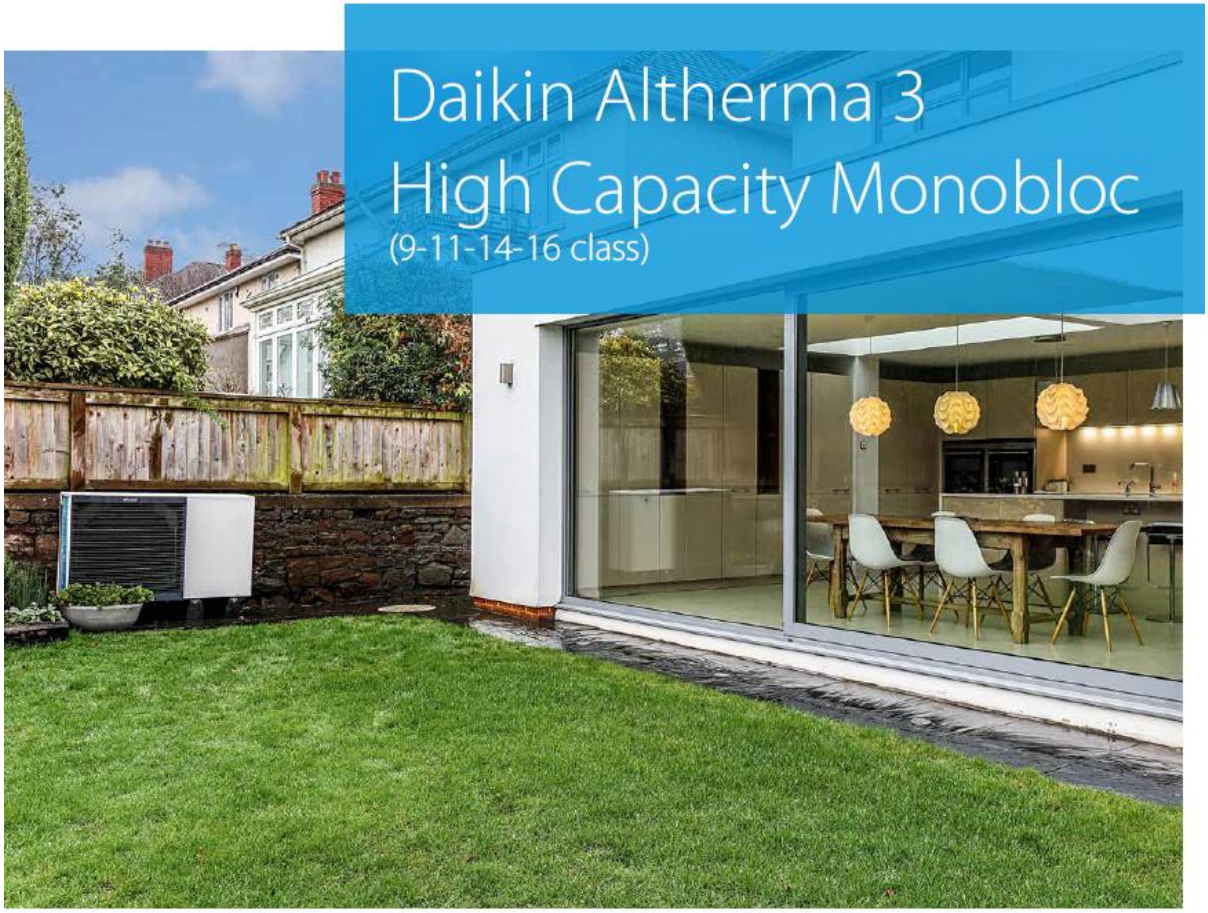
- Fits directly into 100mm diameter ducting
- Standard lengths 300, 600, 900 & 1200mm
- Use up to 70°C (standard construction)
- Systems up to 1000 Pascals
- Special lengths on request

Typical Noise Reduction (dB) - Centre Band Frequency

Product Code	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
CP01 - M20 - 030	2	3	6	13	17	20	18	9
CP01 - M20 - 060	4	6	10	20	27	32	20	11
CP01 - M20 - 090	7	9	14	32	39	36	26	15
CP01 - M20 - 120	10	12	17	35	41	44	28	16

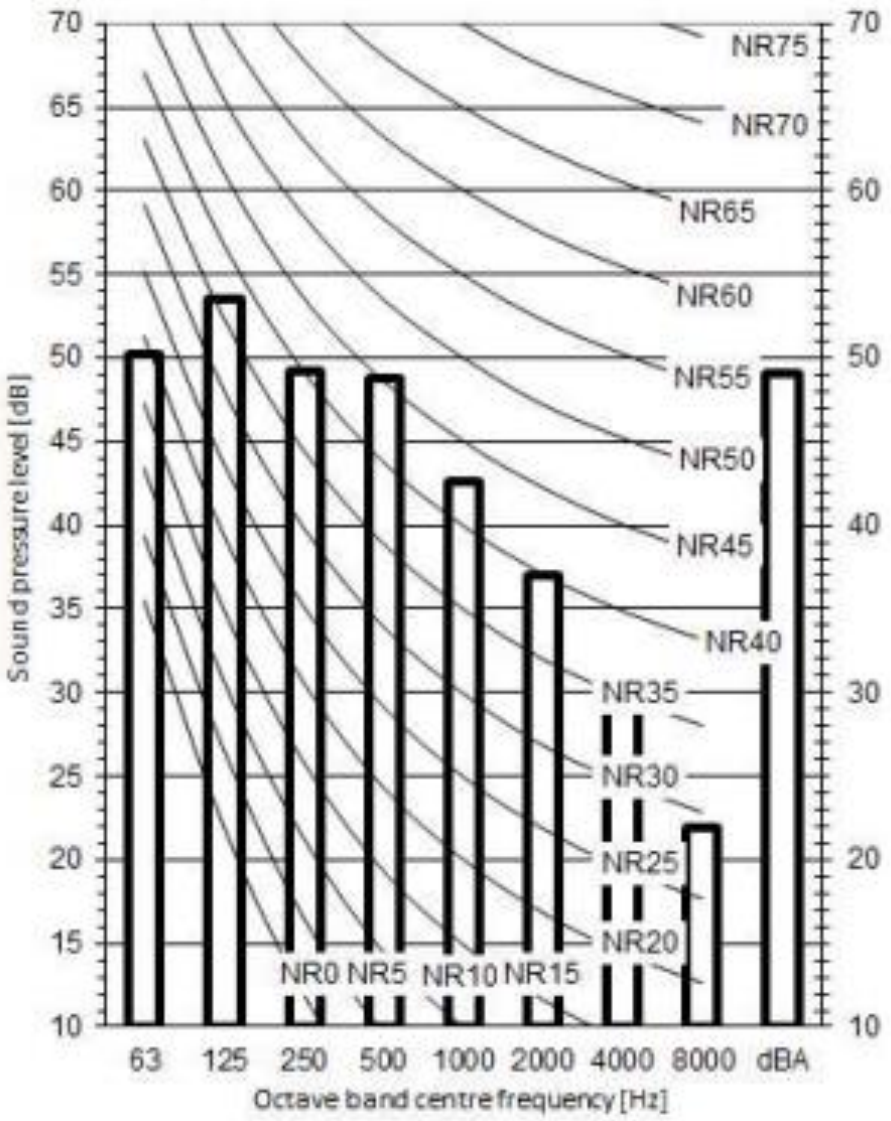
Typical noise reduction data is derived from continual testing to BS4718 and other standards in independent UKAS certified laboratories, which includes where appropriate, re-generated or self noise testing in both forward and reverse flow conditions. If you request system analysis from our technicians all predictions will be assessed using the relevant certified insertion loss data together with relevant dynamic corrections.

Daikin Altherma 3 Monoblock EDLA16D3W1 – Air Source Heat Pump

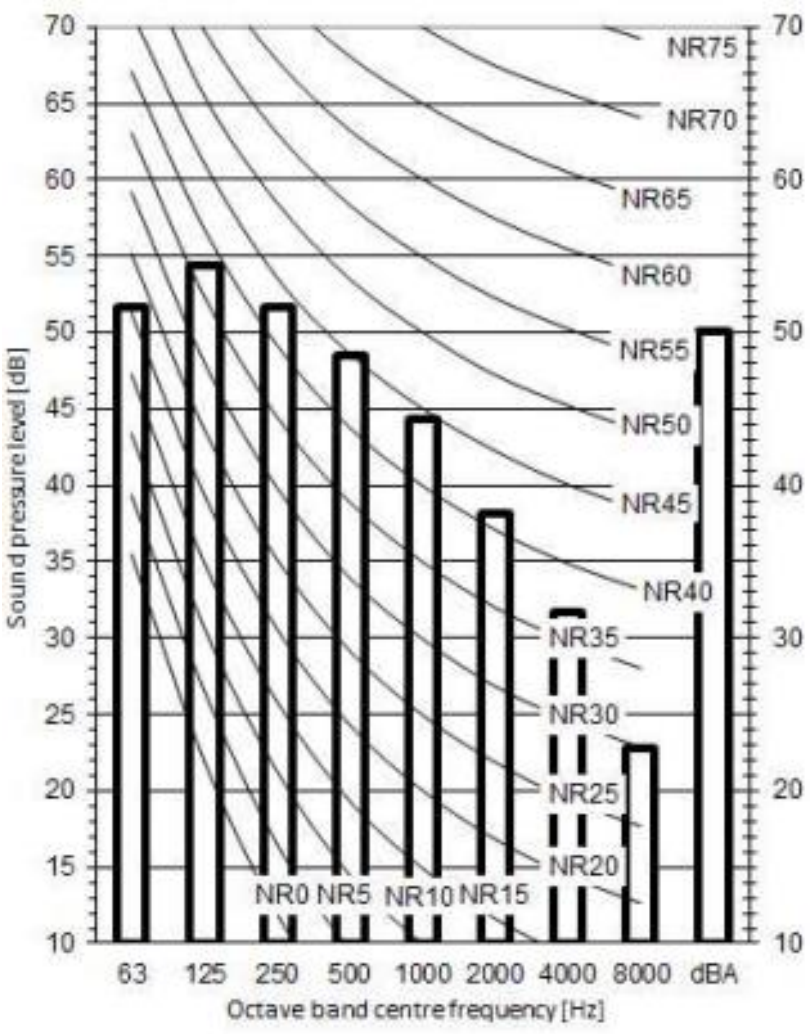


Powerful yet compact

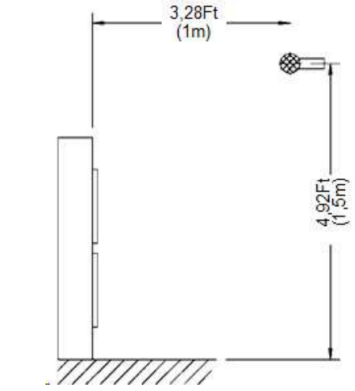
Daikin Altherma 3 Monoblock EDLA16D3W1 Heating Acoustic Data



Daikin Altherma 3 Monoblock EDLA16D3W1 Cooling Acoustic Data

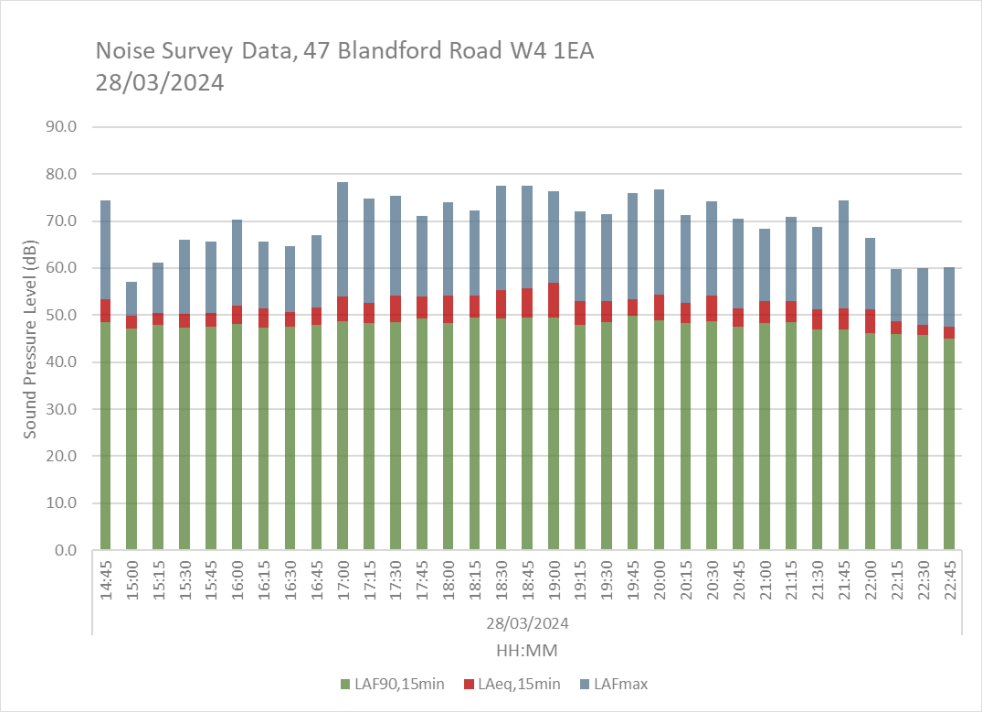


Daikin Measurement Location

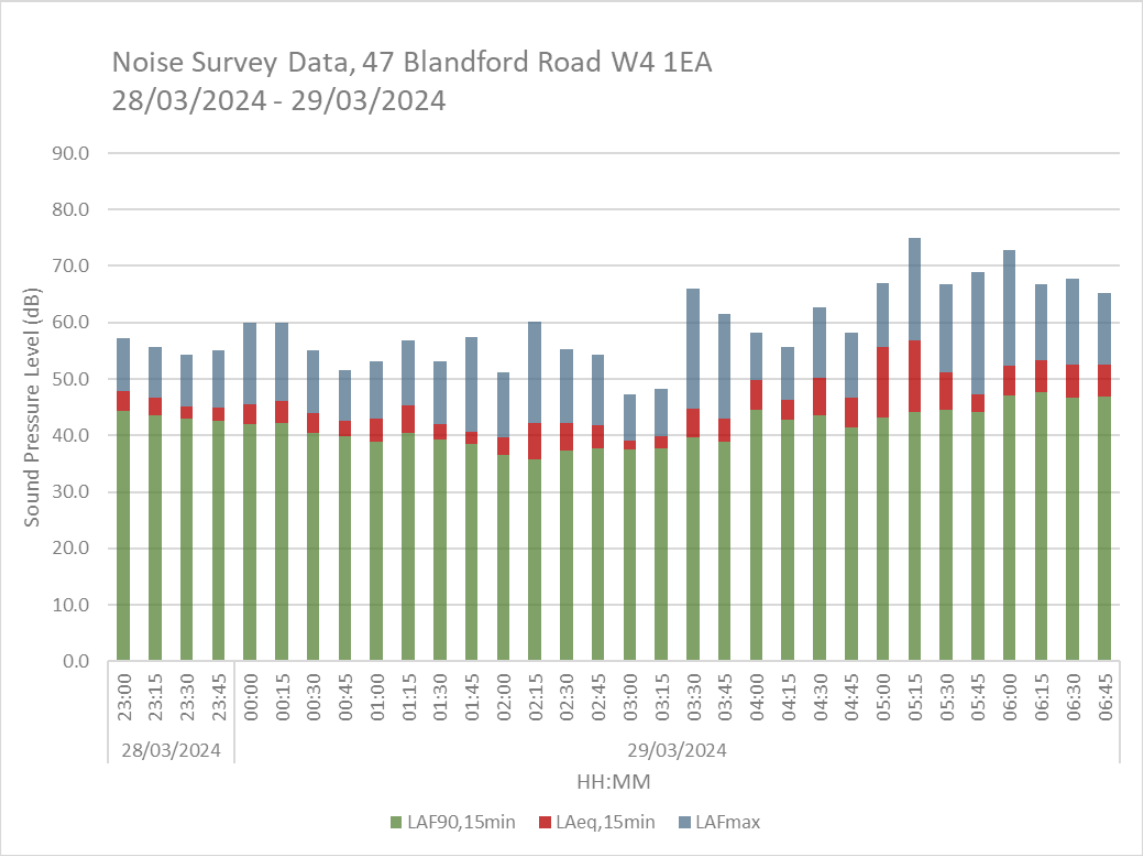


Measuring location (discharge side)

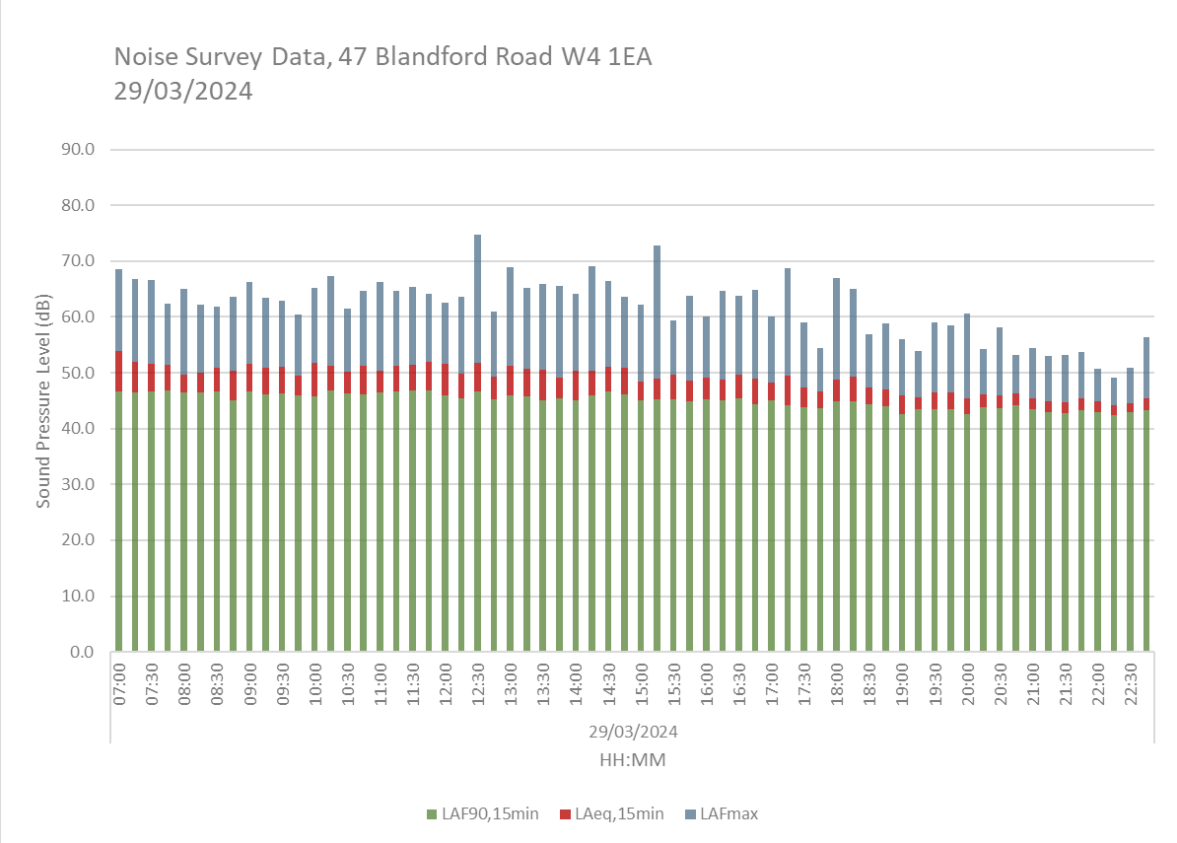
APPENDIX C – Noise Monitoring Data



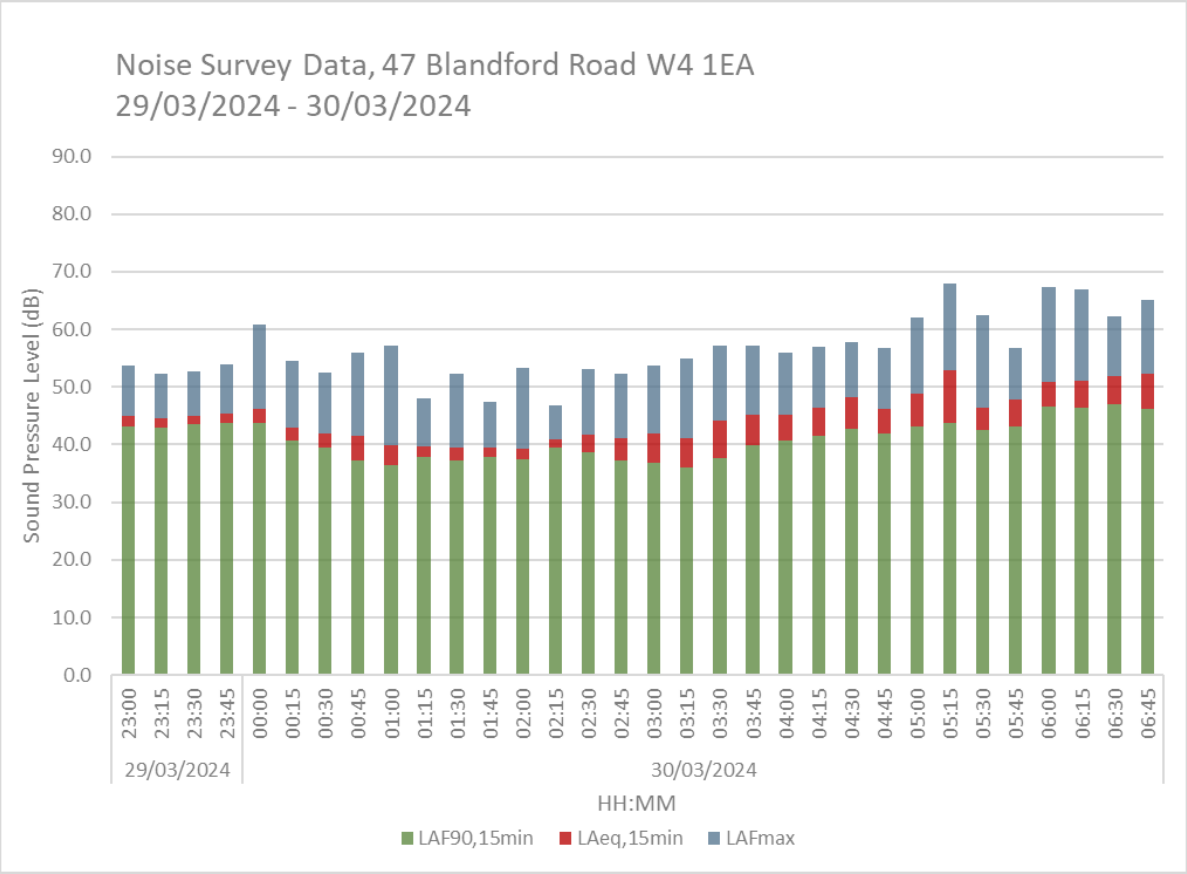
Date	Time	$L_{Aeq,15min}$	L_{AFmax}	$L_{AF90,15min}$	$L_{Aeq,1hour}$	$L_{AF90,1hour}$
28/03/2024	14:45	53.3	74.5	48.5		
	15:00	49.9	57.1	47.1	50.3	47.5
	15:15	50.5	61.1	48.0		
	15:30	50.2	66.0	47.3		
	15:45	50.4	65.6	47.6		
	16:00	52.0	70.3	48.1	51.4	47.7
	16:15	51.5	65.6	47.3		
	16:30	50.7	64.7	47.5		
	16:45	51.5	66.9	47.9		
	17:00	54.0	78.4	48.6	53.7	48.6
	17:15	52.6	74.8	48.3		
	17:30	54.2	75.3	48.4		
	17:45	53.9	71.0	49.2		
	18:00	54.1	73.9	48.3	54.9	49.1
	18:15	54.1	72.3	49.5		
	18:30	55.4	77.5	49.2		
	18:45	55.6	77.5	49.4		
	19:00	56.9	76.4	49.4	54.4	49.0
	19:15	52.9	72.1	48.0		
	19:30	53.0	71.4	48.5		
	19:45	53.5	75.9	49.8		
	20:00	54.4	76.8	48.8	53.3	48.3
	20:15	52.7	71.3	48.3		
	20:30	54.1	74.2	48.6		
	20:45	51.3	70.5	47.6		
	21:00	52.9	68.4	48.2	52.2	47.7
	21:15	52.9	70.9	48.4		
	21:30	51.3	68.8	46.9		
	21:45	51.4	74.3	46.9		
	22:00	51.2	66.3	46.2	49.1	45.7
	22:15	48.7	59.7	46.0		
	22:30	47.8	60.0	45.7		
	22:45	47.5	60.2	44.9		



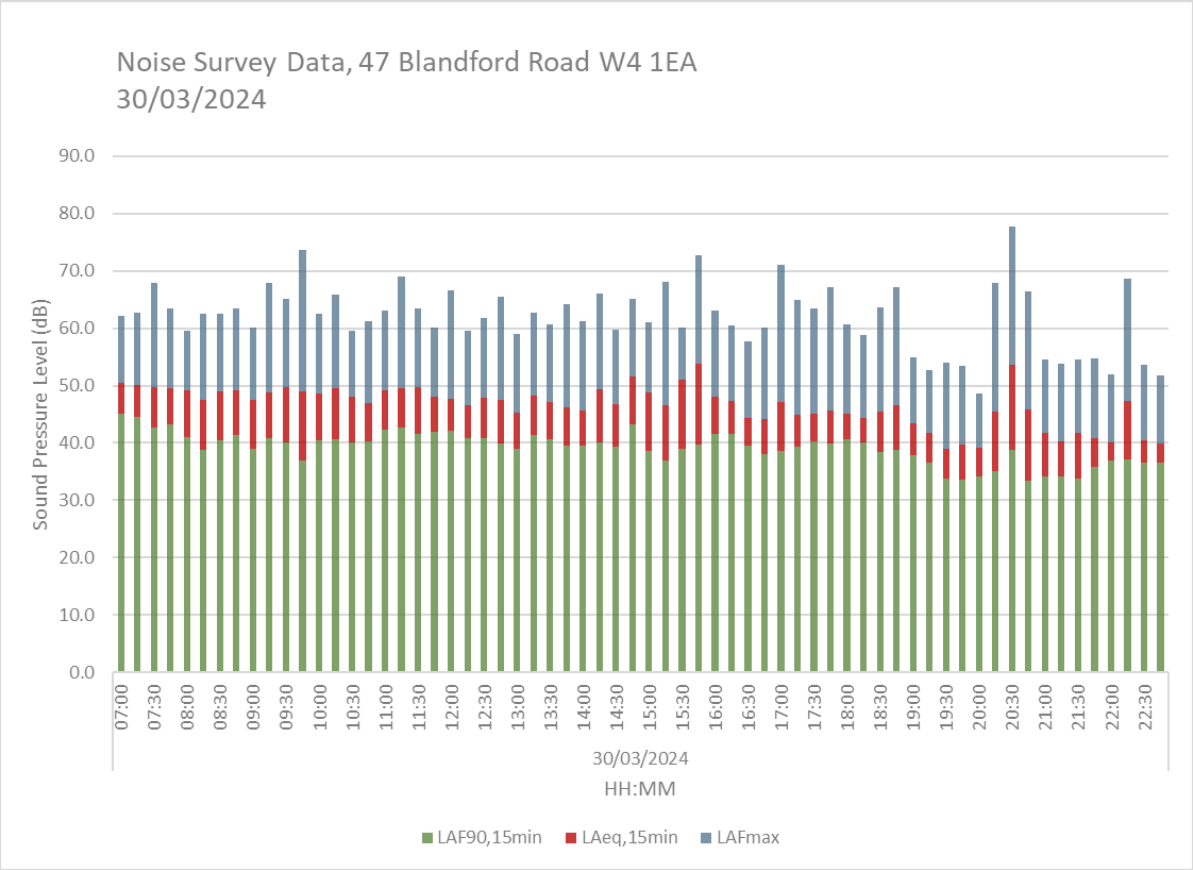
Date	Time	$L_{Aeq,15min}$	L_{AFmax}	$L_{AF90,15min}$
28/03/2024	23:00	47.8	57.2	44.3
	23:15	46.7	55.6	43.5
	23:30	45.2	54.4	42.9
	23:45	45.0	55.1	42.5
29/03/2024	00:00	45.5	60.0	42.0
	00:15	46.1	60.0	42.2
	00:30	43.9	55.2	40.5
	00:45	42.7	51.6	39.8
	01:00	42.9	53.1	38.8
	01:15	45.3	56.8	40.5
	01:30	42.0	53.1	39.2
	01:45	40.6	57.5	38.5
	02:00	39.7	51.2	36.5
	02:15	42.3	60.1	35.7
	02:30	42.2	55.2	37.3
	02:45	41.9	54.2	37.8
	03:00	39.1	47.4	37.5
	03:15	39.9	48.2	37.8
	03:30	44.7	66.0	39.6
	03:45	43.0	61.5	38.9
	04:00	49.8	58.2	44.5
	04:15	46.4	55.6	42.8
	04:30	50.2	62.7	43.6
	04:45	46.6	58.2	41.5
	05:00	55.7	67.0	43.1
	05:15	56.8	75.1	44.1
	05:30	51.1	66.8	44.5
	05:45	47.4	68.9	44.1
	06:00	52.3	72.8	47.1
	06:15	53.4	66.7	47.6
	06:30	52.6	67.7	46.7
	06:45	52.5	65.2	46.9



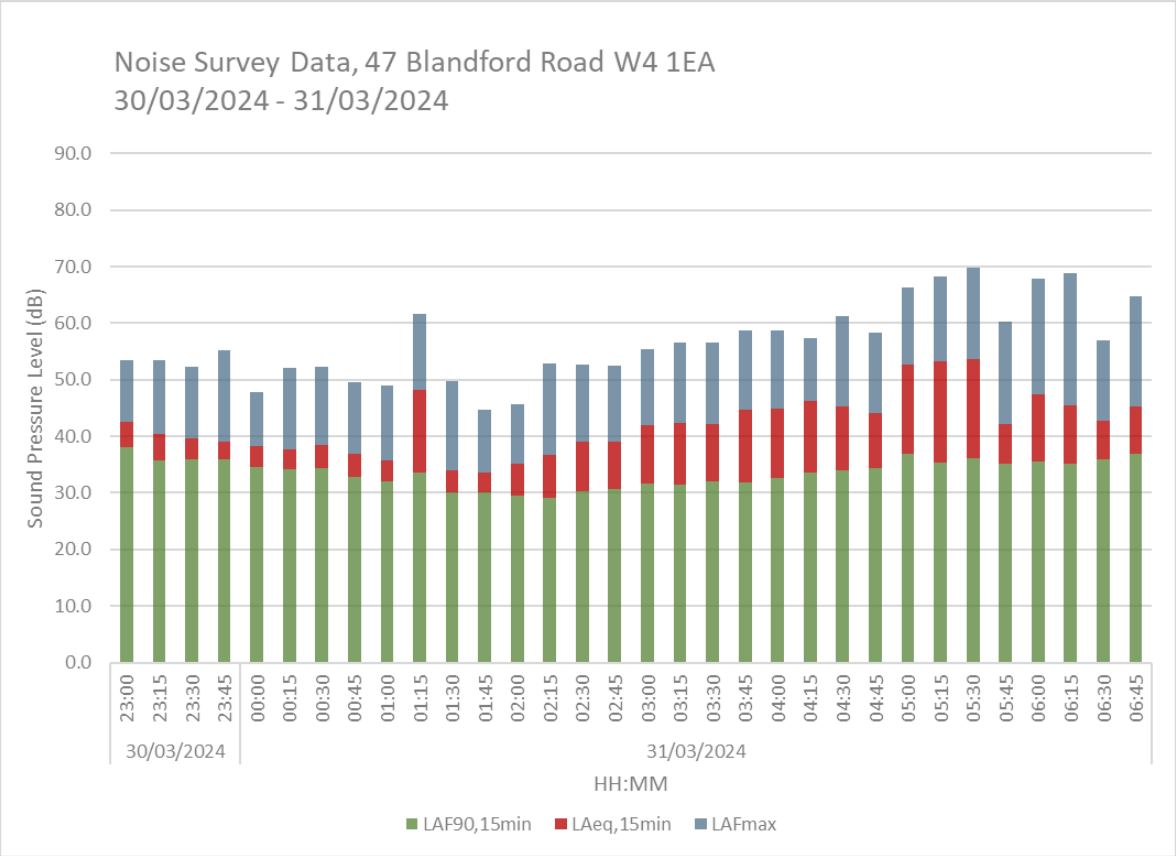
Date	Time	$L_{Aeq,15min}$	L_{AFmax}	$L_{AF90,15min}$	$L_{Aeq,1hour}$	$L_{AF90,1hour}$	Date	Time	$L_{Aeq,15min}$	L_{AFmax}	$L_{AF90,15min}$	$L_{Aeq,1hour}$	$L_{AF90,1hour}$
29/03/2024	07:00	53.9	68.6	46.6	52.3	46.6	29/03/2024	15:00	48.4	62.2	45.0	48.9	45.1
	07:15	51.9	66.7	46.4				15:15	48.9	72.9	45.2		
	07:30	51.6	66.7	46.6				15:30	49.6	59.4	45.3		
	07:45	51.4	62.4	46.8				15:45	48.5	63.8	44.9		
	08:00	49.7	65.0	46.4	50.3	46.2		16:00	49.1	60.1	45.2	49.1	45.0
	08:15	50.1	62.1	46.5				16:15	48.7	64.7	45.0		
	08:30	50.8	61.8	46.7				16:30	49.6	63.8	45.4		
	08:45	50.4	63.7	45.1				16:45	49.0	64.9	44.4		
	09:00	51.6	66.2	46.6	50.8	46.3		17:00	48.3	60.1	45.0	48.1	44.2
	09:15	50.9	63.4	46.1				17:15	49.4	68.7	44.2		
	09:30	51.2	62.9	46.3				17:30	47.4	59.1	43.9		
	09:45	49.4	60.5	46.0				17:45	46.7	54.4	43.6		
	10:00	51.8	65.2	45.8	51.1	46.3		18:00	48.8	67.1	44.9	48.2	44.6
	10:15	51.3	67.2	46.8				18:15	49.2	65.0	44.9		
	10:30	50.2	61.6	46.3				18:30	47.4	56.9	44.4		
	10:45	51.2	64.7	46.1				18:45	47.0	58.8	44.0		
	11:00	50.4	66.3	46.5	51.3	46.7		19:00	45.9	56.1	42.6	46.1	43.2
	11:15	51.2	64.7	46.6				19:15	45.6	53.8	43.4		
	11:30	51.4	65.3	46.9				19:30	46.5	59.0	43.4		
	11:45	52.0	64.2	46.8				19:45	46.4	58.5	43.4		
	12:00	51.6	62.6	46.0	50.8	45.9		20:00	45.5	60.6	42.6	46.0	43.6
	12:15	49.9	63.6	45.4				20:15	46.2	54.3	43.9		
	12:30	51.8	74.8	46.7				20:30	46.0	58.1	43.7		
	12:45	49.3	61.0	45.2				20:45	46.2	53.3	44.1		
	13:00	51.2	68.8	45.9	50.5	45.5		21:00	45.5	54.4	43.5	45.1	43.1
	13:15	50.7	65.2	45.8				21:15	44.9	53.1	42.9		
	13:30	50.5	65.9	45.0				21:30	44.7	53.3	42.8		
	13:45	49.2	65.5	45.4				21:45	45.4	53.8	43.3		
	14:00	50.4	64.1	45.1	50.7	46.0		22:00	44.9	50.7	43.0	44.8	42.9
	14:15	50.4	69.1	46.0				22:15	44.1	49.1	42.4		
	14:30	51.1	66.5	46.7				22:30	44.5	50.8	42.9		
	14:45	50.9	63.5	46.2				22:45	45.4	56.3	43.3		



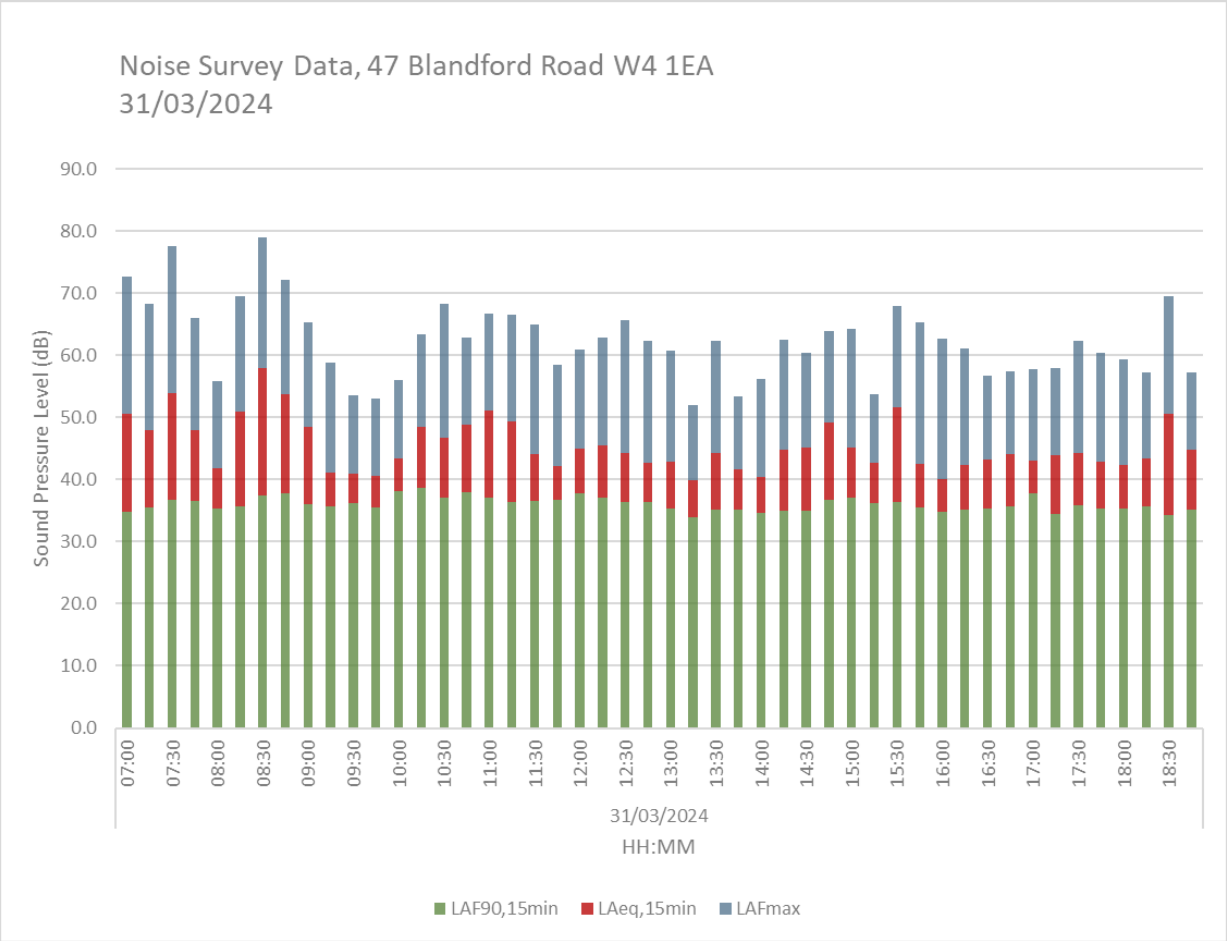
Date	Time	$L_{Aeq,15min}$	L_{AFmax}	$L_{AF90,15min}$
29/03/2024	23:00	44.9	53.7	43.2
	23:15	44.6	52.2	42.9
	23:30	45.0	52.7	43.5
	23:45	45.3	53.9	43.7
30/03/2024	00:00	46.2	60.8	43.8
	00:15	43.0	54.6	40.8
	00:30	41.9	52.6	39.5
	00:45	41.5	55.9	37.2
	01:00	39.8	57.2	36.5
	01:15	39.7	48.1	37.9
	01:30	39.5	52.3	37.2
	01:45	39.5	47.4	37.9
	02:00	39.4	53.4	37.5
	02:15	40.9	46.8	39.4
	02:30	41.7	53.2	38.7
	02:45	41.1	52.3	37.2
	03:00	42.0	53.7	36.8
	03:15	41.0	55.0	36.1
	03:30	44.1	57.2	37.6
	03:45	45.2	57.2	39.8
	04:00	45.2	56.0	40.7
	04:15	46.4	57.0	41.5
	04:30	48.2	57.7	42.7
	04:45	46.1	56.9	42.0
	05:00	48.8	62.0	43.2
	05:15	52.9	67.9	43.8
	05:30	46.5	62.5	42.5
	05:45	47.7	56.8	43.1
	06:00	51.0	67.3	46.7
	06:15	51.1	67.0	46.5
	06:30	51.9	62.3	47.1
	06:45	52.3	65.1	46.1



Date	Time	$L_{Aeq,15min}$	L_{AFmax}	$L_{AF90,15min}$	$L_{Aeq,1hour}$	$L_{AF90,1hour}$	Date	Time	$L_{Aeq,15min}$	L_{AFmax}	$L_{AF90,15min}$	$L_{Aeq,1hour}$	$L_{AF90,1hour}$
30/03/2024	07:00	50.5	62.2	45.1	50.0	44.0	30/03/2024	15:00	48.8	61.1	38.6	50.9	38.7
	07:15	50.2	62.6	44.5				15:15	46.6	68.1	37.0		
	07:30	49.8	68.0	42.6				15:30	51.1	60.1	38.9		
	07:45	49.5	63.5	43.3				15:45	53.9	72.7	39.7		
	08:00	49.1	59.6	41.0	48.7	40.5		16:00	48.0	63.1	41.5	46.3	40.4
	08:15	47.4	62.5	38.7				16:15	47.4	60.4	41.5		
	08:30	49.0	62.6	40.5				16:30	44.4	57.7	39.5		
	08:45	49.1	63.4	41.3				16:45	44.2	60.1	38.0		
	09:00	47.5	60.1	39.0	48.8	39.5		17:00	47.2	71.0	38.6	45.8	39.6
	09:15	48.8	67.8	40.9				17:15	44.8	64.8	39.4		
	09:30	49.7	65.2	40.0				17:30	45.1	63.5	40.2		
	09:45	48.9	73.6	37.0				17:45	45.7	67.1	39.9		
	10:00	48.7	62.6	40.5	48.4	40.4		18:00	45.1	60.7	40.6	45.4	39.6
	10:15	49.5	65.8	40.7				18:15	44.3	58.8	40.1		
	10:30	48.1	59.5	40.1				18:30	45.4	63.6	38.4		
	10:45	46.9	61.2	40.3				18:45	46.5	67.1	38.8		
	11:00	49.3	63.1	42.3	49.2	42.1		19:00	43.5	55.0	37.9	41.4	35.8
	11:15	49.5	69.1	42.6				19:15	41.8	52.7	36.5		
	11:30	49.7	63.5	41.6				19:30	39.1	53.9	33.7		
	11:45	48.1	60.1	41.9				19:45	39.7	53.5	33.6		
	12:00	47.7	66.6	42.2	47.5	41.0		20:00	39.1	48.7	34.2	48.9	35.9
	12:15	46.6	59.5	40.9				20:15	45.5	67.9	35.1		
	12:30	47.9	61.7	40.8				20:30	53.6	77.7	38.7		
	12:45	47.6	65.5	39.9				20:45	45.7	66.4	33.4		
	13:00	45.2	59.0	38.9	46.8	40.2		21:00	41.7	54.6	34.2	41.2	34.6
	13:15	48.2	62.7	41.3				21:15	40.3	53.8	34.1		
	13:30	47.1	60.6	40.6				21:30	41.8	54.5	33.8		
	13:45	46.2	64.3	39.5				21:45	40.8	54.7	35.9		
	14:00	45.7	61.2	39.6	49.0	40.9		22:00	40.1	52.0	36.9	43.3	36.8
	14:15	49.4	66.0	40.0				22:15	47.3	68.7	37.1		
	14:30	46.8	59.7	39.3				22:30	40.5	53.6	36.6		
	14:45	51.6	65.2	43.3				22:45	40.0	51.7	36.5		



Date	Time	$L_{Aeq,15min}$	L_{AFmax}	$L_{AF90,15min}$
30/03/2024	23:00	42.5	53.5	38.0
	23:15	40.3	53.4	35.8
	23:30	39.6	52.3	36.0
	23:45	39.1	55.2	35.9
31/03/2024	00:00	38.3	47.8	34.5
	00:15	37.6	52.1	34.2
	00:30	38.5	52.4	34.4
	00:45	36.9	49.5	32.8
	01:00	35.8	48.9	32.0
	01:15	48.1	61.7	33.5
	01:30	34.0	49.8	30.1
	01:45	33.7	44.8	30.1
	02:00	35.2	45.6	29.6
	02:15	36.7	52.9	29.1
	02:30	39.0	52.7	30.2
	02:45	39.1	52.5	30.7
	03:00	42.0	55.3	31.6
	03:15	42.3	56.6	31.4
	03:30	42.1	56.5	32.1
	03:45	44.7	58.8	31.8
	04:00	45.0	58.7	32.6
	04:15	46.2	57.3	33.6
	04:30	45.3	61.1	33.9
	04:45	44.2	58.4	34.3
	05:00	52.6	66.3	37.0
	05:15	53.3	68.3	35.4
	05:30	53.6	69.8	36.1
	05:45	42.2	60.2	35.2
	06:00	47.5	67.8	35.6
	06:15	45.6	68.9	35.2
	06:30	42.7	56.9	35.9
	06:45	45.3	64.7	37.0



Date	Time	$L_{Aeq,15min}$	L_{AFmax}	$L_{AF90,15min}$	$L_{Aeq,1hour}$	$L_{AF90,1hour}$	Date	Time	$L_{Aeq,15min}$	L_{AFmax}	$L_{AF90,15min}$	$L_{Aeq,1hour}$	$L_{AF90,1hour}$
31/03/2024	07:00	50.6	72.7	34.8	50.9	36.0	31/03/2024	13:00	42.9	60.7	35.3	42.5	35.0
	07:15	47.9	68.4	35.5				13:15	40.0	52.0	34.0		
	07:30	53.9	77.5	36.7				13:30	44.3	62.3	35.2		
	07:45	48.0	66.0	36.6				13:45	41.6	53.4	35.2		
	08:00	41.9	55.8	35.3	54.0	36.6		14:00	40.4	56.1	34.7	45.9	35.4
	08:15	51.0	69.5	35.7				14:15	44.8	62.5	34.9		
	08:30	57.9	78.9	37.4				14:30	45.1	60.5	34.9		
	08:45	53.8	72.2	37.7				14:45	49.2	64.0	36.8		
	09:00	48.4	65.2	36.1	44.2	35.9		15:00	45.2	64.3	37.0	47.4	36.3
	09:15	41.1	58.7	35.7				15:15	42.7	53.7	36.2		
	09:30	40.9	53.6	36.2				15:30	51.7	68.0	36.4		
	09:45	40.5	53.1	35.5				15:45	42.5	65.2	35.5		
	10:00	43.3	55.9	38.1	47.3	38.0		16:00	40.1	62.6	34.8	42.7	35.3
	10:15	48.5	63.4	38.6				16:15	42.3	61.0	35.2		
	10:30	46.7	68.4	37.1				16:30	43.3	56.7	35.3		
	10:45	48.8	62.8	38.0				16:45	44.1	57.5	35.7		
	11:00	51.1	66.8	37.0	48.1	36.7		17:00	43.0	57.7	37.7	43.6	36.0
	11:15	49.4	66.6	36.3				17:15	43.9	57.9	34.5		
	11:30	44.2	64.9	36.6				17:30	44.3	62.3	35.8		
	11:45	42.1	58.5	36.8				17:45	42.9	60.4	35.3		
	12:00	45.0	61.0	37.8	44.5	37.0		18:00	42.3	59.3	35.4	46.6	35.2
	12:15	45.4	62.9	37.1				18:15	43.4	57.3	35.7		
	12:30	44.3	65.6	36.4				18:30	50.6	69.5	34.3		
	12:45	42.7	62.3	36.4				18:45	44.8	57.3	35.2		

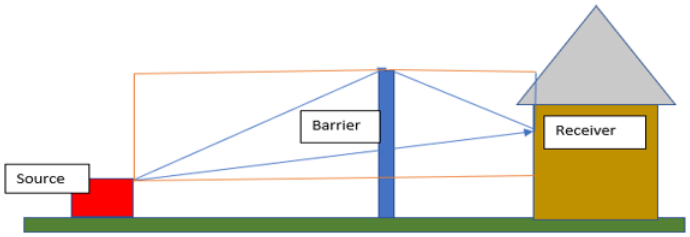
APPENDIX D – Calculations

45 Blandford Road – Front Skylight

ASHP Option A

Applicable where barrier breaks line of sight between source and receiver

Example Illustration of Barrier Attenuation



		Metres
Source to Barrier		1.4
Receiver to Barrier		1.9
Source to Receiver		3

Path Difference	0.3

Frequency Hz	63	125	250	500	1000	2000	4000	8000
Barrier Correction	7.2	8.7	10.7	13.1	15.8	18.6	21.6	24.5

MVHR Outlet Building Screening Calculation

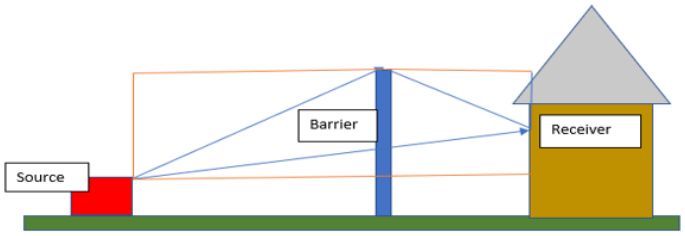
Attenuation per double distance required = (6dB for LpA recommended)				6	dB			Metres	
					Enter Distance =			3	
	Frequency Hz								
	63	125	250	500	1000	2000	4000	8000	Total
	80.9	62	61.8	58.8	43.5	40.1	34.8	26.4	81.04
Total LW	80.9	62.0	61.8	58.8	43.5	40.1	34.8	26.4	81.04
'A' Weight	26.2	16.1	8.6	3.2	0	-1.2	-1	1.1	
LWA (Power)	54.7	45.9	53.2	55.6	43.5	41.3	35.8	25.3	59.76
LPA at New Dist'	37.19	28.39	35.69	38.09	25.99	23.79	18.29	7.81	42.25
SILENCER	7	9	14	32	39	36	26	15	
SCREENING	7.2	8.7	10.7	13.1	15.8	18.6	21.6	24.5	
DIRECTIVITY 90°	0	0	0	2	5	7	12	16	
LPA After Insert	**23.03**	**10.71**	**10.99**	**-9.03**	**-33.81**	**-37.84**	**-41.26**	**-47.71**	**23.53**

MVHR Outlet @ 3m = 24dB $L_{Aeq,T}$

Applicable where barrier breaks line of sight between source and receiver

Example Illustration of Barrier Attenuation

	Metres
Source to Barrier	2.8
Receiver to Barrier	1.9
Source to Receiver	4.5



Path Difference	0.2

Frequency Hz	63	125	250	500	1000	2000	4000	8000
Barrier Correction	6.5	7.7	9.5	11.7	14.2	17.0	19.8	22.8

MVHR Inlet Building Screening Calculation

Attenuation per double distance required = (6dB for LpA recommended)	6	dB			Metres	
		Enter Distance =			4.5	

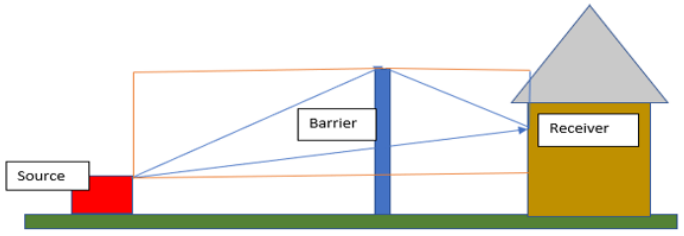
	Frequency Hz								
	63	125	250	500	1000	2000	4000	8000	Total
	84.3	68.7	70.5	69.9	57.1	51	46.6	37.6	84.75
Total LW	84.3	68.7	70.5	69.9	57.1	51.0	46.6	37.6	84.75
'A' Weight	26.2	16.1	8.6	3.2	0	-1.2	-1	1.1	
LWA (Power)	58.1	52.6	61.9	66.7	57.1	52.2	47.6	36.5	68.92
LPA at New Dist'	37.08	31.58	40.88	45.68	36.08	31.18	26.58	15.48	47.90
SILENCER	7	9	14	32	39	36	26	15	
SCREENING	6.5	7.7	9.5	11.7	14.2	17.0	19.8	22.8	
DIRECTIVITY 90°	0	0	0	2	5	7	12	16	
LPA After Insert	**23.58**	**14.86**	**17.42**	**0.02**	**-22.12**	**-28.78**	**-31.26**	**-38.30**	**24.98**

MVHR Inlet @ 4.5m = 25dB $L_{Aeq,T}$

Applicable where barrier breaks line of sight between source and receiver

Example Illustration of Barrier Attenuation

	Metres
Source to Barrier	17.3
Receiver to Barrier	0.8
Source to Receiver	17.5



Path Difference	0.6

Frequency Hz	63	125	250	500	1000	2000	4000	8000
Barrier Correction	8.7	10.7	13.1	15.8	18.6	21.6	24.5	27.5

ASHP A Building Screening Calculation

Attenuation per double distance required = (6dB for LpA recommended)				6	dB			Metres	Ref Dist'
					Enter Distance =			17.5	1
	Frequency Hz								
	63	125	250	500	1000	2000	4000	8000	Total
	52	54.5	52	48.5	44	38	32	23	58.47
'A' Weight	26.2	16.1	8.6	3.2	0	-1.2	-1	1.1	
LPA	25.8	38.4	43.4	45.3	44	39.2	33	21.9	49.94
LPA at New Dist'	0.94	13.54	18.54	20.44	19.14	14.34	8.14	-2.96	25.08
SCREENING	8.7	10.7	13.1	15.8	18.6	21.6	24.5	27.5	
LPA After Insert	**-7.76**	**2.84**	**5.42**	**4.64**	**0.51**	**-7.21**	**-16.38**	**-30.46**	**9.92**

ASHP A @ 17.5m + Façade Reflections (3dB) = 13dB $L_{Aeq,T}$

Adding dB

Levels to be added (Max. of eight)

Enter values	24	25	13	0	0	0	0	0

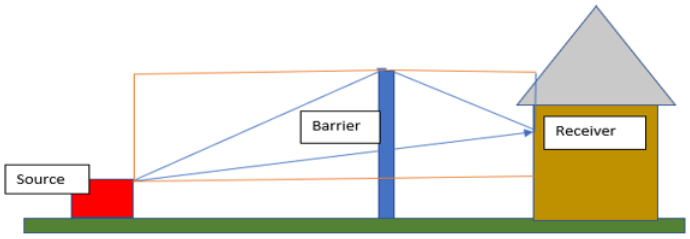
Total = **27.7** dB

Cumulative Sound Pressure Level @ 45 Blandford Road Skylight = 28dB $L_{Ar,T}$

ASHP Option B

Applicable where barrier breaks line of sight between source and receiver

Example Illustration of Barrier Attenuation



	Metres
Source to Barrier	1.4
Receiver to Barrier	1.9
Source to Receiver	3

Path Difference	0.3

Frequency Hz	63	125	250	500	1000	2000	4000	8000
Barrier Correction	7.2	8.7	10.7	13.1	15.8	18.6	21.6	24.5

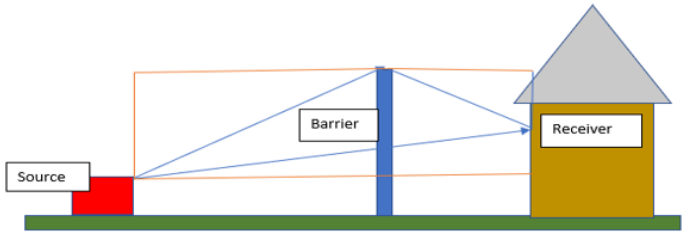
MVHR Outlet Building Screening Calculation

Attenuation per double distance required = (6dB for LpA recommended)				6	dB			Metres	
					Enter Distance =			3	
	Frequency Hz								
	63	125	250	500	1000	2000	4000	8000	Total
	80.9	62	61.8	58.8	43.5	40.1	34.8	26.4	81.04
Total LW	80.9	62.0	61.8	58.8	43.5	40.1	34.8	26.4	81.04
'A' Weight	26.2	16.1	8.6	3.2	0	-1.2	-1	1.1	
LWA (Power)	54.7	45.9	53.2	55.6	43.5	41.3	35.8	25.3	59.76
LPA at New Dist'	37.19	28.39	35.69	38.09	25.99	23.79	18.29	7.81	42.25
SILENCER	7	9	14	32	39	36	26	15	
SCREENING	7.2	8.7	10.7	13.1	15.8	18.6	21.6	24.5	
DIRECTIVITY 90°	0	0	0	2	5	7	12	16	
LPA After Insert	**23.03**	**10.71**	**10.99**	**-9.03**	**-33.81**	**-37.84**	**-41.26**	**-47.71**	**23.53**

MVHR Outlet @ 3m = 24dB $L_{Aeq,T}$

Applicable where barrier breaks line of sight between source and receiver

Example Illustration of Barrier Attenuation



	Metres
Source to Barrier	2.8
Receiver to Barrier	1.9
Source to Receiver	4.5

Path Difference	0.2

Frequency Hz	63	125	250	500	1000	2000	4000	8000
Barrier Correction	6.5	7.7	9.5	11.7	14.2	17.0	19.8	22.8

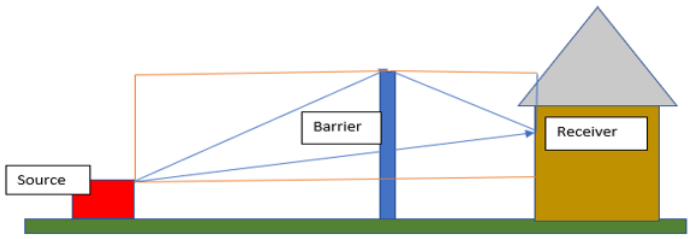
MVHR Inlet Building Screening Calculation

Attenuation per double distance required = (6dB for LpA recommended)				6	dB			Metres	
					Enter Distance =			4.5	
	Frequency Hz								
	63	125	250	500	1000	2000	4000	8000	Total
	84.3	68.7	70.5	69.9	57.1	51	46.6	37.6	84.75
Total LW	84.3	68.7	70.5	69.9	57.1	51.0	46.6	37.6	84.75
'A' Weight	26.2	16.1	8.6	3.2	0	-1.2	-1	1.1	
LWA (Power)	58.1	52.6	61.9	66.7	57.1	52.2	47.6	36.5	68.92
LPA at New Dist'	37.08	31.58	40.88	45.68	36.08	31.18	26.58	15.48	47.90
SILENCER	7	9	14	32	39	36	26	15	
SCREENING	6.5	7.7	9.5	11.7	14.2	17.0	19.8	22.8	
DIRECTIVITY 90°	0	0	0	2	5	7	12	16	
LPA After Insert	**23.58**	**14.86**	**17.42**	**0.02**	**-22.12**	**-28.78**	**-31.26**	**-38.30**	**24.98**

MVHR Inlet @ 4.5m = 25dB $L_{Aeq,T}$

Applicable where barrier breaks line of sight between source and receiver

Example Illustration of Barrier Attenuation



		Metres
Source to Barrier 1		3
Barrier 1 to Barrier 2		3.4
Barrier 2 to Barrier 3		1.5
Receiver to Barrier 3		0.8
Source to Receiver		7.5

Path Difference	1.2

Frequency Hz	63	125	250	500	1000	2000	4000	8000
Barrier Correction	10.7	13.1	15.8	18.6	21.6	24.5	27.5	30.5

ASHP B Building Screening Calculation

Attenuation per double distance required = (6dB for LpA recommended)	6	dB			Metres	Ref Dist'
		Enter Distance =			7.5	1

	Frequency Hz								
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	Total
	52	54.5	52	48.5	44	38	32	23	58.47
'A' Weight	26.2	16.1	8.6	3.2	0	-1.2	-1	1.1	
LPA	25.8	38.4	43.4	45.3	44	39.2	33	21.9	49.94
LPA at New Dist'	8.30	20.90	25.90	27.80	26.50	21.70	15.50	4.40	32.44
SCREENING	10.7	13.1	15.8	18.6	21.6	24.5	27.5	30.5	
LPA After Insert	**-2.43**	**7.78**	**10.10**	**9.17**	**4.95**	**-2.82**	**-12.00**	**-26.10**	**14.59**

ASHP B @ 7.5m + Façade Reflections (3dB) = 18dB $L_{Aeq,T}$

Adding dB

Levels to be added (Max. of eight)

Enter values	24	25	18	0	0	0	0	0

Total = **28.0** dB

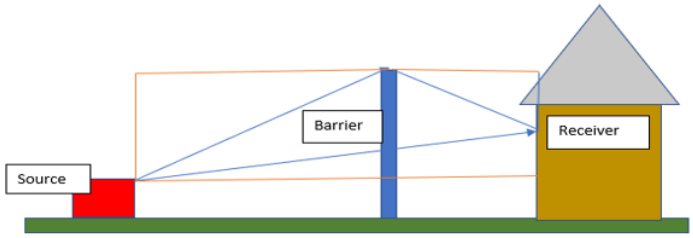
Cumulative Sound Pressure Level @ 45 Blandford Road Skylight = 28dB $L_{Ar,T}$

45 Blandford Road – First-Floor Rear

ASHP Option A

Applicable where barrier breaks line of sight between source and receiver

Example Illustration of Barrier Attenuation



		Metres
Source to Barrier 1		1.5
Barrier 1 to Barrier 2		4.7
Receiver to Barrier 2		3
Source to Receiver		6.5

Path Difference	2.7

Frequency Hz	63	125	250	500	1000	2000	4000	8000
Barrier Correction	13.6	16.3	19.1	22.1	25.0	28.0	31.0	34.0

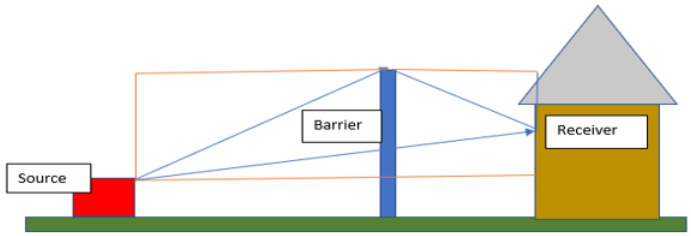
MVHR Outlet Building Screening Calculation

Attenuation per double distance required =				6	dB			Metres	
(6dB for LpA recommended)					Enter Distance =			6.5	
	Frequency Hz								
	63	125	250	500	1000	2000	4000	8000	Total
	80.9	62	61.8	58.8	43.5	40.1	34.8	26.4	81.04
Total LW	80.9	62.0	61.8	58.8	43.5	40.1	34.8	26.4	81.04
'A' Weight	26.2	16.1	8.6	3.2	0	-1.2	-1	1.1	
LWA (Power)	54.7	45.9	53.2	55.6	43.5	41.3	35.8	25.3	59.76
LPA at New Dist'	30.50	21.70	29.00	31.40	19.30	17.10	11.60	1.12	35.56
SILENCER	7	9	14	32	39	36	26	15	
SCREENING	13.6	16.3	19.1	22.1	25.0	28.0	31.0	34.0	
DIRECTIVITY 120°	0	0	2	5	9	13	17	22	
LPA After Insert	**9.91**	**-3.57**	**-6.13**	**-27.66**	**-53.72**	**-59.91**	**-62.41**	**-69.90**	**10.20**

MVHR Outlet @ 6.5m = 10dB $L_{Aeq,T}$

Applicable where barrier breaks line of sight between source and receiver

Example Illustration of Barrier Attenuation



	Metres
Source to Barrier 1	2
Barrier 1 to Barrier 2	4.8
Receiver to Barrier 2	3
Source to Receiver	7

Path Difference	2.8

Frequency Hz	63	125	250	500	1000	2000	4000	8000
Barrier Correction	13.7	16.4	19.3	22.2	25.2	28.2	31.2	34.2

MVHR Inlet Building Screening Calculation

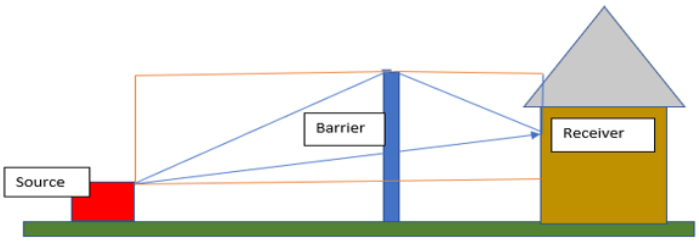
Attenuation per double distance required = (6dB for LpA recommended)	6	dB			Metres	
		Enter Distance =			7	

	Frequency Hz								
	63	125	250	500	1000	2000	4000	8000	Total
	84.3	68.7	70.5	69.9	57.1	51	46.6	37.6	84.75
Total LW	84.3	68.7	70.5	69.9	57.1	51.0	46.6	37.6	84.75
'A' Weight	26.2	16.1	8.6	3.2	0	-1.2	-1	1.1	
LWA (Power)	58.1	52.6	61.9	66.7	57.1	52.2	47.6	36.5	68.92
LPA at New Dist'	33.26	27.76	37.06	41.86	32.26	27.36	22.76	11.66	44.07
SILENCER	7	9	14	32	39	36	26	15	
SCREENING	13.7	16.4	19.3	22.2	25.2	28.2	31.2	34.2	
DIRECTIVITY 120°	0	0	2	5	9	13	17	22	
LPA After Insert	**12.53**	**2.34**	**1.78**	**-17.35**	**-40.92**	**-49.81**	**-51.41**	**-59.52**	**13.25**

MVHR Inlet @ 7m = 13dB $L_{Aeq,T}$

Applicable where barrier breaks line of sight between source and receiver

Example Illustration of Barrier Attenuation



	Metres
Source to Barrier	0.2
Receiver to Barrier	11.9
Source to Receiver	12

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

ASHP A Barrier Screening Calculation

Attenuation per double distance required =				6	dB			Metres	Ref Dist'
(6dB for LpA recommended)					Enter Distance =			12	1
	Frequency Hz								
	63	125	250	500	1000	2000	4000	8000	Total
	52	54.5	52	48.5	44	38	32	23	58.47
'A' Weight	26.2	16.1	8.6	3.2	0	-1.2	-1	1.1	
LPA	25.8	38.4	43.4	45.3	44	39.2	33	21.9	49.94
LPA at New Dist'	4.22	16.82	21.82	23.72	22.42	17.62	11.42	0.32	28.36
SCREENING	5.7	6.5	7.7	9.5	11.7	14.2	17.0	19.8	
LPA After Insert	**-1.51**	**10.33**	**14.10**	**14.26**	**10.75**	**3.41**	**-5.54**	**-19.52**	**18.93**

ASHP A @ 12m + Façade Reflections (3dB) = 22dB $L_{Aeq,T}$

Adding dB

Levels to be added (Max. of eight)

Enter values	10	13	22	0	0	0	0	0

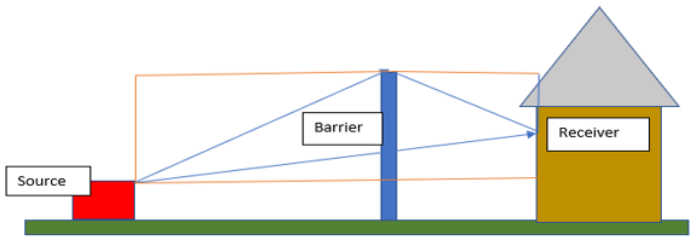
Total = **22.9** dB

Cumulative Sound Pressure Level @ 45 Blandford Road Rear Windows = 23dB $L_{Ar,T}$

ASHP Option B

Applicable where barrier breaks line of sight between source and receiver

Example Illustration of Barrier Attenuation



		Metres
Source to Barrier 1		1.5
Barrier 1 to Barrier 2		4.7
Receiver to Barrier 2		3
Source to Receiver		6.5

Path Difference	2.7

Frequency Hz	63	125	250	500	1000	2000	4000	8000
Barrier Correction	13.6	16.3	19.1	22.1	25.0	28.0	31.0	34.0

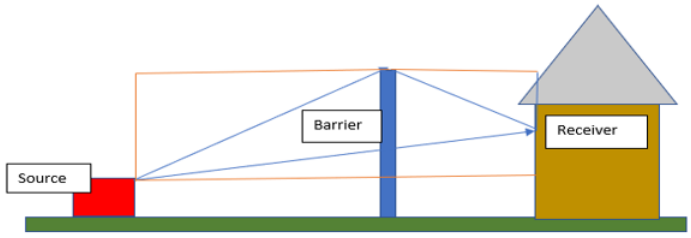
MVHR Outlet Building Screening Calculation

Attenuation per double distance required = (6dB for LpA recommended)				6	dB			Metres	
					Enter Distance =			6.5	
	Frequency Hz								
	63	125	250	500	1000	2000	4000	8000	Total
	80.9	62	61.8	58.8	43.5	40.1	34.8	26.4	81.04
Total LW	80.9	62.0	61.8	58.8	43.5	40.1	34.8	26.4	81.04
'A' Weight	26.2	16.1	8.6	3.2	0	-1.2	-1	1.1	
LWA (Power)	54.7	45.9	53.2	55.6	43.5	41.3	35.8	25.3	59.76
LPA at New Dist'	30.50	21.70	29.00	31.40	19.30	17.10	11.60	1.12	35.56
SILENCER	7	9	14	32	39	36	26	15	
SCREENING	13.6	16.3	19.1	22.1	25.0	28.0	31.0	34.0	
DIRECTIVITY 120°	0	0	2	5	9	13	17	22	
LPA After Insert	**9.91**	**-3.57**	**-6.13**	**-27.66**	**-53.72**	**-59.91**	**-62.41**	**-69.90**	**10.20**

MVHR Outlet @ 6.5m = 10dB $L_{Aeq,T}$

Applicable where barrier breaks line of sight between source and receiver

Example Illustration of Barrier Attenuation



	Metres
Source to Barrier 1	2
Barrier 1 to Barrier 2	4.8
Receiver to Barrier 2	3
Source to Receiver	7

Path Difference	2.8

Frequency Hz	63	125	250	500	1000	2000	4000	8000
Barrier Correction	13.7	16.4	19.3	22.2	25.2	28.2	31.2	34.2

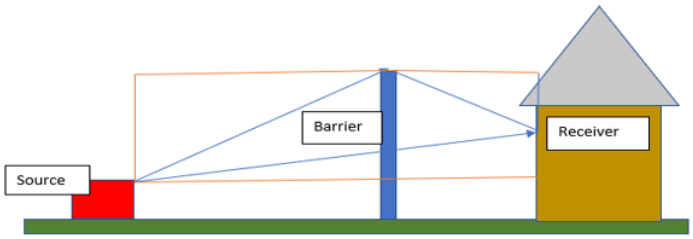
MVHR Inlet Building Screening Calculation

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
	84.3	68.7	70.5	69.9	57.1	51	46.6	37.6	84.75
Total LW	84.3	68.7	70.5	69.9	57.1	51.0	46.6	37.6	84.75
'A' Weight	26.2	16.1	8.6	3.2	0	-1.2	-1	1.1	
LWA (Power)	58.1	52.6	61.9	66.7	57.1	52.2	47.6	36.5	68.92
LPA at New Dist'	33.26	27.76	37.06	41.86	32.26	27.36	22.76	11.66	44.07
SILENCER	7	9	14	32	39	36	26	15	
SCREENING	13.7	16.4	19.3	22.2	25.2	28.2	31.2	34.2	
DIRECTIVITY 120°	0	0	2	5	9	13	17	22	
LPA After Insert	**12.53**	**2.34**	**1.78**	**-17.35**	**-40.92**	**-49.81**	**-51.41**	**-59.52**	**13.25**

MVHR Inlet @ 7m = 13dB $L_{Aeq,T}$

Applicable where barrier breaks line of sight between source and receiver

Example Illustration of Barrier Attenuation



		Metres
Source to Barrier		3.9
Receiver to Barrier		0.4
Source to Receiver		4

Path Difference	0.3

Frequency Hz	63	125	250	500	1000	2000	4000	8000
Barrier Correction	7.2	8.7	10.7	13.1	15.8	18.6	21.6	24.5

ASHP B Barrier Screening Calculation - Partial Enclosure

Attenuation per double distance required =				6	dB			Metres	Ref Dist'
(6dB for LpA recommended)					Enter Distance =			4	1
	Frequency Hz								
	63	125	250	500	1000	2000	4000	8000	Total
	52	54.5	52	48.5	44	38	32	23	58.47
'A' Weight	26.2	16.1	8.6	3.2	0	-1.2	-1	1.1	
LPA	25.8	38.4	43.4	45.3	44	39.2	33	21.9	49.94
LPA at New Dist'	13.76	26.36	31.36	33.26	31.96	27.16	20.96	9.86	37.90
SCREENING	7.2	8.7	10.7	13.1	15.8	18.6	21.6	24.5	
LPA After Insert	**6.60**	**17.68**	**20.66**	**20.14**	**16.16**	**8.53**	**-0.59**	**-14.66**	**25.22**

ASHP B @ 4m + Façade Reflections (3dB) = 28dB $L_{Aeq,T}$

Adding dB

Levels to be added (Max. of eight)

Enter values	10	13	28	0	0	0	0	0

Total = **28.2** dB

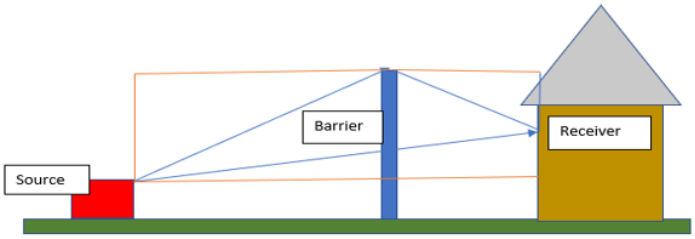
Cumulative Sound Pressure Level @ 45 Blandford Road Rear Windows = 28dB $L_{Ar,T}$

49 Marlborough Crescent – Ground Floor Rear Windows

ASHP Option A

Applicable where barrier breaks line of sight between source and receiver

Example Illustration of Barrier Attenuation



		Metres
Source to Barrier		1.1
Receiver to Barrier		25.5
Source to Receiver		26.5

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

MVHR Outlet Building Screening Calculation

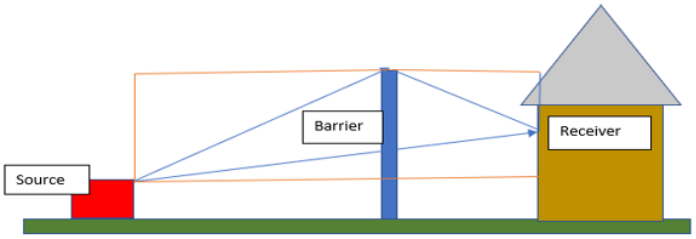
Attenuation per double distance required =	6	dB			Metres	
(6dB for LpA recommended)		Enter Distance =			**26.5**	

	Frequency Hz								
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	Total
	80.9	62	61.8	58.8	43.5	40.1	34.8	26.4	81.04
Total LW	80.9	62.0	61.8	58.8	43.5	40.1	34.8	26.4	81.04
'A' Weight	26.2	16.1	8.6	3.2	0	-1.2	-1	1.1	
LWA (Power)	54.7	45.9	53.2	55.6	43.5	41.3	35.8	25.3	59.76
LPA at New Dist'	18.33	9.53	16.83	19.23	7.13	4.93	-0.56	-11.05	23.39
SILENCER	7	9	14	32	39	36	26	15	
SCREENING	5.7	6.5	7.7	9.5	11.7	14.2	17.0	19.8	
DIRECTIVITY 120°	0	0	2	5	9	13	17	22	
LPA After Insert	**5.61**	**-5.96**	**-6.89**	**-27.23**	**-52.53**	**-58.27**	**-60.52**	**-67.88**	**6.13**

MVHR Outlet @ 26.5m = 6dB $L_{Aeq,T}$

Applicable where barrier breaks line of sight between source and receiver

Example Illustration of Barrier Attenuation



		Metres
Source to Barrier		1.1
Receiver to Barrier		25.5
Source to Receiver		26.5

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

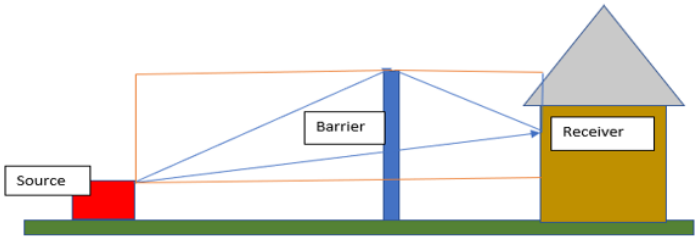
MVHR Inlet Building Screening Calculation

Attenuation per double distance required = (6dB for LpA recommended)				6	dB			Metres	
					Enter Distance =			26.5	
	Frequency Hz								
	63	125	250	500	1000	2000	4000	8000	Total
	84.3	68.7	70.5	69.9	57.1	51	46.6	37.6	84.75
Total LW	84.3	68.7	70.5	69.9	57.1	51.0	46.6	37.6	84.75
'A' Weight	26.2	16.1	8.6	3.2	0	-1.2	-1	1.1	
LWA (Power)	58.1	52.6	61.9	66.7	57.1	52.2	47.6	36.5	68.92
LPA at New Dist'	21.73	16.23	25.53	30.33	20.73	15.83	11.23	0.13	32.55
SILENCER	7	9	14	32	39	36	26	15	
SCREENING	5.7	6.5	7.7	9.5	11.7	14.2	17.0	19.8	
DIRECTIVITY 120°	0	0	2	5	9	13	17	22	
LPA After Insert	**9.01**	**0.74**	**1.81**	**-16.13**	**-38.93**	**-47.37**	**-48.73**	**-56.70**	**10.29**

MVHR Inlet @ 26.5m = 10dB $L_{Aeq,T}$

Applicable where barrier breaks line of sight between source and receiver

Example Illustration of Barrier Attenuation



		Metres
Source to Barrier		1.5
Receiver to Barrier		7
Source to Receiver		8

Path Difference	0.5

Frequency Hz	63	125	250	500	1000	2000	4000	8000
Barrier Correction	8.2	10.1	12.4	15.1	17.9	20.8	23.7	26.7

ASHP A Barrier Screening Calculation

Attenuation per double distance required = (6dB for LpA recommended)				6	dB			Metres	Ref Dist'
					Enter Distance =			8	1
	Frequency Hz								
	63	125	250	500	1000	2000	4000	8000	Total
	52	54.5	52	48.5	44	38	32	23	58.47
'A' Weight	26.2	16.1	8.6	3.2	0	-1.2	-1	1.1	
LPA	25.8	38.4	43.4	45.3	44	39.2	33	21.9	49.94
LPA at New Dist'	7.74	20.34	25.34	27.24	25.94	21.14	14.94	3.84	31.88
SCREENING	8.2	10.1	12.4	15.1	17.9	20.8	23.7	26.7	
LPA After Insert	**-0.51**	**10.21**	**12.89**	**12.17**	**8.06**	**0.36**	**-8.80**	**-22.88**	**17.40**

ASHP A @ 8m + Façade Reflections (3dB) = 20dB $L_{Aeq,T}$

Adding dB

Levels to be added (Max. of eight)

Enter values	6	10	20	0	0	0	0	0

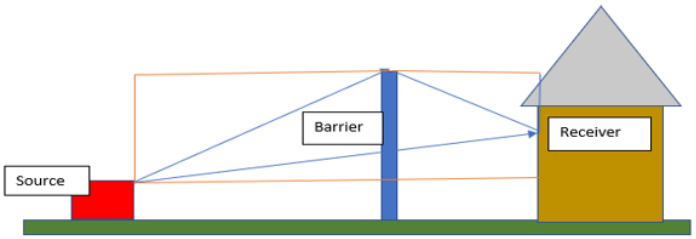
Total = **20.6** dB

Cumulative Sound Pressure Level @ 49 Marlborough Rear Windows = 21dB $L_{Ar,T}$

ASHP Option B

Applicable where barrier breaks line of sight between source and receiver

Example Illustration of Barrier Attenuation



		Metres
Source to Barrier		1.1
Receiver to Barrier		25.5
Source to Receiver		26.5

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

MVHR Outlet Building Screening Calculation

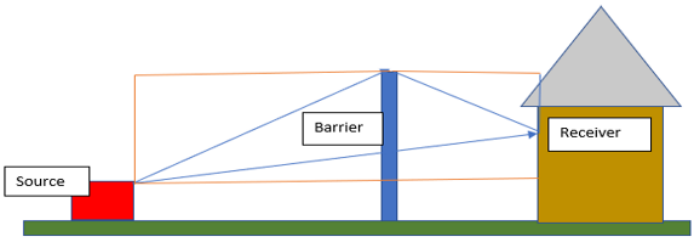
Attenuation per double distance required =				6	dB			Metres	
(6dB for LpA recommended)					Enter Distance =			26.5	
	Frequency Hz								
	63	125	250	500	1000	2000	4000	8000	Total
	80.9	62	61.8	58.8	43.5	40.1	34.8	26.4	81.04
Total LW	80.9	62.0	61.8	58.8	43.5	40.1	34.8	26.4	81.04
'A' Weight	26.2	16.1	8.6	3.2	0	-1.2	-1	1.1	
LWA (Power)	54.7	45.9	53.2	55.6	43.5	41.3	35.8	25.3	59.76
LPA at New Dist'	18.33	9.53	16.83	19.23	7.13	4.93	-0.56	-11.05	23.39
SILENCER	7	9	14	32	39	36	26	15	
SCREENING	5.7	6.5	7.7	9.5	11.7	14.2	17.0	19.8	
DIRECTIVITY 120°	0	0	2	5	9	13	17	22	
LPA After Insert	**5.61**	**-5.96**	**-6.89**	**-27.23**	**-52.53**	**-58.27**	**-60.52**	**-67.88**	**6.13**

MVHR Outlet @ 26.5m = 6dB $L_{Aeq,T}$

Applicable where barrier breaks line of sight between source and receiver

Example Illustration of Barrier Attenuation

		Metres
Source to Barrier		1.1
Receiver to Barrier		25.5
Source to Receiver		26.5



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

MVHR Inlet Building Screening Calculation

Attenuation per double distance required =				6	dB			Metres	
(6dB for LpA recommended)					Enter Distance =			26.5	
	Frequency Hz								
	63	125	250	500	1000	2000	4000	8000	Total
	84.3	68.7	70.5	69.9	57.1	51	46.6	37.6	84.75
Total LW	84.3	68.7	70.5	69.9	57.1	51.0	46.6	37.6	84.75
'A' Weight	26.2	16.1	8.6	3.2	0	-1.2	-1	1.1	
LWA (Power)	58.1	52.6	61.9	66.7	57.1	52.2	47.6	36.5	68.92
LPA at New Dist'	21.73	16.23	25.53	30.33	20.73	15.83	11.23	0.13	32.55
SILENCER	7	9	14	32	39	36	26	15	
SCREENING	5.7	6.5	7.7	9.5	11.7	14.2	17.0	19.8	
DIRECTIVITY 120°	0	0	2	5	9	13	17	22	
LPA After Insert	**9.01**	**0.74**	**1.81**	**-16.13**	**-38.93**	**-47.37**	**-48.73**	**-56.70**	**10.29**

MVHR Inlet @ 26.5m = 10dB $L_{Aeq,T}$

Attenuation per double distance required = (6dB for LpA recommended)				6	dB			Metres	Ref Dist'
					Enter Distance =			19	1
	Frequency Hz								
	63	125	250	500	1000	2000	4000	8000	Total
	52	54.5	52	48.5	44	38	32	23	58.47
'A' Weight	26.2	16.1	8.6	3.2	0	-1.2	-1	1.1	
LPA	25.8	38.4	43.4	45.3	44	39.2	33	21.9	49.94
LPA at New Dist'	0.22	12.82	17.82	19.72	18.42	13.62	7.42	-3.68	24.37
LPA After Insert	**0.22**	**12.82**	**17.82**	**19.72**	**18.42**	**13.62**	**7.42**	**-3.68**	**24.37**

ASHP B @ 12m + Façade Reflections (3dB) = 27dB $L_{Aeq,T}$

Adding dB

Levels to be added (Max. of eight)

Enter values	6	10	27	0	0	0	0	0

Total = **27.1** dB

Cumulative Sound Pressure Level @ 49 Marlborough Rear Windows = 27dB $L_{Ar,T}$