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**AMERESCO**

**WEST  
HAMPSTEAD  
LIBRARY**

**PLANT NOISE  
ASSESSMENT**

**4 APRIL 2025**

**3029-AF-00001-04**

**AMERESCO  
WEST HAMPSTEAD LIBRARY  
PLANT NOISE ASSESSMENT**

**DOCUMENT REFERENCE: 3029-AF-00001-04**

REVIEW AND AUTHORISATION			
<b>Authored and approved by</b> Adrian Finn	<b>Position</b> Director	<b>Signature</b> [Redacted]	<b>Date</b> 04/04/2025
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AMENDMENT HISTORY			
Issue	Status	Description	Date
01	Draft	Report issued	29/08/2024
02	Update	Change in plant location and plant	21/10/2024
03	Update	Use of enclosure	13/11/2024
04	Update	Additional receptors considered and change of enclosure to acoustic louvre	04/04/2025

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## **1. INTRODUCTION**

- 1.1.1 Ameresco has commissioned AF Acoustics Ltd. to undertake a plant noise assessment for the proposed installation of 1 No. Air Source Heat Pump (ASHP) to be installed at the rear of West Hampstead Library.

### **1.2 Brief and Scope**

- 1.2.1 The brief is to undertake a plant noise assessment for the proposed plant to be installed at the West Hampstead Library, to calculate the atmospheric noise emissions at the nearest residential receptors, in accordance with the requirements of Camden Council. If the proposed plant exceeds the local authority criteria, recommendations will be provided such that this can be achieved.

## **2. SITE DESCRIPTION**

### **2.1 Location**

- 2.1.1 West Hampstead Library is located on Dennington Park Road, within the administrative jurisdiction of Camden Council.
- 2.1.2 The library is located on the corner of Dennington Park Road and West End Lane. West End Lane is a mixed commercial and residential road, with shops on the ground floor and apartments located above. Dennington Park Road is a mainly residential road.
- 2.1.3 The ASHP unit is to be located at the rear of the library in the car park.
- 2.1.4 The site layout is shown in Figure 2.1.
- 2.1.5 The noise profile at the measurement locations consisted mainly of noise from traffic on the surrounding road network.

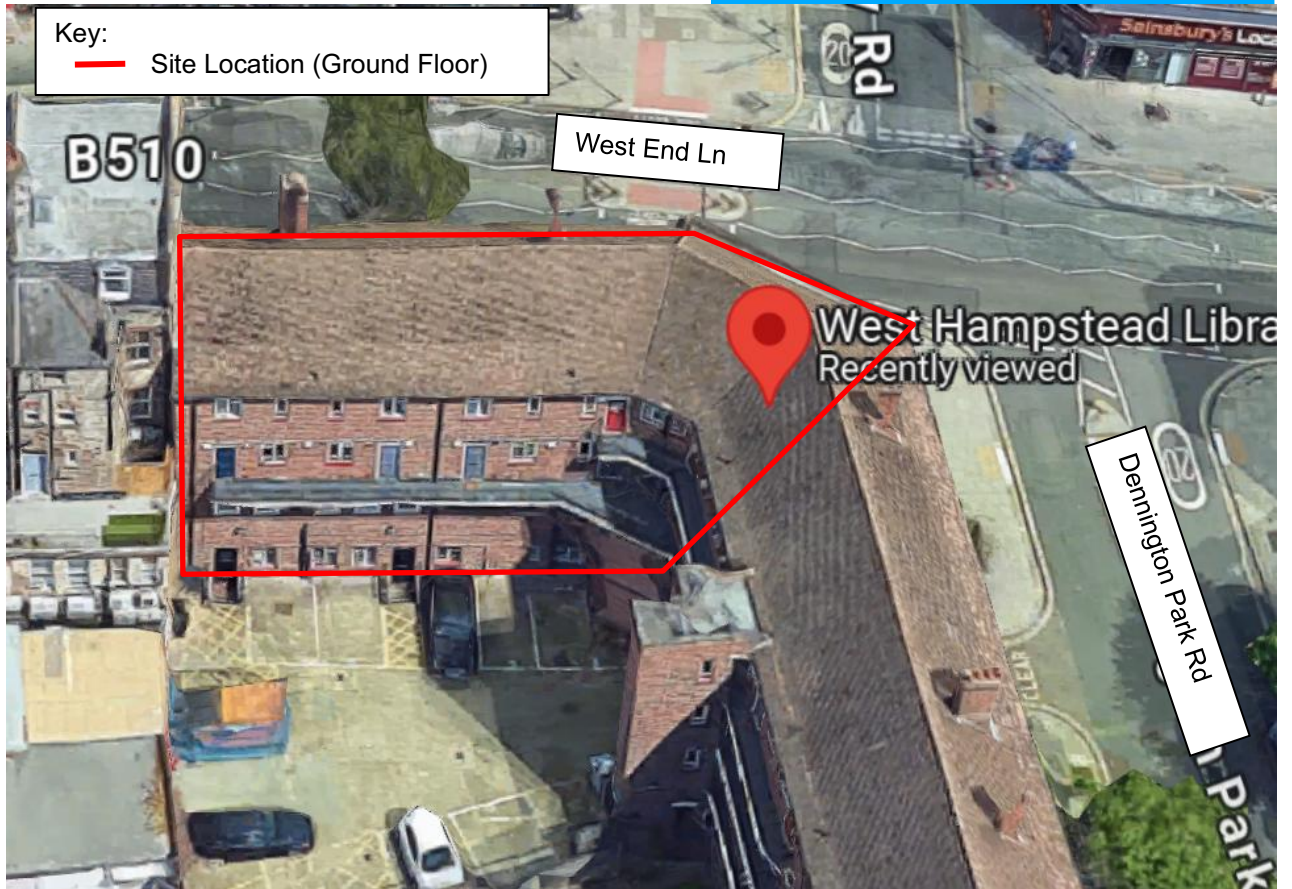


FIGURE 2.1: LOCATION MAP

### 3. GUIDANCE

#### 3.1 British Standard 4142:2014

3.1.1 BS 4142:2014 'Methods for rating and assessing industrial and commercial sound' describes methods for rating and assessing sound from "fixed installations which comprise mechanical and electrical plant and equipment", amongst other sources of noise.

3.1.2 The methodology contained within BS 4142:2014 uses outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

3.1.3 A summary of the approach set out within BS 4142:2014 is set out below:

- establish the specific sound level of the source(s);
- measure the representative background sound level, typically by measurement close to the receptor location;
- rate the specific sound level to account for any distinguishing characteristics;
- estimate the impact by subtracting the background sound level from the rating level; and
- consider the initial estimate of impact, in the context of the noise and its environment.

3.1.4 An initial estimate of the impact of the specific sound is obtained by subtracting the background sound level from the rating level. Using this approach, BS 4142 states:

*"Typically, the greater this difference, the greater the magnitude of impact  
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."*

3.1.5 Certain acoustic features can increase the significance of the impact over that expected from a basic comparison between specific sound level and the background sound level. These features include tonality and impulsivity, as well as additional characteristics and intermittency of the sound.

3.1.6 If appropriate, a subjective assessment of the plant features can be adopted. Where the plant noise contains tonal elements, the following corrections can be made depending on how perceptible the tone is at the noise receptor.

3.1.7 The specific sound level is rated to account for distinguishing characteristics by using the penalties below:

- 0 dB where the tone is not perceptible
- 2 dB where the tone is just perceptible
- 4 dB where the tone is clearly perceptible
- 6 dB where the tone is highly perceptible

3.1.8 Where the plant noise is impulsive, the following corrections can be made depending on how perceptible the impulsivity is at the noise receptor.

- 0 dB where the impulse is not perceptible
- 3 dB where the impulse is just perceptible
- 6 dB where the impulse is clearly perceptible
- 9 dB where the impulse is highly perceptible

3.1.9 For noise which is equally both impulsive and tonal, then both features can be taken into account by linearly summing the corrections for both characteristics.

3.1.10 If the plant has other distinctive characteristics, such as intermittency, then a 3 dB correction can be made.

3.1.11 If a subjective assessment is not appropriate then an objective assessment can be made. A noise source is deemed to be tonal if the time averaged sound pressure level in a one-third octave band exceeds the level in adjacent one-third octave bands by the level differences given below:

- 15 dB in the low frequency one-third octave bands (25 Hz to 125 Hz)
- 8 dB in the mid frequency one-third octave bands (160 Hz to 400 Hz)
- 5 dB in the high frequency one-third octave bands (500 Hz to 10000 Hz)

3.1.12 If an objective assessment identifies the plant noise to be tonal then a 6 dB correction must be made.

## 3.2 Local Authority Guidance – Camden Council - Policy A4 Noise and vibration

3.2.1 The Camden Local plan seeks to ensure that noise and vibration is controlled and managed. Noise and Vibration thresholds are provided, appended to the local plan documentation. The noise limits relating to industrial and commercial noise sources are reproduced below in Table 3.1.

3.2.2 The local plan states that planning permission will not be granted for A) development likely to generate unacceptable noise and vibration impacts or B) development sensitive to noise in locations which experience high levels of noise, unless appropriate attenuation measures can be provided and will not harm the continued operation of existing uses.

3.2.3 It is also stated that Camden will only grant permission for noise generating development, including any plant and machinery, if it can be operated without causing harm to amenity.

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 57 dB $L_{Amax}$	'Rating level' between 9dB below and 5dB above background or noise events between 57 dB and 88dB $L_{Amax}$	'Rating level' greater than 5dB above background and/or events exceeding 88 dB $L_{Amax}$

**TABLE 3.1: CAMDEN LOCAL PLAN INDUSTRIAL AND COMMERCIAL NOISE THRESHOLDS**



## 4. NOISE SURVEY AND MEASUREMENTS

### 4.1 Unattended Noise Survey

- 4.1.1 An unattended noise survey was undertaken by Adrian Finn of AF Acoustics.
- 4.1.2 The duration of the survey was between 11:00 on Tuesday 13 August to 11:00 on Wednesday 14 August 2024.
- 4.1.3 The sound level meter was located at the rear of the library in the car park. The sound level meter was mounted on a tripod at a height of 1.5m above ground level.
- 4.1.4 The measurement and plant locations are shown below in Figure 4.1.
- 4.1.5 Measurements were carried out in accordance with the requirements of BS 7445-2:1991 and ISO 1996-2:1987.
- 4.1.6 The sound level meter was calibrated both prior to and on completion of the survey, with no calibration drift observed. The microphone was fitted with a windshield.



**FIGURE 4.1: MEASUREMENT LOCATION**



4.1.1.7 The equipment used is shown in Table 4.1.

Name	Serial Number	Last Calibrated
NTI Audio XL2-TA Class 1 Sound Level Meter	A2A-18530-E0	January 2023
NTI Audio MA220 Pre-amplifier	9566	January 2023
NTI Audio MC230A Microphone	A19842	January 2023
Larson Davis Calibrator	18295	January 2024

**TABLE 4.1: MEASUREMENT EQUIPMENT**

## 4.2 Measurement Weather Conditions

4.2.1 The weather during the measurements was mainly dry and clear. The temperature ranged from 14 to 22°C. Average wind speeds remained below 3 ms<sup>-1</sup>. The weather is deemed to have caused no significant effect during the measurement period.

## 4.3 Results

4.3.1 The results of the continuous noise monitoring survey are presented in graphical form in Figure A1 of Appendix A and summarised in Table 4.2.

4.3.2 The period averaged  $L_{Aeq}$  noise levels are presented below. The  $L_{A90}$  background noise level has been derived considering the most commonly occurring 15 minute period, whilst the  $L_{Amax,F}$  is the maximum noise level measured.

Time period	Measured Noise Levels (dB re 2.0 x 10 <sup>-5</sup> Pa)		
	$L_{Amax,F}$	$L_{Aeq,T}$	Typical $L_{A90,T}$
<b>Daytime</b> (07:00 – 23:00)	83	50	45
<b>Nighttime</b> (23:00 – 07:00)	78	46	38

**TABLE 4.2: SUMMARY OF UNATTENDED NOISE MEASUREMENTS**

## 5. PLANT NOISE ASSESSMENT

### 5.1 Noise Rating Limit

5.1.1 The table below presents the maximum noise rating level which must not be exceeded at the noise sensitive receptor.

Location	Measurement Period	Assessed Background Noise Level dB $L_{A90}$	Noise Rating Level Design Criteria	Plant Noise Rating Level Limit dB $L_{Ar,Tr}$
Flats above the library and on Dennington Park Road	24 hour	38	-10dB below the typical background noise level – at night	28
Flats on Dennington Park Road – Garden	Day (07:00 – 23:00)	45	-10dB below the typical background noise level – daytime	35

**TABLE 5.1: TARGET BACKGROUND NOISE LEVEL**

### 5.2 Plant Noise Levels

5.2.1 It is proposed to install one Daikin EWYT050CZPBA2 ASHP. The manufacturer's noise levels are stated below in Table 5.2.

Plant	Parameter	Sound Level at Octave band Centre Frequency, dB							
		63	125	250	500	1000	2000	4000	8000
Daikin EWYT050CZPBA2	$L_p$ at 1m	77	72	63	59	56	55	54	48

**TABLE 5.2: PLANT NOISE LEVEL**

5.2.2 To meet the local authority criteria that noise from the plant is 10dB below the background noise levels an acoustic enclosure with the following insertion loss is required, as shown in Table 5.3.

Name	Insertion Loss (dB) at Octave band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
<b>Acoustic Louvre Allaway L70E</b>	4	6	8	11	18	25	20	16

**TABLE 5.3: ACOUSTIC LOUVRE**

### 5.3 Location of Nearest Sensitive Receptors

#### Receptor 1 – Flats above the library

The closest residential receptor with the potential to be affected by noise from the plant installation has been identified as belonging to the flats above the library and is marked in Figure 4.1. The nearest bedroom windows are located at an approximate distance of 19.2 m

from the proposed plant. The noise from the plant will be attenuated by the Allaway L70 E acoustic louvres.

#### Receptor 2 – Flats on Dennington Park Road

The residential receptor with the potential to be affected by noise from the plant installation has been identified as belonging to the flats on Dennington Park Road and is marked in Figure 4.1. The first floor windows are located at an approximate distance of 18.5 m from the proposed plant and the garden is approximately 14m from the plant. The noise from the plant will be attenuated by a 2m high wall which has been taken into account in the calculations.

### **5.4 Calculated Noise Levels**

5.4.1 Table 5.4 provides a summary of the calculated plant noise levels at the nearest noise sensitive receptors. The calculation sheets are presented in Appendix B.

Location	Assessment Period	Target Plant Noise Rating Level dB $L_{Ar,Tr}$	Calculated Plant Noise Rating Level dB $L_{Ar,Tr}$
R1 - Flats above the library	24 hour	28	28
R2 - Flats on Dennington Park Road	24 hour	28	28
R2 - Flats on Dennington Park Road - Garden	Day (07:00 – 23:00)	35	27

**TABLE 5.4: PREDICTED NOISE LEVEL AT THE NEAREST RESIDENTIAL RECEPTOR**

5.4.2 No correction factors have been added in accordance with BS4142:2014. There are no tones or other acoustic characteristics present from the proposed plant.

5.4.3 The results of the analysis indicate that the plant installation meets the proposed plant criteria. As per the semantics of BS4142:2014, the assessment indicates little likelihood of adverse impact.

5.4.4 With an acoustic enclosure, the plant noise levels achieve the requirements of Camden Council at the closest residential receptor, and should therefore be considered acceptable.

## **6. CONCLUSION**

- 6.1.1 Ameresco has commissioned AF Acoustics Ltd. to undertake a plant noise assessment for the proposed installation of 1 No. Air Source Heat Pump (ASHP) to be installed at the rear of West Hampstead Library.
- 6.1.2 A noise survey was undertaken at the rear of West Hampstead Library in August 2024. The measurement position is considered representative of the noise levels affecting the nearest noise sensitive receptor. The representative noise levels measured at this location have been used to establish the prevailing environmental noise climate.
- 6.1.3 Plant noise emission criteria have been set at the nearest receptor based on the results of the noise survey and in conjunction with the national and local guidance.
- 6.1.4 Noise calculations based on the plant data have been undertaken to the nearest noise sensitive receptors.
- 6.1.5 The results of the assessment have been used to assess the impact of noise from the proposed plant at the nearest noise-sensitive receptors. The calculations show that with an acoustic enclosure, with the minimum insertion losses set out in this report, the predicted plant noise levels will meet the requirements of Camden Council at the closest residential receptors, and should therefore be considered acceptable.

### **AF Acoustics**

APPENDIX A: FIGURES

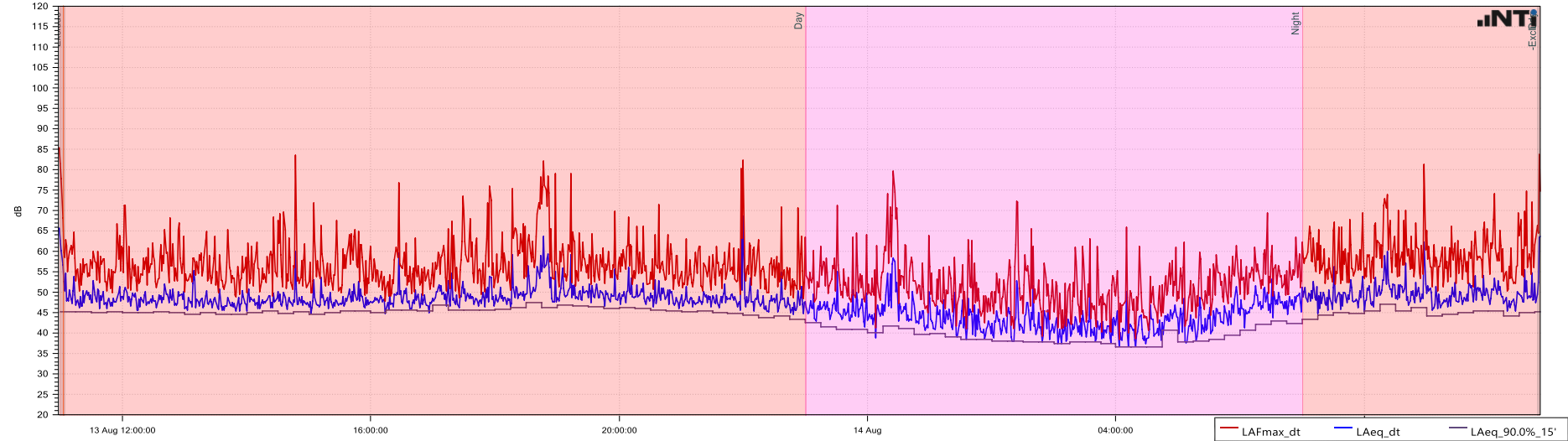


FIGURE A1: NOISE MEASUREMENT RESULTS – WEST HAMPSTEAD LIBRARY



## APPENDIX B: TABLES



Job No.	3029	Job Title	West Hampstead Library
Date Created	21 Oct 2024	By	AF
Date Revised	04 Apr 2025	Rev	15
Date Reviewed	04 Apr 2024	By	AF
Review Type	Self Check	Review Status	No Comments
Sheet	14		

### Plant noise calculations - To flats

Item / Description		Rating/Broadband/Input			Octave Band Centre Frequency, Hz								
		Rating	dB	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k
To flats above Library					31.5								48.0
Daikin EWYT050CZPBA2	Lp			63.7 (A)		77.0	72.0	63.0	59.0	56.0	55.0	54.0	48.0
Number of Sources Correction		1 x		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ratio of Distances - Point Source		1.0 m	19.2 m	-25.7		-25.7	-25.7	-25.7	-25.7	-25.7	-25.7	-25.7	-25.7
Enclosure	Allaw ay L70E 2.4m high				-4.0	-6.0	-8.0	-11.0	-18.0	-25.0	-20.0	-16.0	
Sum at receiver				28 (A)	47.3	40.3	29.3	22.3	12.3	4.3	8.3	6.3	
To flats on Dennington Park Road		First Floor											
Daikin EWYT050CZPBA2	Lp			63.7 (A)	77.0	72.0	63.0	59.0	56.0	55.0	54.0	48.0	
Number of Sources Correction		1 x		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Ratio of Distances - Point Source		1.0 m	18.5 m	-25.3	-25.3	-25.3	-25.3	-25.3	-25.3	-25.3	-25.3	-25.3	
Barrier Attenuation - Theory: Maekaw a, Source Height: 1 m, Receiver Height: 4.5 m		2.0 m	1.0 m	17.5 m	-6.6	-7.8	-9.6	-12.1	-14.9	-17.9	-20.9	-23.9	
Sum at receiver				27 (A)	45.1	38.9	28.1	21.6	15.8	11.8	7.8	-1.2	
To flats on Dennington Park Road		2nd Floor											
Daikin EWYT050CZPBA2	Lp			63.7 (A)	77.0	72.0	63.0	59.0	56.0	55.0	54.0	48.0	
Number of Sources Correction		1 x		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Ratio of Distances - Point Source		1.0 m	19.5 m	-25.8	-25.8	-25.8	-25.8	-25.8	-25.8	-25.8	-25.8	-25.8	
Barrier Attenuation - Theory: Maekaw a, Source Height: 1 m, Receiver Height: 7.5 m		2.0 m	1.0 m	18.5 m	-6.0	-6.8	-8.2	-10.2	-12.8	-15.7	-18.7	-21.7	
Sum at receiver				28 (A)	45.2	39.4	29.0	23.0	17.4	13.5	9.5	0.5	
To flats on Dennington Park Road		3rd Floor											
Daikin EWYT050CZPBA2	Lp			63.7 (A)	77.0	72.0	63.0	59.0	56.0	55.0	54.0	48.0	
Number of Sources Correction		1 x		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Ratio of Distances - Point Source		1.0 m	21.3 m	-26.6	-26.6	-26.6	-26.6	-26.6	-26.6	-26.6	-26.6	-26.6	
Barrier Attenuation - Theory: Maekaw a, Source Height: 1 m, Receiver Height: 11.5 m		2.0 m	1.0 m	20.3 m	-5.5	-6.0	-6.8	-8.2	-10.2	-12.8	-15.7	-18.7	
Sum at receiver				28 (A)	44.9	39.4	29.6	24.2	19.2	15.6	11.7	2.7	
To flats on Dennington Park Road		Garden											
Daikin EWYT050CZPBA2	Lp			63.7 (A)	77.0	72.0	63.0	59.0	56.0	55.0	54.0	48.0	
Number of Sources Correction		1 x		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Ratio of Distances - Point Source		1.0 m	15.0 m	-23.5	-23.5	-23.5	-23.5	-23.5	-23.5	-23.5	-23.5	-23.5	
Barrier Attenuation - Theory: Maekaw a, Source Height: 1 m, Receiver Height: 1.5 m		2.0 m	1.0 m	14.0 m	-7.3	-8.9	-11.2	-13.9	-16.8	-19.8	-22.8	-25.0	
Sum at receiver				27 (A)	46.2	39.6	28.3	21.6	15.7	11.7	7.7	-0.5	

**TABLE B1: CALCULATIONS TO THE NEAREST RESIDENTIAL RECEPTORS**

## APPENDIX C: TERMINOLOGY RELATING TO NOISE

<b>Sound Pressure</b>	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
<b>Sound Pressure Level</b>	The sound level is the sound pressure relative to a standard reference pressure of $20\mu\text{Pa}$ ( $20 \times 10^{-6}$ Pascals) on a decibel scale.
<b>Sound Power Level (L<sub>w</sub>)</b>	is the total amount of sound energy inherent in a particular sound source, independent of its environment. It is a logarithmic measure of the sound power in comparison to a specified reference level (usually $10^{-12}$ W).
<b>Decibel (dB)</b>	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds $s_1$ and $s_2$ is given by $20 \log_{10} (s_1 / s_2)$ . The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is $20\mu\text{Pa}$ .
<b>A-weighting, dB(A)</b>	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
<b>L<sub>Aeq,T</sub></b>	Equivalent continuous A-weighted sound pressure level. The value of the A-weighted sound pressure level of a continuous steady sound that, within a measurement time interval T, has the same A-weighted sound energy as the actual time-varying sound
<b>L<sub>90,T</sub></b>	L <sub>90</sub> is the noise level exceeded for 90% of the period T (i.e. the quietest 10% of the measurement) and is often used to describe the background noise level.
<b>L<sub>max,T</sub></b>	A noise level index defined as the maximum noise level during the period T. L <sub>max</sub> is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L <sub>eq</sub> noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
<b>Specific Noise</b>	The noise source under investigation for assessing the likelihood of complaints.
<b>Rating Level</b>	The specific noise level plus any adjustment for the characteristic features of the noise.
<b>Free field</b>	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m.
<b>Façade</b>	At a distance of 1m in front of a large sound reflecting object such as a building façade.

## **APPENDIX D: LIMITATIONS TO THE REPORT**

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

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