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NOISE IMPACT ASSESSMENT REPORT - CONDENSING UNITS

40 GOODGE STREET, FITZROVIA W1T 2QP

FOR

KA SANDWICH FITZROVIA LTD

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1. EXECUTIVE SUMMARY

The client is seeking planning approval (Planning Reference: 2017/5155/P) for the discharge of a variation of condition 4 (Planning Reference: 2015/3833/P) for the night-time use of 2 (No.) condensing units servicing the premises at 40 Goodge Street, Fitzrovia W1T 2QP. A night-time noise survey has been requested by the council.

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 the rear of 42 Goodge Street and the third-floor residential premises at the rear of 38 Goodge Street.

Measurements were also taken with the condensing units in operation at its typical maximum operational level (both condensing units in operation) to ensure worst case scenarios.

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 measurement data, 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 at the nearest noise sensitive properties is considered to comply with the London Borough of Camden Council's policy.

2. INTRODUCTION

The client is seeking planning approval for the use of 2 (No.) condensing units between 23:00 – 09:30 hours to service the premises at 40 Goodge Street, Fitzrovia W1T 2QP, 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.

3. SITE DESCRIPTION

Planning permission is being sought (Planning Reference: 2017/5155/P) for the discharge of a variation of condition 4 (Planning Reference: 2015/3833/P) for the night-time use of 2 (No.) condensing units servicing the premises at 40 Goodge Street, Fitzrovia W1T 2QP (hereafter referred to as 'the site'). The property is a traditional brick built four-storey terraced building in the London Borough of Camden. It is located in a mixed area comprising predominantly of commercial units at ground floor level with residential accommodation on the floors above. Similar properties lie to either side of the site and on the opposite side of the road.

The nearest sensitive residential receptors were noted to be the second-floor residential premises at the rear of 42 Goodge Street and the third-floor residential premises at the rear of 38 Goodge Street at an approximate distance of 4m & 7m respectively, as 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

A manned environmental noise survey was undertaken on the 9th May 2019 at the site to determine the specific noise level of the condensing units in typical operation. The noise survey was undertaken at a single measurement location at the rear at first-floor level between 23:20 – 23:40 hours.

The background noise survey with both condensing units turned off was undertaken between 23:30 hours on the 9th May and 08:00 hours on the 10th May 2019. A survey at this time covers the most sensitive period of time in which the condensing units may be operational.

Ambient, background & maximum noise levels (L_{Aeq}, L_{Amax} & L_{A90} 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 2.5m at first floor level & in direct line of sight approximately 1m from the condensing units. The position is not considered to be in free-field and therefore a 3dB 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	0004702
Larson Davis 377B02	½" microphone	1	159519
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. 5-11° Celsius), cloudy skies (50 to 100% 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 specific, ambient and background noise levels during the monitored operational hours are shown in Table 5.1 & 5.2 below.

Table 5.1 Measured specific, background and ambient sound pressure levels

	Time	$L_{Aeq,5min}$	L_{AFmax}	$L_{AF90,5min}$
Plant On	**23:35**	**51***	**63***	**44***
Plant Off	**23:20**	**48***	**51***	**47***

*3dB façade correction applied

The specific noise level at 1 metre during the survey is **48dB** $L_{Aeq,5min}$.

Table 5.2 Measured typical background and ambient sound pressure levels

Date / Period (hours)	Ambient Sound Pressure Level, dB $L_{Aeq,15min}$	Typical Background Sound Pressure Level, dB $L_{A90,15min}$
09/05/2019 - 10/05/2019 (23:45 to 08:00)	**37-48***	**38***

*3dB façade correction applied

The 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

The background noise levels were dominated by noise existing commercial activities & several pidgeon infestations. Specific noise levels were not considered to be tonal or impulsive. 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 Camden Council. The council have requested that a night-time noise survey be completed at the most sensitive time periods for the existing condensing units for the discharge on a variation of condition 4 of planning application 2015/3833/P.

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}

*10dB should be increased to 15dB if the noise contains audible tonal elements. (day and night). However, if it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required. In addition, a frequency analysis (to include, the use of Noise Rating (NR) curves or other criteria curves) for the assessment of tonal or low frequency noise may be required.

**levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises.

The periods in Table C correspond to 0700 hours to 2300 hours for the day and 2300 hours to 0700 hours for the night. The Council will take into account the likely times of occupation for types of development and will be amended according to the times of operation of the establishment under consideration.

There are certain smaller pieces of equipment on commercial premises, such as extract ventilation, air conditioning units and condensers, where achievement of the rating levels (ordinarily determined by a BS:4142 assessment) may not afford the necessary protection. In these cases, the Council will generally also require a NR curve specification of NR35 or below, dependant on the room (based upon measured or predicted Leq,5mins noise levels in octave bands) 1 metre from the façade of affected premises, where the noise sensitive premise is located in a quiet background area.

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)	Measured Background Noise Level, dB $L_{A90,15min}$	Rating noise level at nearest residential facade, dB L_{Aeq}
09/05/2019 - 10/05/2019 (23:45 to 08:00)	38*	28*

*3dB façade correction

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."

7. MECHANICAL PLANT AND ASSOCIATED NOISE LEVELS

The following items of plant have been installed at the rear of the premises.

Table 7.1 Condensing Units

External Plant Item	Make	Model	Reference Noise Level* L_p
Chiller Condenser	J&E Hall	JEH088M1	28dB(A) @ 10m
Freezer Condenser	J&E Hall	JEH175L1	35dB(A) @ 10m

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

The condensing units are mounted on the rear façade with a partial enclosure around the top & sides of the unit.

In reference to section 6 of this report, a 3dB penalty addition has been applied for intermittency as the system will switch on and off as required. Penalty additions have not been applied for tonality or 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 Building Screening

Due to the significant screening provided by the building there will be no direct line of sight to the condensing units from either noise sensitive receptor. The building screening is calculated to attenuate the specific noise level by 16dB to the second-floor receptor and by 14dB to the third-floor receptor. Full path difference calculations for the condensing units can be found in Appendix D.

8. NOISE IMPACT ASSESSMENT

This section presents calculations to predict the noise impact of the condensing units, located at the rear of the site, at the nearest noise sensitive properties.

8.1 Operational Hours and Background Noise Levels

The condensing units will be active throughout the night-time period of 23:00 to 07:00.

The lowest measured background noise level at the measurement position during the survey is **38dB** $L_{A90,15min.}$ The design range is **28dB** L_{Aeq} at 1m from the façade of the nearest residential premises.

8.2 Nearest Noise Sensitive Properties

The nearest noise sensitive receptors to the mechanical plant were noted to be the second-floor residential premises at the rear of 40 Goodge Street at an approximate distance of 4m from the condensing units & the third-floor at 38 Goodge Street at an approximate distance of 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 mechanical plant could be operational at its typical level. Given the distances between the noise sources and the noise sensitive receptors, point source calculations have been used.

8.4 Noise Level Ratings

Calculations to predict the noise of the mechanical plant operating at 1m from the facades of the residential properties are given below.

The rating noise level at 1m from the 2nd floor residential façade at 42 Goodge Street, with the mechanical plant operating, is predicted to be **26dB L_{Aeq}** which is **12dB(A) below** the typical background noise level (38dB $L_{A90, 15Min}$).

The rating noise level at 1m from the 3rd floor residential façade at 38 Goodge Street, with the mechanical plant operating, is predicted to be **23dB L_{Aeq}** which is **15dB(A) below** the typical background noise level (38dB $L_{A90, 15Min}$).

In accordance with BS 4142:2014 guidance, the rating noise ***"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. The isolators shall incorporate rubber or neoprene high-frequency isolation pads.

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.

9.0 Conclusion

Sound Licensing has undertaken an environmental noise survey at the site in order to determine specific mechanical plant & 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 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 demonstrated to comply with the London Borough of Camden Council's policy.

APPENDIX A – Acoustic Terminology

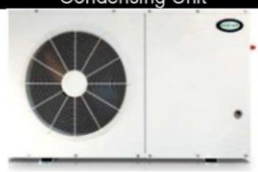
Parameter	Description
Acoustic environment	Sound from all sound sources as modified by the environment
Ambient sound	Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far
Ambient sound level, La = LAeq,T	Equivalent continuous A-weighted 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’

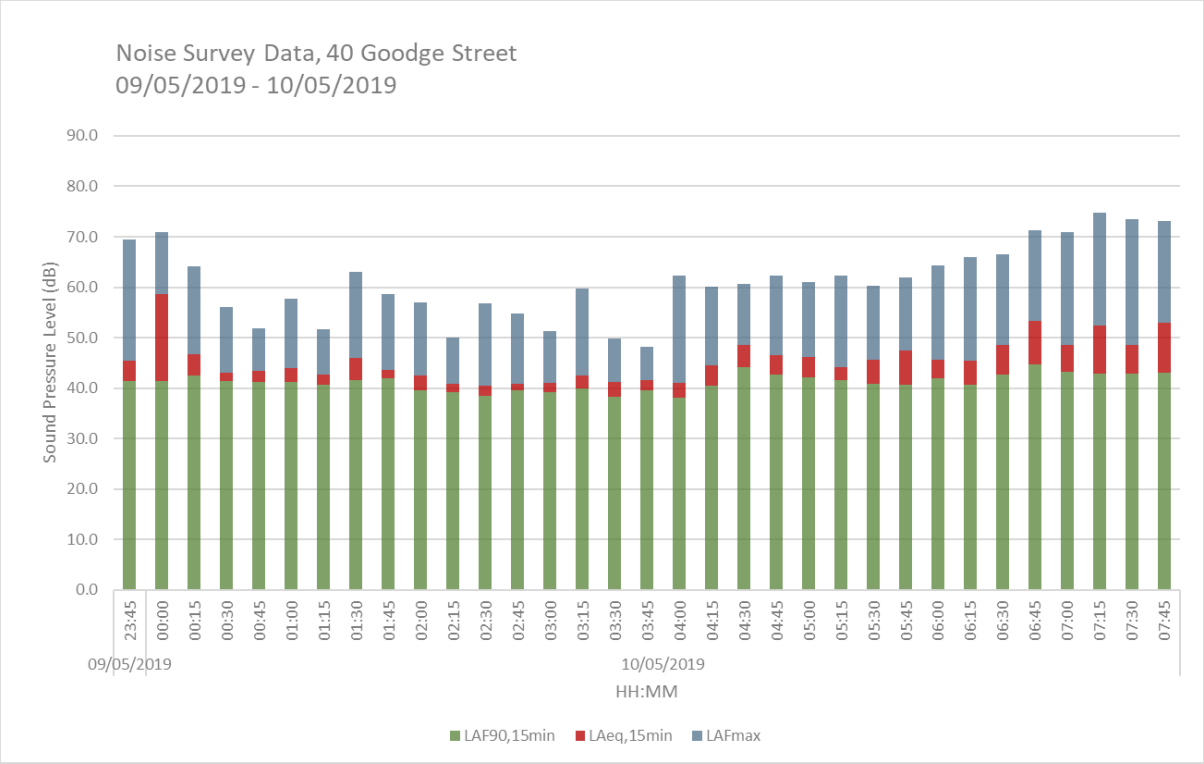
APPENDIX B – Data Sheets

JEH088M1 and JEH175L1 Condensing Units

	Condensing Unit	Evaporator	Control Panel
Freezer 1			
	JEH175L1 1109x478x649mm, 86kg, †35dBA	FTEC4-5L 866x376x180mm	DCPG2/W 230/1/50 20A
Chiller 2			
	JEH088M1 887x430x489mm, 38kg, †28dBA	FTEC4-5L 866x376x180mm	DCPG2/W 230/1/50 20A

†dBA measured at 10m field condition, dimensions shown are WxDxH unless stated otherwise

APPENDIX C - Noise Monitoring Data



Date	Time	$L_{Aeq,15min}$	L_{AFmax}	$L_{AF90,15min}$	Date	Time	$L_{Aeq,15min}$	L_{AFmax}	$L_{AF90,15min}$
09/05/2019	23:45	45.4	69.4	41.4	10/05/2019	04:00	41.0	62.3	38.1
10/05/2019	00:00	58.7	71.0	41.4		04:15	44.5	60.1	40.5
	00:15	46.7	64.1	42.5		04:30	48.6	60.7	44.1
	00:30	43.1	56.0	41.4		04:45	46.5	62.3	42.7
	00:45	43.5	51.8	41.2		05:00	46.1	61.0	42.1
	01:00	44.0	57.7	41.3		05:15	44.2	62.3	41.5
	01:15	42.7	51.6	40.7		05:30	45.6	60.3	40.9
	01:30	45.9	63.1	41.5		05:45	47.4	61.9	40.7
	01:45	43.6	58.6	42.0		06:00	45.6	64.2	41.9
	02:00	42.5	56.9	39.6		06:15	45.3	65.9	40.7
	02:15	40.9	50.1	39.2		06:30	48.5	66.6	42.6
	02:30	40.4	56.8	38.4		06:45	53.3	71.2	44.7
	02:45	40.8	54.7	39.5		07:00	48.5	70.9	43.3
	03:00	41.0	51.3	39.2		07:15	52.4	74.8	42.9
	03:15	42.5	59.7	40.0		07:30	48.5	73.5	42.9
	03:30	41.3	49.8	38.2		07:45	52.9	73.1	43.1
	03:45	41.5	48.2	39.6					

APPENDIX D – Calculations

Specific Noise Calculation

Decibel subtraction:								
	51	dB	minus	48	dB	=	48.0	dB
		Formula: $L_P = 10 \text{ Log } (I_1 - I_2)$						

Ambient SPL - Residual SPL = Specific = 48dB(A)

Calculations for the 2nd Floor at 42 Goodge Street

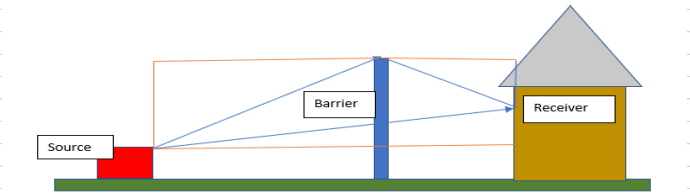
Level distance given a LPA @ a distance (Assumes point source and Hemispherical)								
							(Pressure Calculations)	
LPA =	**48**	dB	at distance of =	**1**	metre			
	dB level at	**3**	metres =	**38.5**	dB			
	Formula = $L_{PA1} = L_{PA2} - 20 \text{ Log } (d_1/d_2)$							

Sound Pressure Level @ 1m from the Nearest Residential Façade + 3dB Intermittency = 42dB(A)

Barrier Calculation

Applicable where barrier breaks line of sight between source and receiver

Example Barrier figure



		Metres
	Source Height	1.5
	Barrier Height	2.5
	Receiver Height	3
	Source to Barrier	0
	Barrier to Receiver	2
	Path Difference	0.561553

Frequency Hz	125	250	500	1000	2000	4000	8000
Barrier Correction	10.5	12.9	15.5	18.4	21.3	24.2	27.2

Barrier Attenuation = 16dB

Sound Pressure Level @ 1m from the 2nd Floor Residential Façade = 26dB(A)

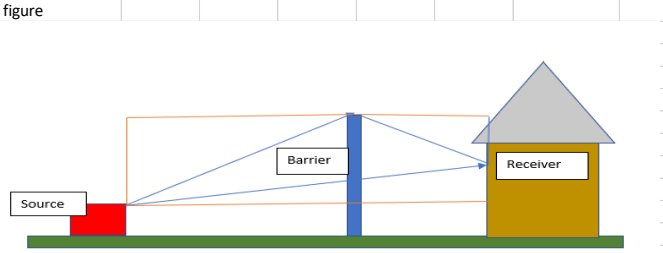
Calculation for the 3rd Floor at 38 Goodge Street

Level distance given a LPA @ a distance (Assumes point source and Hemispherical)						
						(Pressure Calculations)
LPA =	48	dB	at distance of =	1	metre	
	dB level at	5	metres =	34.0	dB	
	Formula =	$L_{PA1} = L_{PA2} - 20 \text{ Log } (d_1/d_2)$				

Sound Pressure Level @ 1m from the Nearest Residential Façade + 3dB Intermittency = 37dB(A)

Applicable where barrier breaks line of sight between source and receiver

Example Barrier figure



		Metres
	Source Height	1.5
	Barrier Height	5
	Receiver Height	6
	Source to Barrier	2
	Barrier to Receiver	2
	Path Difference	0.2464

Frequency Hz	125	250	500	1000	2000	4000	8000
Barrier Correction	8.2	10.1	12.4	15.0	17.8	20.7	23.7

Barrier Attenuation = 14dB

Sound Pressure Level @ 1m from the 3rd Floor Residential Façade = 23dB(A)