

ACOUSTIC DESIGN TECHNOLOGY
Noise and Vibration Consultants

ADT 3505

23 March 2023

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47 / 47A SPEAR STREET, MANCHESTER

ENVIRONMENTAL NOISE IMPACT ASSESSMENT

ACOUSTIC CONSULTANCY REPORT ADT 3505/ENIA

Revision	Date	Issued By	Checked By	Revision Notes
-	23 March 2023	Andrew Lockwood	-	-

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1.0 SUMMARY

Planning permission is being sought for the construction of a seven storey residential development, as shown on the planning application drawings.

Acoustic Design Technology Limited have undertaken an environmental noise survey to determine the existing ambient noise levels in the vicinity.

The survey data has been used to determine the sound insulation requirements necessary to control external noise intrusion to suitable levels inside the new apartments and offices, with reference to the guidance contained in BS 8233:2104.

The assessment has established that the ambient noise levels are relatively low for a city centre location, and that the sound insulation necessary to control external noise intrusion are also relatively low.

Consideration has also been given to the potential for noise breakout from the new development into the street.

The conclusion of this report is that the application site is well suited for city centre residential development.

2.0 BASIS OF ASSESSMENT

2.1 Site Location

The application site is a small, undeveloped plot of land fronting onto Spear Street in the Northern Quarter of Manchester. It lies just to the south of the junction with Faraday Street on the opposite side of the road.

The surrounding buildings appear to be mainly used for commercial purposes although there are also existing residential premises in relatively close proximity.

2.2 Proposed Development

Planning permission is being sought for the erection of a seven storey building comprising offices at basement and ground floor levels, and a single two bedroom apartment on each of the upper five floors.

2.3 Assessment Criteria

Manchester City Council have requested an acoustic assessment to address the following issues:-

- i. details of the existing noise levels in the area
- ii. an indication of noise levels to be achieved inside the accommodation
- iii. details of acoustic glazing and ventilation
- iv. how noise breakout from the new uses will be limited

2.4 Strategy for Noise Impact Assessment

Based on the information in Sections 2.1 to 2.3 above, the strategy for the noise impact assessment has been broken down into the following stages:

- i. undertake an environmental noise survey to obtain baseline noise data, as described in Section 3.0 below
- ii. consider the sound attenuation measures necessary to control noise intrusion into the new apartments in accordance with the guidance contained in BS 8233:2014
- iii. consider the requirements to control noise breakout from the new development to the surrounding area

3.0 ENVIRONMENTAL NOISE SURVEY

3.1 Introduction

Unattended environmental noise monitoring was undertaken between 15:15 hours on Friday 10 November and 17:00 hours on Monday 13 November 2017. Supplementary attended measurements were also undertaken concurrently on Friday 10 November between 16:00 18:00 hours.

The site itself was not judged to be sufficiently secure to allow monitoring equipment to be left unattended over the weekend, so the unmanned monitoring was undertaken from the roof of the adjacent building, the only area to which access could be gained.

3.2 Instrumentation

The instrumentation used, and the field calibration values before and after the survey are detailed in Appendix A of this report.

3.3 Procedure

Two measurement positions were selected as described below and indicated on the attached site plan 3505/SP1:

- i. on roof of adjacent building (long term monitoring with 01dB Solo)
- ii. on Spear Street (2 hour attended monitoring with Svan 971)

At position 1, the microphone was mounted on a tripod approximately 1.2 metres above the roof of the adjacent building, at least 3.5 metres from any other acoustically reflective surface, and approximately in line with the Spear Street façade.

At position 2, the microphone was mounted on a tripod approximately 1.2 metres above the ground and at least 3.5 metres from any other acoustically reflective surface.

At both positions, the noise levels were logged continuously with the meter set to store the octave band and 'A' weighted 100ms short-term L_{eq} for subsequent post processing. Periodic audio recordings were also taken at position 1 to assist with the processing and analysis of the logged data.

3.4 Results

The logged data from both positions has been post processed to determine $L_{Aeq,T}$, $L_{A90,T}$ and L_{Amax} levels for each 15 minute period.

The results for position 1 have been plotted on the attached time history graph 3505/TH1, and additionally, the average daytime and nighttime octave band $L_{eq,T}$ together with the $L_{Aeq,T}$, $L_{A90,T}$ and L_{Amax} levels are summarised on the attached table 3505/T1.

For position 2, octave band $L_{eq,T}$ together with the $L_{Aeq,T}$, $L_{A90,T}$ and L_{Amax} for each 15 minute period are presented in table 3505/T2.

It is worth noting that the average daytime and night-time levels are remarkably constant throughout the entire survey period ranging between 53 and 55 dB L_{Aeq} , apart from Sunday night / Monday morning when the level dropped to 50 dB L_{Aeq} .

Please refer to Appendix B for explanation of the noise units and the A-weighting terms used in this report.

3.5 Weather Conditions

As the survey was largely unattended, it is not possible to provide a detailed description of the weather conditions throughout the entire survey period. At the beginning of the survey, there was a slight drizzle but this dried up by around 17:00 hours and the conditions forecast for the remainder of the survey period were dry with a light to moderate breeze.

3.6 Description of Existing Acoustic Environment

As the survey was largely unattended, it is not possible to provide a detailed description of the noise climate for the entire survey period.

However, at the beginning and end of the survey period, the noise climate was primarily controlled by the sound of distant road traffic and pedestrian activity in the city centre; there was virtually no traffic on Spear Street itself to affect the noise levels.

The recorded data over the weekend follows a diurnal pattern that is fairly typical of a city centre environment, and there is no evidence of any entertainment noise in either the logged data or the audio recordings.

Reference to graph 3505/TH1 shows, however, that the ambient and background levels were significantly higher between around 22:00 hours and 03:00 hours on Friday and Saturday night than on Sunday night. The audio recordings suggest this is due to the noise generated by people frequenting the bars and clubs in the city centre.

The lack of any entertainment noise or more than the occasional vehicle movement on Spear Street result in relatively low ambient noise levels for an urban location, making the application site well suited for city centre residential development.

3.7 Average Noise Levels

Reference to the attached tables shows that the average noise levels at the front of the site were typically 53 – 55 dB $L_{Aeq,16hour}$ during the daytime, and 50 – 54 dB $L_{Aeq,8hour}$ during the night.

4.0 EXTERNAL NOISE INTRUSION

4.1 Introduction

When assessing noise levels on the site it must be borne in mind that the noise climate may change in the future. The following discussion is of necessity based on the results of the environmental noise survey described in Section 3.0 above.

4.2 Incident Noise Levels

The levels recorded at ground level on the site were slightly lower than the levels measured on the roof of the adjacent building. This is consistent with the fact that there was virtually no road traffic in Spear Street, and that the noise levels on and around the site were consequently controlled by the general hubbub of the city centre rather than localised noise sources.

The results of the survey therefore indicate that the noise levels incident on the Spear Street elevation will be fairly similar at all levels, and also on the upper floors of the side elevation. Lower down the side elevation, the levels are likely to decrease a little, due to the nature of the fairly enclosed courtyard that will be created by the new building.

4.3 Internal Noise Design Criteria

BS 8233:2014 provides guidance on suitable design criteria for different types of buildings including residential dwellings and commercial offices. The applicable levels from Section 7.7 for dwellings, and 7.3 for offices are summarised below:-

Area	07:00 – 23:00	23:00 – 07:00
living room	35 dB $L_{Aeq,16hour}$	-
dining room / area	40 dB $L_{Aeq,16hour}$	-
bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$
outdoor amenity areas	50 – 55 dB $L_{Aeq,16hour}$	-
office	45 – 50 $L_{Aeq,T}$	

4.4 External Noise Intrusion with the Windows Open

It is generally accepted that for buildings affected by general environmental noise, the level inside a room with an open window will be between 10 and 12 dB(A) lower than the level outside the window.

The practical implication of this is that the levels recommended in BS 8233 would only be achieved with windows open if the external noise levels were lower than:

Location / Activity	Period	Maximum Level
living rooms	07:00 – 23:00	45 – 47 dB $L_{Aeq,16hour}$
bedrooms	23:00 – 07:00	40 – 42 dB $L_{Aeq,8hour}$
offices	any time	55 – 57 $L_{Aeq,T}$

Comparison of these figures with the ones summarised in Section 3.7 above shows that the indoor ambient noise criteria for the apartments cannot be achieved with the windows open. This does not mean that the windows cannot be openable, but merely that an alternative means of background ventilation must be provided to obviate the need to open the windows.

By contrast, indoor levels inside the offices should be acceptable, even with any windows open for ventilation.

4.5 External Noise Intrusion with the Windows Closed

Although noise intrusion through open windows into the apartments would be excessive, the sound insulation requirements are not particularly onerous and external noise intrusion can readily be controlled by means of double glazing and acoustic trickle vents.

The attached calculation 3505/C1 predicts the resultant noise levels inside a bedroom based on the levels measured between 23:00 hours on Friday and 07:00 hours on Saturday.

This shows that with basic domestic double glazing and up to two standard acoustic trickle vents, the resultant noise level inside the room with the window closed would be below 30 dB $L_{Aeq,8hour}$ and would therefore achieve the recommended levels in BS 8233.

It should be noted that this is the worst-case scenario. The building is oriented such that all the bedrooms overlook the courtyard rather than Spear Street. And as discussed in Section 4.2, the noise levels in the courtyard at lower levels are expected to be lower than the measured ones used in the calculation.

4.6 Outdoor Amenity Areas

The proposed development does not include any outdoor amenity areas.

4.7 Summary

In summary, this assessment has demonstrated that suitable noise levels within the apartments will be achieved using standard domestic double glazing and acoustic trickle vents. For the offices, there are no requirements, as the levels will be acceptable even with the windows open.

5.0 NOISE BREAKOUT

5.1 General

The Council's request for an assessment of noise breakout from the building includes references to sound limiters and sound amplification equipment.

However, the proposed development comprises only offices and apartments, so it is unclear why the Council have raised these concerns.

5.2 Offices

Offices are not noisy environments, so there is no reason why noise breakout to the street should need to be considered. Nonetheless, the proposed layouts include lobbies to both the ground floor and basement offices, which means that any noise breakout from these areas should be negligible.

5.3 Apartments

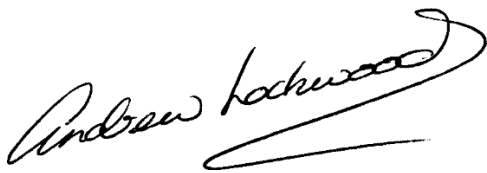
Whilst it is always theoretically possible for a resident to generate high levels of noise inside their apartment, which could result in audible levels of noise outside the building, it is not practical to design the development to mitigate the problem.

In theory, it would be possible to fit the apartments with non-openable windows, but this would result in very poor residential amenity. The amount of noise breakout from any of the apartments will therefore be principally determined by whether the occupant has the window open or not, a factor that is outside the control of the Developer.

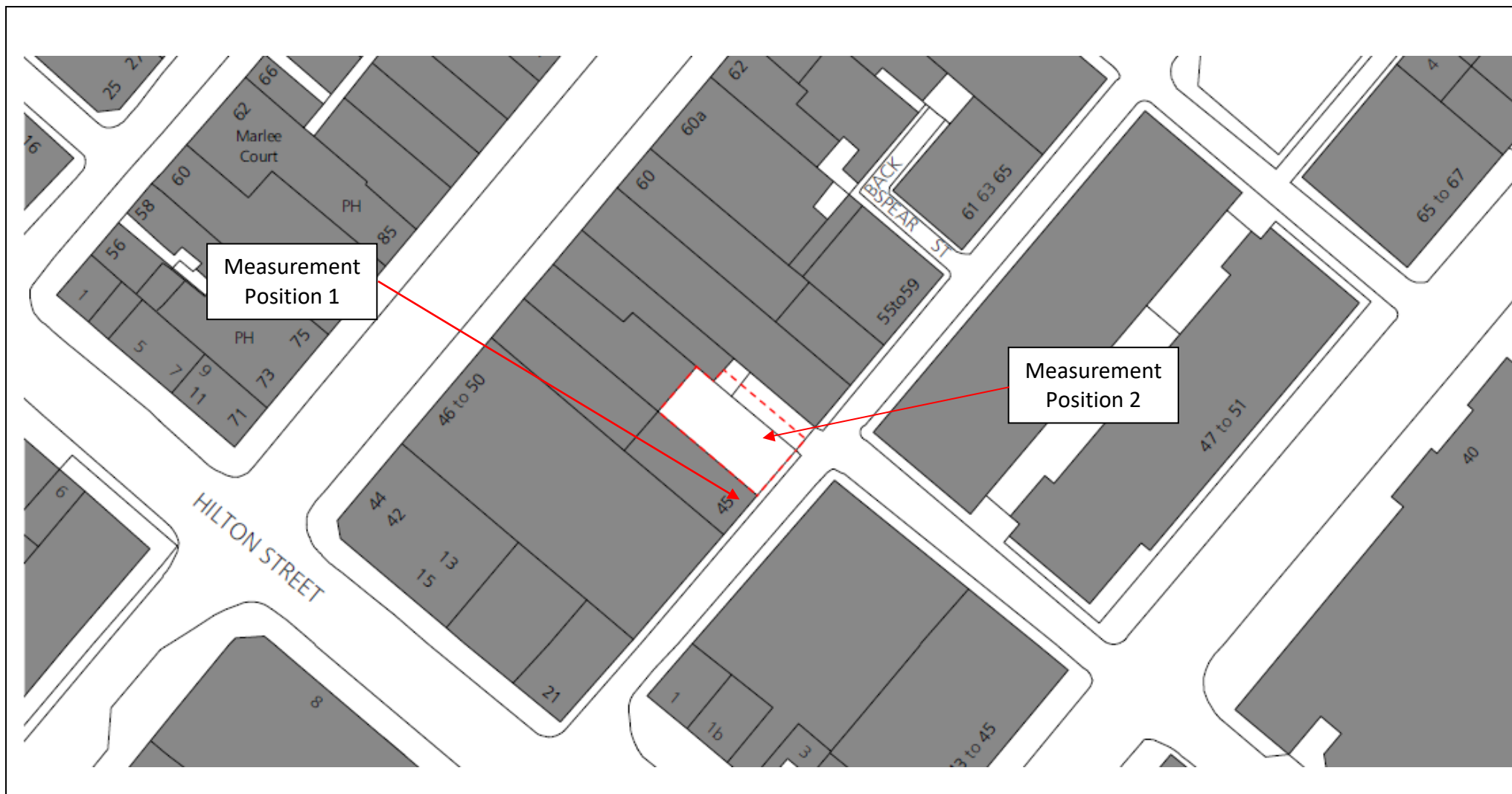
6.0 CONCLUSIONS

- 6.1 The environmental noise survey has demonstrated that the ambient noise levels in the vicinity are relatively low for an urban location.
- 6.2 This initial assessment has demonstrated that external noise intrusion into the new apartments can be readily controlled to the levels recommended in BS 8233 by means of standard double glazing and acoustic trickle vents.

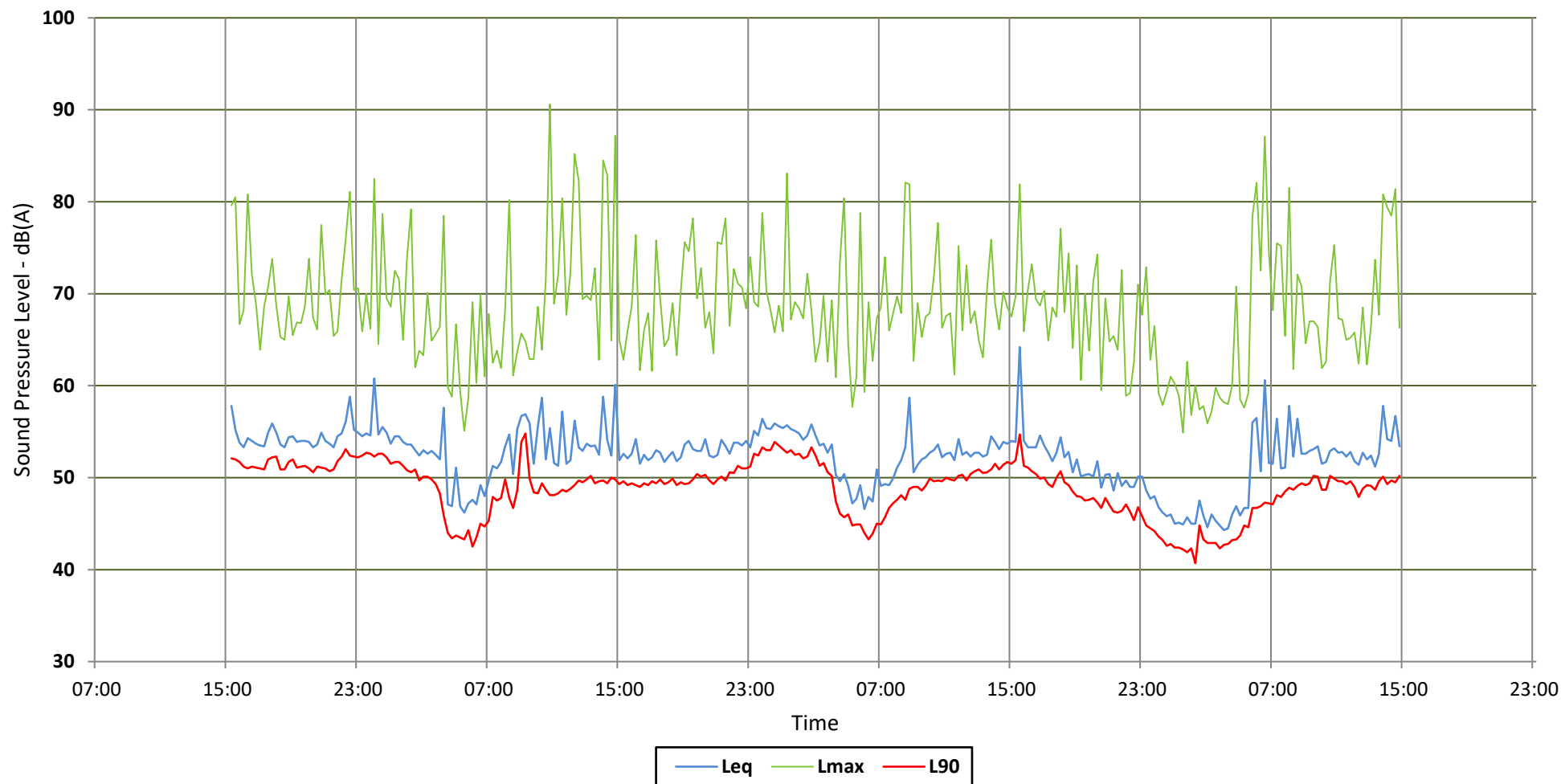
- 6.3 There are no requirements to control external noise intrusion into the offices, as suitable levels will be achieved, even with the windows open.
- 6.4 It is not practical to introduce any noise mitigation measures to control noise breakout from the apartments, as this would mean having non-openable windows, which would result in very poor residential amenity.
- 6.5 Offices are not noisy areas, and there should therefore be no need for any measures to control noise breakout. Nonetheless, the entrances to both the ground floor and basement offices are lobbied.
- 6.6 The conclusion of this report is therefore that from an acoustic point of view, the application site is well suited for city centre residential development.

A handwritten signature in black ink, reading "Andrew Lockwood". The signature is fluid and cursive, with a long, sweeping underline that extends to the right.

FOR ACOUSTIC DESIGN TECHNOLOGY



<u>Notes</u>	<u>Description</u> Site Plan Showing Noise Monitoring Locations		 ACOUSTIC DESIGN TECHNOLOGY Noise and Vibration Consultants
	<u>Project</u> 47 / 47A Spear Street, Manchester		
	<u>Survey Date</u> 10 to 13 November 2017	<u>Drawing No.</u> 3505/SP1	



Notes

Description

Time History Graph - Measurement Position 1

Project

47 / 47A Spear Street, Manchester

Survey Date

10 to 13 November 2017

Drawing No.

3505/TH1



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Noise and Vibration Consultants

SUMMARY OF UNATTENDED NOISE MONITORING RESULTS – POSITION 1

(Free Field Levels)

Period	Duration	Average $L_{eq,T}$ (dB) at octave band centre frequency (Hz)								L_{Aeq}	L_{Amax}	L_{A90}
		63	125	250	500	1k	2k	4k	8k			
Fri 10 Nov 15:00 – Fri 10 Nov 23:00	8 hours	64	57	52	52	51	47	40	33	55	81	53
Fri 10 Nov 23:00 – Sat 11 Nov 07:00	8 hours	67	57	50	50	50	46	38	28	54	83	45
Sat 11 Nov 07:00 – Sat 11 Nov 23:00	16 hours	64	56	53	51	49	46	43	36	54	91	49
Sat 11 Nov 23:00 – Sun 12 Nov 07:00	8 hours	65	57	50	51	50	45	38	27	54	83	46
Sun 12 Nov 07:00 – Sun 12 Nov 23:00	16 hours	63	56	52	51	49	44	37	34	53	82	48
Sun 12 Nov 23:00 – Mon 13 Nov 07:00	8 hours	58	52	48	46	45	44	40	31	50	87	43
Mon 13 Nov 07:00 – Mon 13 Nov 17:00	10 hours	63	56	54	50	49	46	42	31	54	86	49

TABLE 3505/T1

ATTENDED NOISE MONITORING RESULTS

(Free Field Levels)

Date	Period	Duration	Average $L_{eq,T}$ (dB) at octave band centre frequency (Hz)								L_{Aeq}	L_{Amax}	L_{90}
			63	125	250	500	1k	2k	4k	8k			
10 November	16:00 – 16:15	15 mins	62	57	53	53	50	46	41	36	55	65	53
	16:15 – 16:30	15 mins	60	54	51	50	48	44	36	29	52	64	50
	16:30 – 16:45	15 mins	60	55	50	52	52	47	41	37	55	81	49
	16:45 – 17:00	15 mins	61	56	51	50	49	46	42	35	54	69	49
	17:00 – 17:15	15 mins	63	53	50	49	48	46	41	33	53	67	49
	17:15 – 17:30	15 mins	60	54	50	49	48	44	36	27	52	63	49
	17:30 – 17:45	15 mins	60	55	51	50	48	44	37	28	52	61	49
	17:45 – 18:00	15 mins	60	56	52	51	49	45	39	31	54	63	50

TABLE 3505/T2

SAMPLE FAÇADE CALCULATION

Bedroom - Nighttime

		Octave Band Centre Frequency - Hz								dB(A)	NR
		63	125	250	500	1k	2k	4k	8k		
Incident noise level		67	57	50	50	50	46	38	28	54	
Direct Field											
Composite SRI of structure (from below)		-22	-27	-24	-27	-30	-29	-29	-29		
Direct L _p		45	30	26	23	20	17	9	-1		
Reverberant Field											
Composite SRI of structure (from below)		-22	-27	-24	-27	-30	-29	-29	-29		
10 log (S / A)		1	0	-1	-4	-4	-5	-5	-5		
Constant (for line source)		1	1	1	1	1	1	1	1		
Reverberant L _p		47	31	26	20	17	13	5	-5		
Total L _p		49	34	29	25	22	18	10	0	22	29
Composite SRI Calculation											
Brick faced wall		4.3	28	34	40	45	50	55	55		
4/12/4 sealed (Pilkington)		2	18	24	20	25	35	38	35		
Acoustic Trickle Vent (BS 8233)		10	37	37	36	35	36	34	34		
Acoustic Trickle Vent (BS 8233)		10	37	37	36	35	36	34	34		
Composite SRI		22	27	24	27	30	29	29	29		

CALCULATION 3505/C1

APPENDIX A

Instrumentation

Manufacturer	Type and / or Model	Serial Number	Last Laboratory Calibration	Calibrator Output (dB)	Free Field Correction (dB)	Initial reading (dB)	Final reading (dB)
01dB	(Black) Solo Class 1 Sound Level Meter	65201	October 2017	114.17	-0.1	114.1	113.7
	PRE 21 S Pre-Amplifier	15619	October 2017				
	MCE 212 ½ inch Microphone	101204	October 2017				
Svantek	Svan 971 Class 1 Sound Level Meter	34392	October 2015	114.17	-0.13	114.04	114.04
ACO	7052E ½ inch Microphone	54655					
Svantek	SV18 Preamplifier	32179					
Norsonic	Nor1251 Calibrator (Cal 4)	33453	January 2017	114.17	-	-	-

APPENDIX B

Acoustic Terminology

The annoyance produced by noise is dependent upon many complex interrelated factors such as 'loudness', its frequency (or pitch) and any variations in its level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

A-weighting The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the A-weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average person. It is also possible to calculate the A-weighted noise level by applying certain corrections to an un-weighted spectrum.

When the noise being measured has variable amplitude, such as traffic noise, it is necessary to qualify the basic dB unit. This may be done using a statistical index L_n dB, where n is any value between 0 and 100, and is the percentage of the sample time for which the stated level is exceeded. In defining the use of the index, both the value of n and the length of the sample period must be stated.

L_{10} L_{10} , being the level exceeded for 10% of the time, has been shown to be a good indicator for traffic noise intrusion, and is used in assessing the effect of traffic noise on residential or commercial premises.

L_{90} L_{90} is the level exceeded for 90% of the time, and is used as a measure of background noise level, as it excludes the effects of occasional transient levels, such as individual passing cars or aircraft.

In addition to the statistical noise indices defined above, the following noise units are also used to define variable amplitude noise sources:

$L_{eq,T}$ $L_{eq,T}$ is defined as the notional steady sound pressure level which, over a stated period of time, would contain the same amount of acoustical energy as the actual fluctuating sound measured over the same period. In other words, it is a measure of the "average" noise level

L_{max} L_{max} is the maximum time-weighted sound pressure level recorded over the stated time period