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ACOUSTICS PLUS

Proposed Retention of Mechanical Plant

69 Grays Inn Road, London, WC1X 8TP.

Environmental Noise Assessment

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Project Address:	69 Grays Inn Road London WC1X 8TP
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Author:		**Andy Dodd**	**Senior Consultant**	**18/10/2018**
Reviewer:		**Phil Huffer**	**Principal Consultant**	**18/10/2018**

1. INTRODUCTION

1.1 Acoustics Plus Ltd (APL) is an independent firm of multi-disciplinary acoustic engineers. APL is engaged by both private and public sector clients. APL is a registered member of The Association of Noise Consultants (ANC) and the author is a corporate member of The Institute of Acoustics (IOA).

1.2 APL has been instructed by the Applicant's architect, Zaavia Design, to consider and advise upon the noise implications of the proposed installation of an extract fan.

1.3 The extract fan is located internally within the dry cleaning shop and is ducted out via the front façade of the site.

1.4 It is understood the Local Planning Authority (LPA) require further information on noise levels from the proposed installation in order to fully assess the noise impact upon the surrounding neighbourhood.

1.5 This report provides the response to the LPA, on behalf of the Applicant.

1.6 This report has been prepared by Acoustics Plus Limited (APL) with all reasonable skill, care, and diligence in accordance with generally accepted acoustic consultancy principles and taking account the services and terms agreed between APL and our client. Any information provided by third-parties and referred to herein may not have been checked or verified by APL unless expressly stated otherwise. Certain statements made in the report are predictions based on reasonable assumptions and good industry practice. Such statements involve risk and uncertainty which could cause measured and predicted results to differ materially. APL does therefore not guarantee or warrant any prediction contained in this report.

2. BASELINE SITUATION

2.1 The Application Site (the "site") is situated at 69 Grays Inn Road, London, WC1X 8TP. The site is situated within a mixed use area. The site and its surroundings can be seen in Figures 1 to 5.

2.2 The extract fan is located within the shop, trading as 'Lux Dry Cleaners' (see Diagram 1 overleaf) and the fan is ducted out via the front façade of the site.

2.3 The nearest noise sensitive windows to point of discharge is considered to be the first floor front windows of the residential accommodation located directly above the site (see Diagram 1 overleaf).

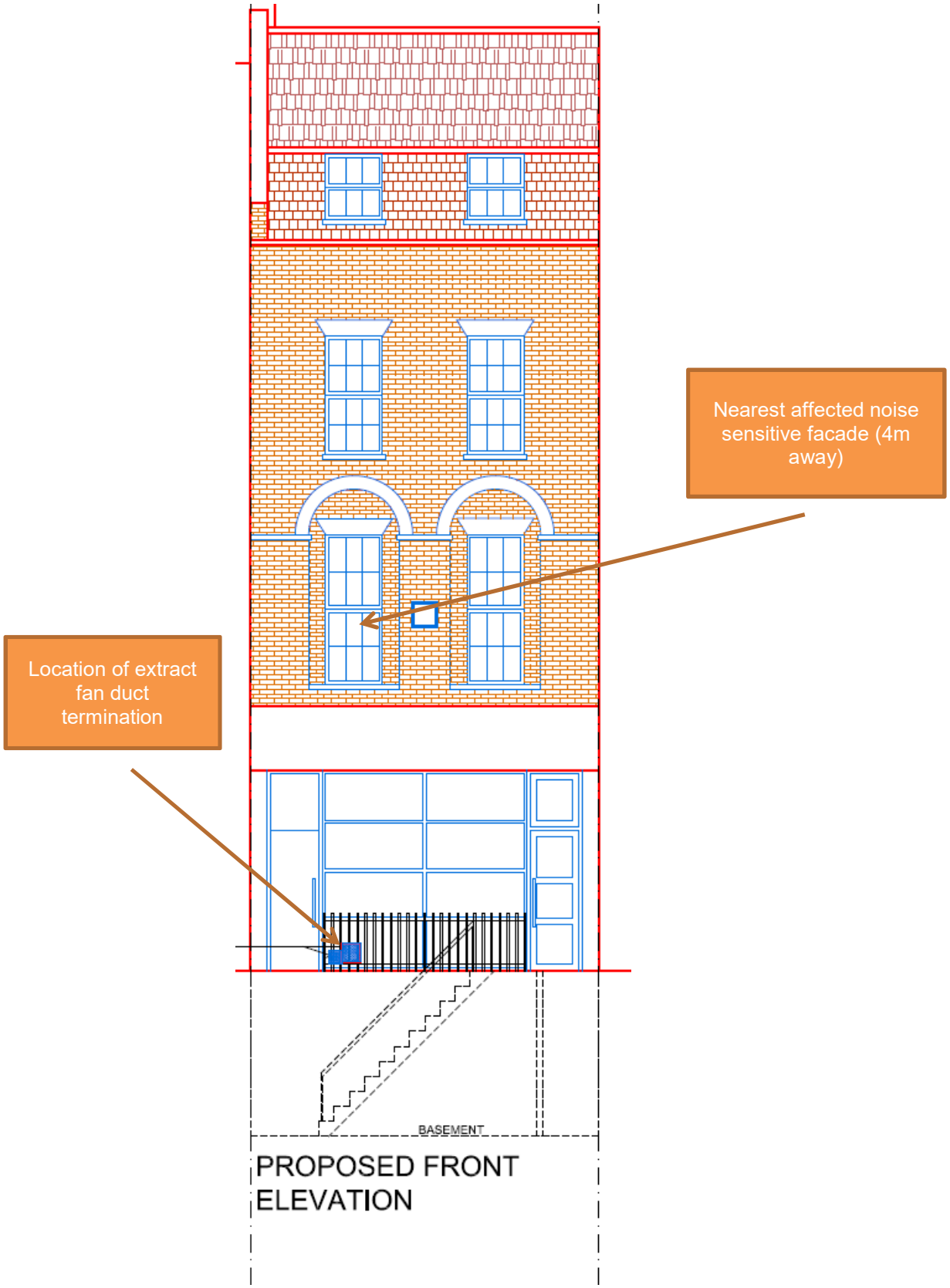

Nearest affected noise sensitive facade (4m away)
Location of extract fan duct termination
BASEMENT
PROPOSED FRONT ELEVATION

Diagram 1

3. NOISE OUTLINE

3.1 In order to produce an environmental noise assessment, consideration must be given to the prevailing background noise in the locality of the installation.

3.2 Measurements of background noise were obtained over a 24 hour period at a location deemed representative of background noise levels experienced at the nearest noise sensitive façade. The measurements were obtained at the front of the building at ground floor level.

3.3 The particulars of the measurement exercise are recorded below. The weather conditions were considered appropriate to monitor environmental noise.

Date: 8th & 9th October 2018
Start Time: 14:32 hrs
Location: Front façade of 69 Grays Inn Road.

Weather conditions

Date	Precipitation	Wind	Temperature
8/10/18	0.0mm	6km/h	16 ºC
9/10/18	0.0mm	7km/h	20 ºC

3.4 Minimum background and average noise levels are shown in Table 1 below (L_{Aeq} and L_{A90}). Noise levels were influenced by items of mechanical plant located adjacent to the site.

Time period	Lowest $L_{A90,15min}$	Average $L_{Aeq,T}$
07:00-23:00hrs	62[1]	72[1]

Table 1

[1] Measurement data during the daytime period was coloured by other items of mechanical plant operating nearby

4. DESIGN CRITERIA

4.1 Information regarding the noise levels not to be exceeded by the proposed installation was extracted from the LPA (London Borough of Camden) Local Plan Adopted version June 2017 (Appendix 3 Noise thresholds).

Industrial and Commercial Noise Sources

A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion).

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 57dB L_{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 88dB L_{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.

4.1 The procedure contained in BS4142 is to quantify the "specific sound level", which is the measured or predicted level of sound from the source in question over a one hour period for the daytime and a 15 minute period for the night-time. Daytime is defined in the standard as 07:00 to 23:00 hours, and night-time as 23:00 to 07:00 hours.

4.2 The specific sound level is converted to a rating level by adding penalties to account for either tonality or impulsivity. The standard sets out objective methods for determining the presence of tones or impulsive elements but notes that it is acceptable to subjectively determine these effects.

4.3 The penalty for tonal elements is between 0dB and 6dB, and the standard notes:

"Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible."

4.4 The penalty for impulsive elements is between 0dB and 9dB, and the standard notes:

"Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible."

4.5 With regard to intermittency, the standard notes:

"When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. This can necessitate measuring the specific sound over a number of shorter sampling periods that are in combination less than the reference time interval in total, and then calculating the specific sound level for the reference time interval allowing for time when the specific sound is not present. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied."

4.6 The background sound level should be established in terms of the LA90 noise index. The standard states that the background sound level should be measured over a period of sufficient length to obtain a representative value. This should not normally be less than 15 minute intervals. The standard states that:

"A representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value."

4.7 The assessment outcome results from a comparison of the rating level with the background sound level. The standard states:

a) Typically, the greater this difference, the greater the magnitude of the impact.
b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
d) 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.
Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact."

4.8 The standard goes on to note that:

"*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."*

4.9 In addition to the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, the 2014 edition places emphasis upon an appreciation of the context, as follows:

"An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context."

4.10 The background noise levels were assessed by looking at the levels either side of the trading hours of the dry cleaners.

4.11 The background noise varied throughout the measurement period due to urban traffic movements and mechanical plant running nearby. However, the measurement data collected before the dry cleaners opens and after it ceases operating provides an indication of the noise climate in the area when shop activities are absent. For the benefit of this assessment the considered background noise level is detailed below

Day time period	Considered $L_{A90,15min}$
Level outside trading hours 19:32 and 07:17	66

Table 2

4.12 In determining a rating level, corrections to account for tonality, intermittency and impulsivity must be added to the specific noise level of the unit. The octave band sound levels of the fan (see Appendix A) does not indicate a tonal component, so no correction was added to account for this. No correction of was added to account for impulsivity or for intermittency as the fan remains operational constantly and does not switch on and off.

4.13 The plant noise emission criteria that should not be exceeded is therefore based on Table 2 and is shown in Table 3 below. These levels should not be exceeded at the nearest noise sensitive façade.

Noise emission limit for mechanical plant	
Daytime limit	Night time limit
L_{Aeq} 56dB	Not applicable

Table 3

4.14 The noise levels of the installed extract fan were obtained from manufacturers data sheets as follows (see Appendix A). The extract fan relate to the ventilation of the site.

(a) Extract fan – Soler & Palau CVAB-4-6000 450 64dBA @ 1m.

5. EQUIPMENT

5.1 All background noise measurements were obtained using the following equipment:

- Svantek Svan 958 Class 1 Serial No. 45530
- Rion Calibrator Type NC-74 Class 1 Serial No. 00410215

5.2 The relevant equipment carries full and current traceable calibration. The equipment, where necessary, was calibrated prior to and after the measurements were carried out.

6. CALCULATIONS

6.1 In order to predict the noise impact of the climate control system, consideration has been given to noise egress from the condenser units to the nearest noise sensitive façade. The following noise impact was considered:

(a) Noise impact from extract ventilation termination grille;

6.2 The calculation exercise utilised information provided by Soler & Palau (copy of the data sheet is provided in Appendix A).

6.3 Throughout the calculation exercise, guidance and formula were extracted from the authoritative publication *"Noise Control in Building Services" (published by SRL)*.

6.4 The ductwork system attenuation was calculated by considering the attenuation of sound energy produced by each component of the ductwork system. The duct components are as follows:

(a) 7m length 400mm circular ducting;

(b) 2No. 90-degree bends (400mm circular)

6.5 Detailed calculations are contained in Appendix B.

6.6 Noise leaving the ductwork system at the duct terminations was propagated to the nearest noise sensitive façade using point source propagation. The calculation exercise (attached as Appendix B) provided the following results at the nearest noise sensitive façade.

S&P CVAB-4-6000 450 extract fan	L_p dBA @ noise sensitive façade
noise impact at 69A Grays Inn Road	54

Table 4

Source	L_p dBA @ noise sensitive façade
Extract fan	54
BS4142 Acoustic Feature Corrections	+0
Predicted rating noise level at façade	54dB

Table 5

6.7 In order to comply with the requirements of the LPA, any noise from the proposed installation of mechanical plant should not exceed a level of 56 dBA (10dB below the considered background noise over the operational hours of the plant) at 1m from the nearest noise sensitive façade.

6.8 The calculated noise impact is 54dBA. The calculation exercise (Table 5) demonstrates that the proposed installation meets the LPA criteria by 2dB with the noise impact 12dB lower than the considered background noise level of 66dB L_{A90}.

7. CONCLUSION

7.1 The foregoing assessment indicates that the proposed installation meets the requirements imposed by the LPA. Additional mitigation measures will not be required.

7.2 It is recommended that the fan is mounted on anti-vibration mounts to minimise the transmission of structure borne sound to other parts of the building.

Figures

69 Grays Inn Road, London, WC1X 8TP

Figure 1

Figure 2


Figure 3

Figure 4


Figure 5

Appendix A

CVAB/CVAT-N

5137823500 - CVAB/4-6000/450 N D 0,91KW (230V) 50HZ - ACOUSTIC CABINET FANS

Range of direct drive backward curved centrifugal cabinet fans designed for ventilation of commercial kitchens and industrial applications. Cabinet fan manufactured from aluminium profiles and double thickness side panels internally lined with 25 mm thickness of fireproof fiberglass acoustic insulation. Circular duct connection flange on the inlet and outlet. CVAB-N/CVAT-N incorporates direct drive backward curved centrifugal impeller,manufactured from aluminium (CVAB-N), with motor fitted inside the air stream.

Motors

CVAB-N

Single-phase external rotor motors 230V 50Hz, IP55, class F, with thermal protection, speed controllable by tension. Working temperature from -40ºC to 60ºC.

Theoretical Working Point

Airflow	-
Static Pressure	0,000 N/m²
Temperature	20 °C
Altitude	0 m
Density	1,2 kg/m³
Frequency	50 Hz
Voltage	1-230V-50Hz

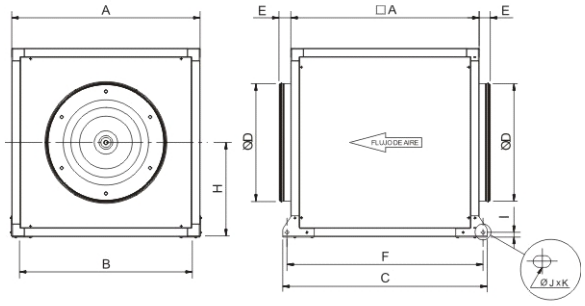
Construction

Discharge diameter	450 mm
Fan size	450
Weight	46,00 kg

Motor Characteristics

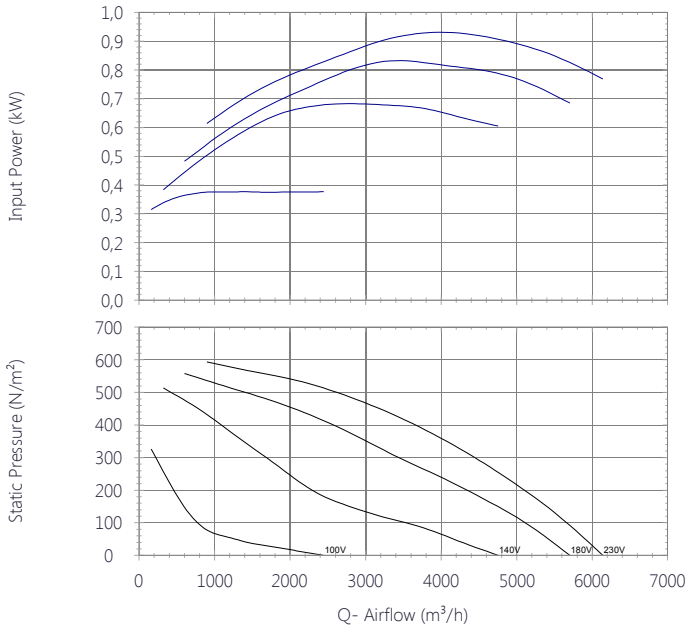
Number of poles	4
Voltage	1-230V-50Hz
Maximum absorbed current	4,0 A
IP Rating	IP55
Motor insulation class	F

Drawing



A	B	C	D	E	F	H	I	J	K
750	707	824	450	58	784	375	23	12	18

Performance Chart



Sound Performance

	63	125	250	500	1k	2k	4k	8k	Overall
Inlet (LwA)	50	70	75	78	74	73	68	64	82
Inlet LpA @ 1m	39	59	64	67	63	62	57	53	71
Outlet (LwA)	55	70	73	75	77	71	65	60	81
Outlet LpA @ 1m	44	59	62	64	66	60	54	49	70
Breakout (LwA)	46	67	69	69	67	62	58	54	75
Breakout LpA @ 1m	35	56	58	58	56	51	47	43	64

Appendix B

ACOUSTICS PLUS

CONTRACT TITLE: 69 Grays Inn Road
SOUND SOURCE: Extract air fan (outlet)
MAKE & MODEL: S&P CVAB-4-6000 450

					OCTAVE BAND CENTRE FREQUENCY (Hz)								
OVERALL Lw					63	125	250	500	1k	2k	4k	8k	dBA
1			L_w of fan		81	86	82	78	77	70	64	61	81
2				1.000									
3			Lw at grille		81	86	82	78	77	70	64	61	81
4													
5	LENGTH (m)	C or R	x (mm)	x (mm)									
6	7.00	C	400-800		0.49	0.49	0.49	0.70	1.12	1.12	1.12	1.12	
7													
8													
9													
10													
11													
12													
13													
14													
15													
16	Bends (Unlined)												
17	NUMBER	TYPE	SIZE (mm)										
18	2	90	0400-0500		0.00	0.00	10.00	16.00	8.00	6.00	6.00	6.00	
19													
20													
21													
22													
23													
24													
25	BRANCHES												
26			1		0	0	0	0	0	0	0	0	
27			0										
28													
29	DUCT X-SECTIONAL AREAS												
30													
31													
32	OTHER ATTENUATION												
33													
34													
35													
36													
37	END REFLECTION SIZE (m)												
38	0.016 – 0.020				17	12	8	3	1	0	0	0	
39													
40				**Lw LEAVING SYSTEM**	64	74	63	59	67	63	57	54	70
41	Room Volume (m^3)			10000	-26	-26	-26	-26	-26	-26	-26	-26	
42	Mid-Frequency RT (s)			0.1	-10	-10	-10	-10	-10	-10	-10	-10	
43				**REVERBERANT SPL**	28	38	27	23	31	27	21	18	34
44	Distance to Listener			4	-23	-23	-23	-23	-23	-23	-23	-23	
45	Q=1 in free space			n/a	0	0	0	0	0	0	0	0	
46	Q=2 flush with surface			0.013 – 0.020	3	3	4	6	7	8	8	8	
47	Q=4 junction with 2 surfaces			n/a	0	0	0	0	0	0	0	0	
48				**DIRECT SPL**	44	54	44	41	51	48	42	39	54
49				**RESULTANT TOTAL SPL**	44	54	44	42	51	48	42	39	54

Appendix C

Background noise measurements at front of 69 Grays Inn Road, London, WC1X 8TP.

No.	Date & time	LAFmax	LAFmin	LAeq	L90
1	08/10/2018 14:32:11	84	67	72	70
2	08/10/2018 14:47:11	104	70	74	71
3	08/10/2018 15:02:11	83	69	73	71
4	08/10/2018 15:17:11	102	68	74	70
5	08/10/2018 15:32:11	89	67	72	69
6	08/10/2018 15:47:11	80	67	72	70
7	08/10/2018 16:02:11	110	66	80	68
8	08/10/2018 16:17:11	83	65	70	67
9	08/10/2018 16:32:11	79	65	70	67
10	08/10/2018 16:47:11	89	65	71	67
11	08/10/2018 17:02:11	83	66	70	68
12	08/10/2018 17:17:11	96	65	73	67
13	08/10/2018 17:32:11	81	61	70	66
14	08/10/2018 17:47:11	80	64	69	66
15	08/10/2018 18:02:11	83	64	70	66
16	08/10/2018 18:17:11	87	65	70	67
17	08/10/2018 18:32:11	83	65	69	66
18	08/10/2018 18:47:11	92	65	70	66
19	08/10/2018 19:02:11	83	65	70	66
20	08/10/2018 19:17:11	89	65	69	66
21	08/10/2018 19:32:11	83	65	70	**66**
22	08/10/2018 19:47:11	87	65	70	66
23	08/10/2018 20:02:11	80	65	70	66
24	08/10/2018 20:17:11	87	65	69	66
25	08/10/2018 20:32:11	84	64	69	66
26	08/10/2018 20:47:11	98	65	73	66
27	08/10/2018 21:02:11	84	64	70	66
28	08/10/2018 21:17:11	81	65	70	66
29	08/10/2018 21:32:11	84	65	69	66
30	08/10/2018 21:47:11	85	64	69	66
31	08/10/2018 22:02:11	87	64	70	66
32	08/10/2018 22:17:11	81	64	69	65
33	08/10/2018 22:32:11	79	65	69	66
34	08/10/2018 22:47:11	79	64	69	65
35	08/10/2018 23:02:11	81	61	69	65
36	08/10/2018 23:17:11	82	60	67	61
37	08/10/2018 23:32:11	87	59	67	61
38	08/10/2018 23:47:11	76	59	66	60
39	09/10/2018 00:02:11	82	59	66	60
40	09/10/2018 00:17:11	77	59	65	60
41	09/10/2018 00:32:11	80	59	65	60
42	09/10/2018 00:47:11	102	59	68	60
43	09/10/2018 01:02:11	84	59	65	60
44	09/10/2018 01:17:11	77	59	62	59
45	09/10/2018 01:32:11	84	59	64	59
46	09/10/2018 01:47:11	79	59	63	59
47	09/10/2018 02:02:11	78	59	64	59
48	09/10/2018 02:17:11	81	59	64	59
49	09/10/2018 02:32:11	79	59	63	59

Background noise measurements at front of 69 Grays Inn Road, London, WC1X 8TP.

No.	Date & time	LAFmax	LAFmin	LAeq	L90
50	09/10/2018 02:47:11	78	59	64	59
51	09/10/2018 03:02:11	77	59	63	59
52	09/10/2018 03:17:11	78	59	62	59
53	09/10/2018 03:32:11	78	59	63	59
54	09/10/2018 03:47:11	78	59	63	59
55	09/10/2018 04:02:11	83	59	64	59
56	09/10/2018 04:17:11	80	59	62	59
57	09/10/2018 04:32:11	79	59	64	60
58	09/10/2018 04:47:11	80	59	64	60
59	09/10/2018 05:02:11	80	59	64	60
60	09/10/2018 05:17:11	82	59	65	60
61	09/10/2018 05:32:11	83	59	66	60
62	09/10/2018 05:47:11	85	59	66	60
63	09/10/2018 06:02:11	82	59	67	61
64	09/10/2018 06:17:11	79	59	66	61
65	09/10/2018 06:32:11	81	59	67	61
66	09/10/2018 06:47:11	79	59	67	61
67	09/10/2018 07:02:11	90	61	74	62
68	09/10/2018 07:17:11	88	65	70	**66**
69	09/10/2018 07:32:11	87	65	73	70
70	09/10/2018 07:47:11	84	68	73	70
71	09/10/2018 08:02:11	85	68	74	70
72	09/10/2018 08:17:11	81	69	73	71
73	09/10/2018 08:32:11	83	68	73	71
74	09/10/2018 08:47:11	91	68	73	70
75	09/10/2018 09:02:11	91	70	73	71
76	09/10/2018 09:17:11	92	64	74	72
77	09/10/2018 09:32:11	88	71	75	73
78	09/10/2018 09:47:11	80	72	74	73
79	09/10/2018 10:02:11	84	71	74	72
80	09/10/2018 10:17:11	83	71	74	72
81	09/10/2018 10:32:11	80	70	73	72
82	09/10/2018 10:47:11	82	70	73	72
83	09/10/2018 11:02:11	83	71	73	72
84	09/10/2018 11:17:11	82	70	73	72
85	09/10/2018 11:32:11	82	70	73	72
86	09/10/2018 11:47:11	78	67	72	70
87	09/10/2018 12:02:11	85	67	72	70
88	09/10/2018 12:07:11	81	70	73	72

Considered LA90 66dB