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6 COPTIC STREET, LONDON

ACOUSTIC ASSESSMENT

EXTERNAL PLANT NOISE

ASSESSMENT

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1.0 Introduction

1.1 It is proposed to change the use of the ground floor and basement of 6 Coptic Street from offices to a restaurant. This proposed change of use will include the installation of mechanical plant serving the kitchen. The upper floors of the building are offices as are the upper floors on adjacent buildings.

1.2 There are residential properties to the north of the development site in Streatham Street which overlooks the rear of the development site. On the ground floor of the property adjacent to 6 Coptic Street there is an existing restaurant with an external dining area to the rear of the building which is directly overlooked by the residential properties.

1.3 As part of the submission to the London Borough of Camden to obtain planning permission for the development, information will be required concerning the level of environmental noise associated with mechanical services plant and equipment. It is understood that the only mechanical services plant will be a kitchen extract located inside the building with external duct running up the rear elevation to eaves level. This report will therefore provide a review of noise from the proposed kitchen extract fan, in the form of an assessment in relation to prevailing background noise levels and the current policy requirements of London Borough of Camden.

1.4 See Figure 1 for the site location plan and location of the proposed external kitchen extract duct. A glossary of terms is included as Figure 3.

2.0 Planning Conditions

2.1 London Borough of Camden planning policies are set out in the Local Development Framework (LDF) document "*Camden Development Policies 2010-2025*". In particular Policy DP28 Noise and Vibration. The requirements relevant to noise from mechanical services plant are set out in Table E on page 133 of the document, this is copied below;

Table E: Noise levels from plant and machinery at which planning permission will not be granted

Noise description and location of measurement	Period	Time	Noise level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	5dB(A) <LA90
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise at 1 metre external to sensitive façade where LA90>60dB	Day, evening and night	0000-2400	55dBL_{Aeq},

2.2 Although not stated in the Camden Development Documents it is known that Camden Council have in the past also set noise criteria for plant with respect of octave band noise control limits.

2.3 Typically such a noise control criterion would be as set out below;

For each of the octave band of centre frequencies 63Hz-8kHz inclusive, noise levels from ALL plant/equipment (measured in L_{Aeq}) when in operation shall at all times add not more than 1 decibel to the existing background noise level L_{A90}, expressed in dBA, in the same octave band as measured 1 metre external to sensitive facades.

2.4 To ensure a robust assessment is made with respect of the proposed kitchen extract fan consideration has been given to both the broadband and octave band noise criteria.

3.0 Survey Details – Background Noise Levels

3.1 Aims: To assess the level of background noise in the vicinity of the site, in order to allow the setting of environmental noise criteria for external mechanical plant such that the requirements of the planning authority are achieved.

3.2 Instrumentation: NTI type XL2 Class 1 environmental noise level analyser, the instrument was powered by an external battery and stored in a weather proof case. The instrument was field calibration checked both before and after use with no drift in calibration noted.

3.3 Location: At a height of 4m above local ground level to the rear of the proposed development as close as could be achieved to the nearby residential properties in Streatham Street. See figure 1b.

3.4 Period: Monitoring was continuous from approximately 14:00 on Thursday 16th March 2017 until 14:00 on Tuesday 21st March 2017. The monitor was set up to measure noise levels continuously in fifteen-minute intervals.

3.5 Weather: Predominantly dry (except for some minor light showers) with light winds to calm.

3.6 Site Noise Characteristics: The background and ambient noise levels in the vicinity of the nearest residential windows are controlled by noise from traffic using adjacent local roads. It is thought that no unusual events occurred during the survey period, and the data includes a fair representation of background noise levels in the area.

3.7 Results: The survey results are presented in graphical format in Figure 2, showing the recorded values of $L_{Aeq,15min}$ and $L_{A90,15min}$.

3.8 Surveyor: Sam Liu TechIOA

4.0 Plant Noise Criteria

4.1 It is understood that the proposed operating hours of the restaurant are 12:00 to 22:30. Limiting noise level criteria for new plant will be considered here in two distinct periods, related to the operating periods of the plant; i.e. daytime (12:00 to 19:00) and evening (19:00 to 23:00) hours.

4.2 Broadband noise level assessment

4.2.1 The typical lowest value of background noise level ($L_{A90,15min}$) measured over the three assessment periods are shown in Table 1;

Table 1 : Minimum background noise levels

Period	Minimum Background Noise Level
Daytime (12:00 to 19:00)	$L_{A90,15min}$ 43 dB
Evening (19:00 to 23:00)	$L_{A90,15min}$ 45 dB

4.2.2 To comply with the likely planning requirements, the residual plant noise level must be at least 5 dB lower than these background noise levels, and the appropriate limits are therefore as shown in Table 2:

Table 2 : Limiting plant noise level criteria – A-weighted noise levels

Period	Maximum Plant Noise Level
Daytime (12:00 to 19:00)	L_{Aeq} 38 dB
Evening (19:00 to 23:00)	L_{Aeq} 40 dB

4.2.3 If the proposed plant is likely to emit any distinguishable, discrete continuous notes (whine, hiss, screech, hum), or possess any distinct impulses (bangs, clicks, clatters, thumps), then the values of L_{Aeq} shown above must be reduced by 5 dB.

4.3 Octave band noise level assessment

4.3.1 The representative octave band sound pressure levels associated with the overall noise levels from Table 1 are shown in Table 3;

Table 3 : Typical octave band background noise levels

Period	octave band centre frequency (Hz							
	63	125	250	500	1k	2k	4k	8k
	L_{90} sound pressure level, dB re $2x10^{-5}$ Pa							
12:00 – 19:00	51	47	43	41	38	34	26	16
19:00 – 23:00	53	51	46	43	40	35	25	17

4.3.2 To comply with the likely planning requirements, the spectra shown above must be increased by no more than 1 dB in any octave band by the new plant, assessed as the value of L_{eq}. In practice, this means that the value of L_{eq} per octave shall be at least 5 dB less than the value of L_{90}.

4.3.3 In order to achieve the requirements of London Borough of Camden, the residual plant noise level at 1 m from the nearest affected sensitive façade should be no more than those shown in Table 4;

Table 4 : Limiting plant noise level targets – octave band noise levels

Period	octave band centre frequency (Hz							
	63	125	250	500	1k	2k	4k	8k
	L_{eq} sound pressure level, dB re $2x10^{-5}$ Pa							
12:00 – 19:00	46	42	38	36	33	29	21	11
19:00 – 23:00	48	46	41	38	35	30	20	12

5.0 Plant Noise Assessment

5.1 It is understood that the only mechanical plant associated with the proposed restaurant is a cooking hood extract fan to the basement kitchen area. The fan will be located in the kitchen area with ductwork carrying the extracted air up to eaves level. The external ductwork will be enclosed and located as shown in Figure 1b.

5.2 The nearest potentially affected noise sensitive façade is considered to be the residential building overlooking the rear of the site, as shown in Figure 1a.

5.3 The extract fan is understood to be a Vortice VORT QBK-SAL KC M 400 fan and the relationship of the extract ductwork to the nearest noise sensitive property, is detailed in table 5:

Table 5 : Relationship of ductwork to nearest noise sensitive property

Plant	Distance and disposition
VORT QBK-SAL KC M 400	~3.0 m, no line of sight

5.4 It should be noted that there is a significant acoustic path difference greater than achieved by line of sight difference, between the residential facades and proposed plant location, due to the screening effect of a dividing wall above roof level and ducting serving the existing restaurant.

5.5 The noise levels published by the fan manufacturer have been used in acoustic calculations to reveal noise levels arising at the nearest noise sensitive façade. The manufacturer's noise level data are as shown in Table 6:

Table 6 : Plant noise level data

Lw, dB re $2x10^{-5}$ Pa	octave band centre frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
VORT QBK-SAL KC M 400	-	84	71	69	72	66	60	57	81

5.6 Noise level calculations have been performed using recognised standard procedures and formulae for noise propagation outdoors. The calculation is summarised in Table 7, for the full load noise level condition;

Table 7 : Receiver noise level calculation

	octave band centre frequency (Hz)								A
	63	125	250	500	1k	2k	4k	8k	
VORT QBK-SAL KC M 400	-	84	71	69	72	66	60	57	81
Distance attenuation : r = 3 m	-	-18	-18	-18	-18	-18	-18	-18	
Screening loss (δ=0.8 m)	-	-9	-10	-13	-16	-18	-20	-20	
End reflection loss (0.283m)	-	-3	-	-	-	-	-	-	
Directivity	-	-	-7	-7	-7	-14	-17	-19	
Source façade reflections	-	-	-	-	-	-	-	-	
Lp receive	-	54	36	31	31	16	5	-	39

6.0 Comparison of Plant Noise to Criteria

6.1 A-weighted assessment

6.1.1 The first part of the likely planning condition requires the mechanical plant noise level to be at least 5 dBA less than the prevailing background noise level (L_{A90}), or 10 dB less if the plant noise is tonal etc.

6.1.2 The comparative assessment of predicted plant noise in relation to the time related criteria from Table 2 is shown in Table 8;

Table 8 : Comparative assessment – A-weighted noise levels

	Period	
	12:00 – 19:00	19:00 – 23:00
Criteria (L_{Aeq})	38 dB	40 dB
Plant noise level (L_{Aeq})	39 dB	39 dB
DIFFERENCE	+1 dB	-1 dB

6.1.3 This comparative assessment demonstrates that the predicted A-weighted noise level of the proposed plant will just be in excess of the suggested planning criteria during daytime hours and just inside the criteria during the evening period.

6.1.4 N.B. It is not considered that the plant will exhibit any distinguishable, discrete continuous note (whine, hiss, screech, hum) or distinct impulses (bangs, clicks, clatters, thumps) – as such, there is no need to apply a further 5 dBA penalty.

6.2 Octave band assessment

6.2.1 The second part of the likely planning condition will require the individual octave band plant noise levels to cause increases in the background octave band noise levels of no more than 1 dB. In practice, this means that each individual octave band plant noise level must be at least 5 dB less than the prevailing background noise level.

6.2.2 A comparison of the predicted total plant noise levels with the target noise levels shown in table 4, for the two time periods, is shown in Tables 9 and 10;

Table 9 : Comparison of predicted plant noise to criteria (daytime)

07:00 – 19:00	octave band centre frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Criteria	46	42	38	36	33	29	21	11
Predicted plant noise	-	54	36	31	31	16	5	-
DIFFERENCE	-	+12	-	-	-	-	-	-

Table 10 : Comparison of predicted plant noise to criteria (evening)

19:00 – 23:00	octave band centre frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Criteria	48	46	41	38	35	30	20	12
Predicted plant noise	-	54	36	31	31	16	5	-
DIFFERENCE	-	+8	-	-	-	-	-	-

6.3 The tables above demonstrate that the predicted octave band noise levels in the 250 Hz octave band will be in excess of the suggested planning noise criteria.

7.0 Mitigation Measures

7.1 As the calculations indicate that noise from the kitchen extract is likely to be in excess of the noise criteria, it will be necessary to include noise mitigation measures such that the appropriate criteria are achieved. With reference to Table 8, Table 9 and Table 10, it can be seen that such measures must achieve a noise reduction of not less than 1 dBA, and not less than 12 dB at 250 Hz.

7.2 The required level of noise reduction in the 250 Hz octave band, as a guide, should be achievable using a 1200mm long attenuator with 33% open area in the extract fan duct. This reduction will also achieve the 1 dBA reduction required by the likely broadband noise criterion.

7.3 Different suppliers/manufacturers of attenuators are likely to provide different noise reductions. Consequently it would be for the mechanical services sub-contractor to ensure that whatever attenuator is installed provides at least 12 dB reduction in the 250 Hz octave band.

7.4 If the attenuator is installed in the external vertical length of ducting, the attenuator and external length of duct running from the attenuator back to the building must be lagged to minimise the risk of noise break out.

7.5 Two suggested options for lagging are given below;

<u>Type A: Heavy Duty Acoustic Lagging – Sheet material</u>

7.5.1 Resilient Layer; 75mm (minimum thickness of mineral wool or fibreglass having a density of approximate 100kg/m^3, or 75mm (minimum) thick Lamella mat at a density of 45kg/m^3.

7.5.2 Outer Mass Skin; 2mm sheet steel, or other sheet material of surface density no less than 15kg/m^2.

7.5.3 The sheet material shall be fixed to an independently supported timber or steel framework which does not come into direct contact with the ductwork. All joints shall be taped and sealed with caulking or a suitable dense mastic.

Type B: Heavy Duty Acoustic Lagging - Render

7.5.4 Substrate layer 80mm thick Rockwool Lamella mineral wool mat (or Bold New Tech equivalent) having density 45kg/m^3 (100mm thick 100kg/m^3 density mineral wool is a lesser preferred alternative) mechanically fixed to ductwork via pins and washers.

7.5.5 3-4mm thick layer adhesive, with glass-fibre reinforcing mesh bedded into the top 1mm layer.

7.5.6 Outer mass skin applied as two render layers each 8mm thick, final surface weight 18.0kg/m^2.

7.6 With either type of lagging, the outer mass skin shall not at any point come into direct contact with the ductwork, especially at flanged joints and hangers. Similarly, it shall not come into contact with the building structure. In addition, it must be ensured that the whole acoustic lagging system is tightly fitted. All joints in non-Lamella substrates must be staggered and lapped by no less than 50mm - direct butt joints are not permitted.

7.7 All materials shall be non-combustible and to the approval of the fire officer.

8.0 Conclusion

8.1 A comparative assessment of likely plant noise has been performed, from calculations using measured noise levels, manufacturers' noise source data, architects and mechanical services consultants' drawings, and prudent calculation techniques. The assessment demonstrates that the resulting kitchen extract fan noise levels at the nearest noise sensitive facade is not likely to achieve the limiting noise level criteria during the proposed 12:00 hours to 22:30 hours operational time period. In order to achieve the relevant criteria it will be necessary to apply noise control mitigation as described here.

8.2 It is therefore considered that, consequent upon the addition of noise mitigation measures as per section 7.0 of this report, the proposed plant will achieve the noise planning requirements of London Borough of Camden, for the proposed hours of operation.

Figure 1: Site plan

Figure 1a : site location

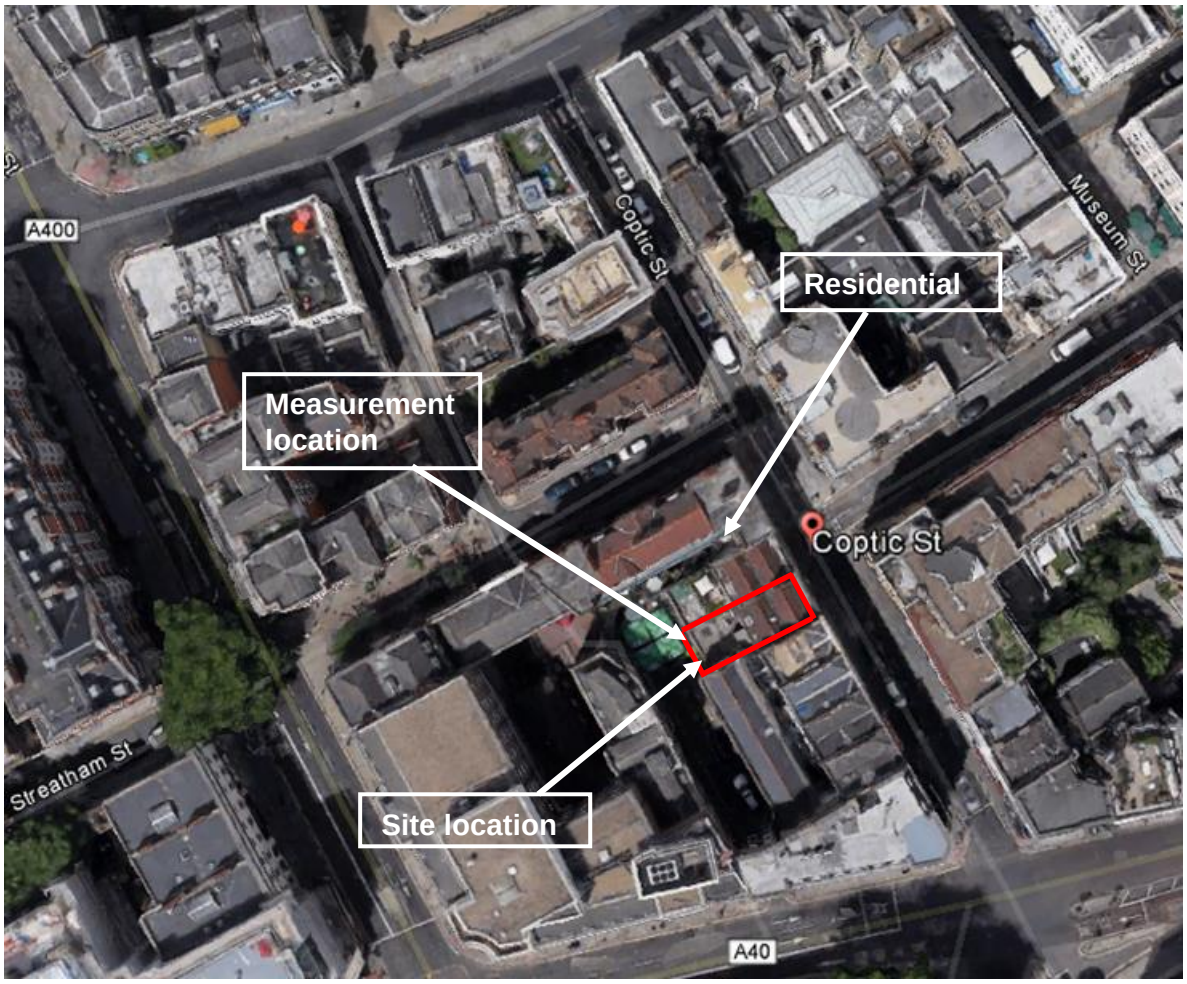

Figure 1b : proposed extract ducting

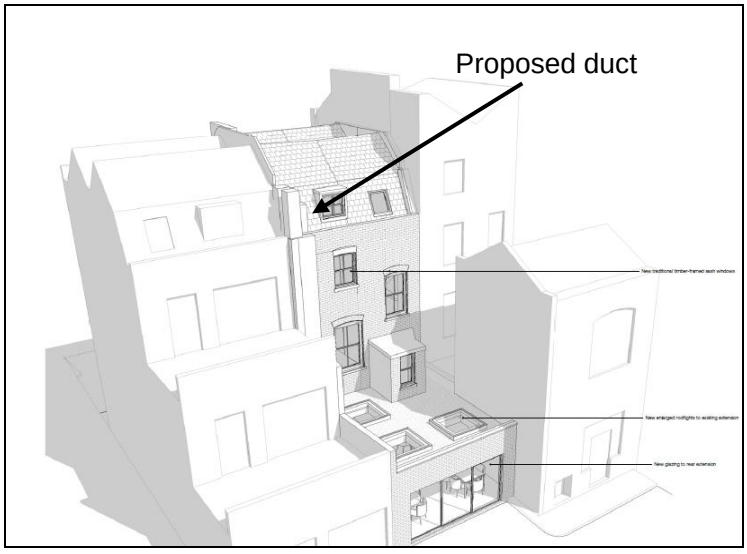

Figure 2: Survey Data

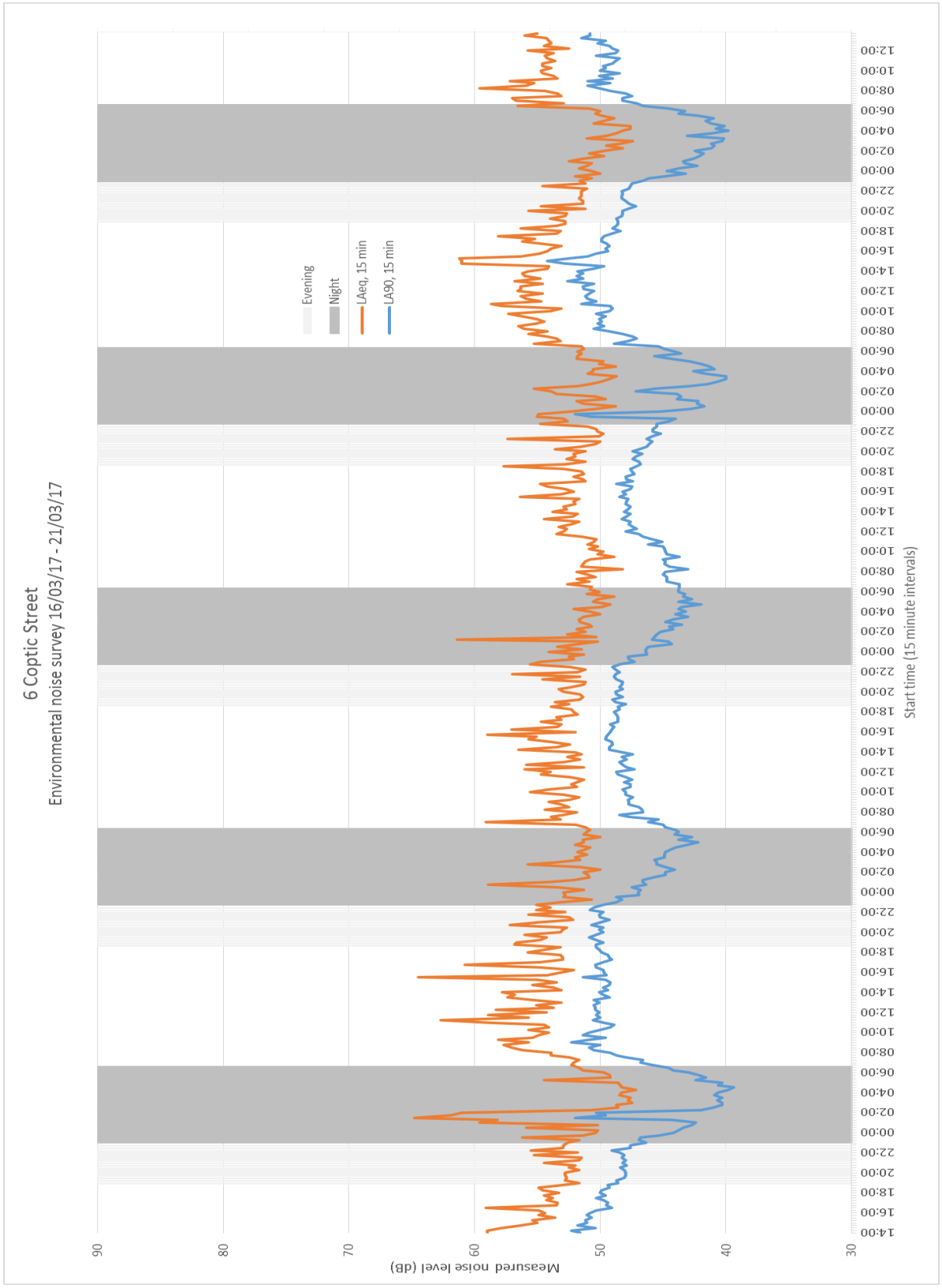

Figure 3 : Glossary of Terms

Decibel, dB	A unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. For sound pressure level (Lp) the reference quantity is $2x10^{-5}$ N/m^2. The sound pressure level existing when microphone measured pressure is $2x10^{-5}$ N/m^2 is 0 dB, the threshold of hearing.
L	Instantaneous value of Sound Pressure Level (Lp) or Sound Power Level (Lw).
Frequency	Number of cycles per second, measured in hertz (Hz), related to sound pitch.
A weighting	Arithmetic corrections applied to values of Lp according to frequency. When logarithmically summed for all frequencies, the resulting single "A weighted value" becomes comparable with other such values from which a comparative loudness judgement can be made, then, without knowledge of frequency content of the source.
$L_{eq,T}$	Equivalent continuous level of sound pressure which, if it actually existed for the integration time period T of the measurement, would possess the same energy as the constantly varying values of Lp actually measured.
$L_{Aeq,T}$	Equivalent continuous level of A weighted sound pressure which, if it actually existed for the integration time period, T, of the measurement would possess the same energy as the constantly varying values of Lp actually measured.
$L_{n,T}$	Lp which was exceeded for n% of time, T.
$L_{An,T}$	Level in dBA which was exceeded for n% of time, T.
$L_{max,T}$	The instantaneous maximum sound pressure level which occurred during time, T.
$L_{Amax,T}$	The instantaneous maximum A weighted sound pressure level which occurred during time, T.
Background Noise Level	The value of $L_{A90,T}$, ref. BS4142:1997.
Traffic Noise Level	The value of $L_{A10,T}$.
Specific Noise Level	The value of $L_{Aeq,T}$ at the assessment position produced by the specific noise source, ref. BS4142:1997.
Rating Level	The specific noise level, corrected to account for any characteristic features of the noise, by adding a 5 dBA penalty for any tonal, impulsive or irregular qualities, ref. BS4142:1997.
Specific Noise Source	The noise source under consideration when assessing the likelihood of complaint.
Assessment Position	Unless otherwise noted, is a point at 1m from the façade of the nearest affected sensitive property.