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AAD
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acoustic
design

246 KILBURN HIGH ROAD

LONDON NW6

ACOUSTIC ASSESSMENT

EXTERNAL PLANT NOISE

PLANNING SUPPORT NARRATIVE

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1.0 Introduction

1.1 As part of the redevelopment of 246 Kilburn High Road, it is proposed to install a new air conditioning system to serve the proposed ground floor B1 units. The installation will include three condenser units, located centrally within the development at first floor level. These units will be located within a ventilated and attenuated enclosure. There are some residential properties overlooking this location.

1.2 As part of the submission to London Borough of Camden to seek planning permission for the development, information will be required concerning the level of noise associated with the proposed external mechanical services plant and equipment. This report provides a review of external plant noise levels, in the form of an assessment in relation to prevailing background noise levels and the current policy requirements of London Borough of Camden.

1.3 See figure 1 for site plan and proposed plant layout. A glossary of terms is included as figure 3.

2.0 Planning Conditions

2.1 Planning consents issued by London Borough of Camden generally include several conditions relating to noise and vibration. At time of writing, the standard conditions which are likely to apply to this development are as follows;

Noise levels at a point 1 m external to sensitive facades shall be at least 5 dBA less than the existing background measurement (L_{A90}) expressed in dBA when ALL plant/equipment are in operation. Where it is anticipated that any plant/equipment will have a noise that has a distinguishable, discrete continuous note (whine, hiss, screech, hum) and/or if there are distinct impulses (bangs, clicks, clatters, thumps) special attenuation should be given to reducing the noise levels from that piece of plant/equipment at any sensitive façade to at least 10 dBA below the L_{A90}, expressed in dBA. The applicant is therefore required to undertake a full acoustic background noise assessment, the full details of which shall be submitted to the Council, in order that the design criteria for the acoustic enclosure of plant/equipment can be properly assessed.

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 nose level L_{A90}, expressed in dBA, in the same octave band as measured 1 metre external to sensitive facades.

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 plant such that the requirements of the planning authority are achieved.

3.2 Instrumentation

Larson Davis type 820 environmental noise level analyser, equipped with a Larson Davis type 2541 microphone and Larson Davis type 900B pre-amplifier. The instrument was powered by an external battery and stored in a weather proof case. The instrument was calibrated prior and subsequent to use with a Larson Davis type CA 250 calibrator – no calibration drift was recorded.

3.3 Location:

Centrally on the existing flat roof, screened from road traffic noise by a parapet approximately 2.0m high. The microphone was attached to a tripod, at some 1.5 m above local ground level, and 2.0 m from the building façade.

3.4 Period:

Monitoring was continuous from approximately 12:30 on Friday 16th February 2007 until approximately 15:00 on Monday 19th February 2007. The monitor was set up to monitor noise levels continuously in fifteen-minute intervals.

3.5 Weather:

Predominantly dry 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:

Susan Witterick, BSc (Hons) MA MIOA

4.0 Plant Noise Criteria

4.1 Limiting noise level criteria for new plant will be considered here in two distinct periods, related to the probable operating periods of the plant; i.e. daytime (09:00 to 19:00), and evening (19:00 to 22:00). The equipment is not proposed to operate outside these hours.

4.2 A-weighted noise level assessment

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

Table 1 : Minimum background noise levels

Period	Minimum Background Noise Level
Daytime (09:00 to 19:00)	$L_{A90,15min}$ 48 dB
Evening (19:00 to 22:00)	$L_{A90,15min}$ 51 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 (09:00 to 19:00)	L_{Aeq} 43 dB
Evening (19:00 to 22:00)	L_{Aeq} 46 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							
09:00 – 19:00	65	55	48	42	42	40	37	31
19:00 – 22:00	68	58	51	45	45	43	40	34

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 that 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							
09:00 – 19:00	60	50	43	37	37	35	32	26
19:00 – 22:00	63	53	46	40	40	38	35	29

5.0 Plant Noise Assessment

5.1 The proposed plant will be located on the first floor roof terrace as shown in figure 1.

5.2 The nearest potentially affected sensitive façades are considered to be those of the residential flats within the new development, overlooking the plant area, as shown in figure 1. The proposed plant enclosure will be located approximately 4m from the closest window.

5.3 The list of plant, and its relationship with the nearest noise sensitive property, is detailed in table 5:

Table 5: List of plant, and relationship to nearest noise sensitive property

Plant	Distance and disposition
Mitsubishi PUMY-P140YHM (3 no.)	~4.0 m, line of sight to enclosure
Flakt Woods 90JM/25/6/9/22	~4.0 m, line of sight to enclosure

5.4 Plant selections from manufacturers ranges have been made by the building services consulting engineers. The noise levels published by the manufacturers for these selections have been used in acoustic calculations to reveal noise levels likely to arise at the nearest noise sensitive façade. The related manufacturer's noise level data are as shown in table 6:

Table 6: Plant noise level data

L_W, dB re 10^{-12} W	octave band centre frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Mitsubishi Condenser	77	71	68	67	64	59	53	56	69
Fan inlet	79	81	82	83	81	78	73	69	88
Fan outlet	81	81	82	83	81	78	74	70	89

5.5 The proposed enclosure and associated intake and outlet attenuators will be specified with the following minimum insertion loss:

Table 7: Insertion loss of enclosure and attenuators

Insertion Loss, dB	octave band centre frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Enclosure	27	30	32	41	50	59	67	71
Attenuators (each)	8	16	28	45	49	50	48	32

5.6 Noise level calculations have been performed for plant noise emissions, using recognised standard procedures and formulae for noise propagation outdoors. The calculations are summarised in table 8 as follows, for the full load noise level condition;

Table 8

	octave band centre frequency (Hz)								A
	63	125	250	500	1k	2k	4k	8k	
Calculated sound pressure level within enclosure for all plant	83	80	78	80	77	73	69	66	82
Complex sound reduction of enclosure and attenuators	-14	-22	-31	-42	-50	-55	-54	-38	
Distance attenuation : r = 4	-12	-12	-12	-12	-12	-12	-12	-12	
Source façade reflections	+3	+3	+3	+3	+3	+3	+3	+3	
Total at 1m from facade	60	49	38	29	18	9	6	19	38

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 total 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 9;

Table 9: Comparative assessment – A-weighted noise levels

	Period	
	09:00 – 19:00	19:00 – 22:00
Criteria (L_{Aeq})	43	46
Plant noise level (L_{Aeq})	38	38
DIFFERENCE	-5	-8

6.1.3 This comparative assessment demonstrates that the predicted A-weighted noise level of the proposed plant will comply with the planning criteria.

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 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 an increase 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 10 and 11;

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

09:00 – 19:00	octave band centre frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Criteria	60	50	43	37	37	35	32	26
Predicted plant noise	60	49	38	29	18	9	6	19
DIFFERENCE	0	-1	-5	-8	-19	-26	-26	-7

Table 11 : Comparison of predicted plant noise to criteria (evening)

19:00 – 22:00	octave band centre frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Criteria	63	53	46	40	40	38	35	29
Predicted plant noise	60	49	38	29	18	9	6	19
DIFFERENCE	-3	-4	-8	-11	-22	-29	-29	-10

6.2.3 The tables above demonstrate that the predicted octave band noise levels will comply with the likely planning noise criteria.

7.0 Conclusion

7.1 The comparative assessments of likely plant noise, from calculations using measured noise levels, manufacturers noise source data, architects and mechanical services consultants drawings, and prudent calculation techniques, demonstrates that, with all plant operating simultaneously within the proposed acoustic enclosure, the resulting noise level at the nearest noise sensitive facade is likely to achieve the limiting noise level criteria.

7.2 It is therefore considered that the proposed plant may operate during the daytime and evening periods whilst achieving the planning requirements of London Borough of Camden.

Figure 1: Site plan

Figure 1a : site location

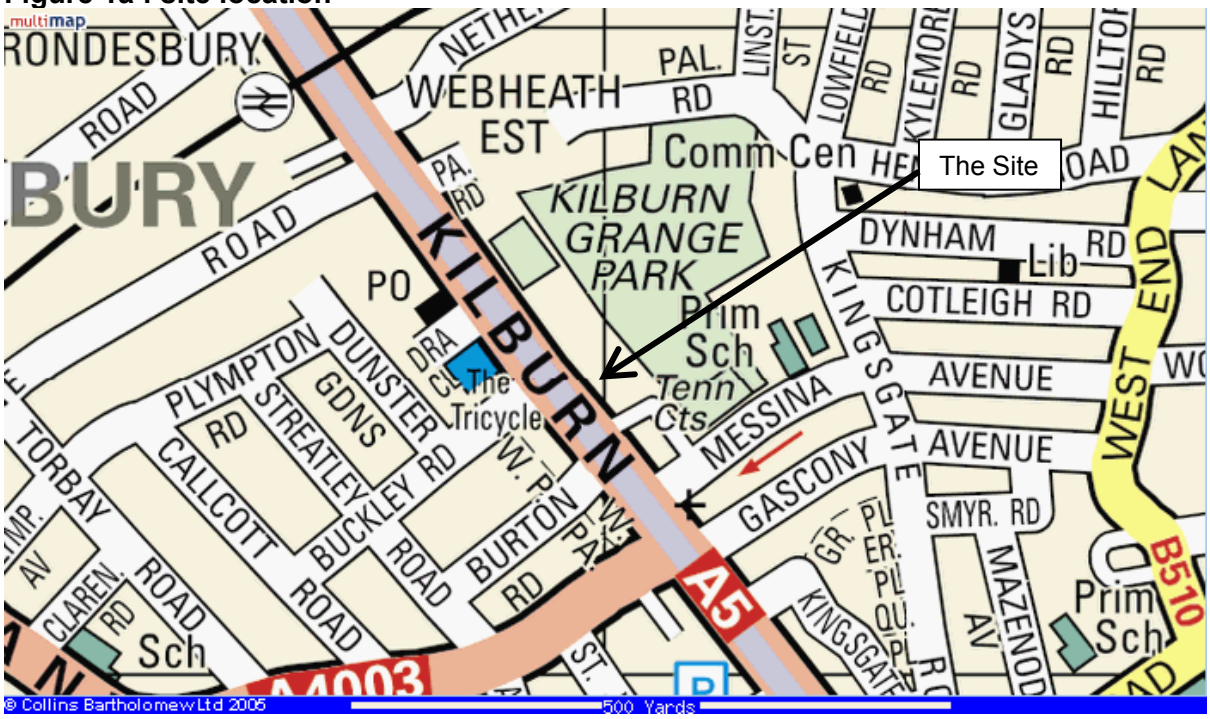

Figure 1b : site plan

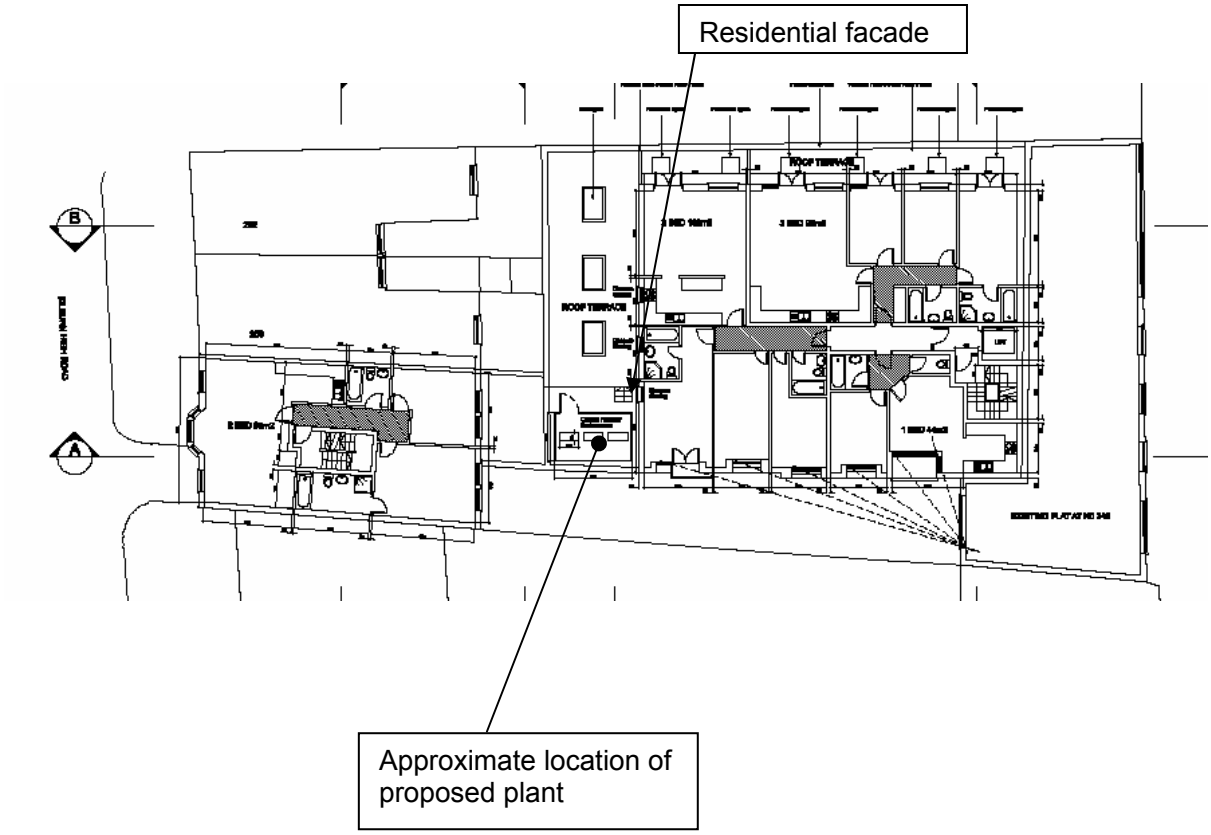

Figure 2: Survey Data

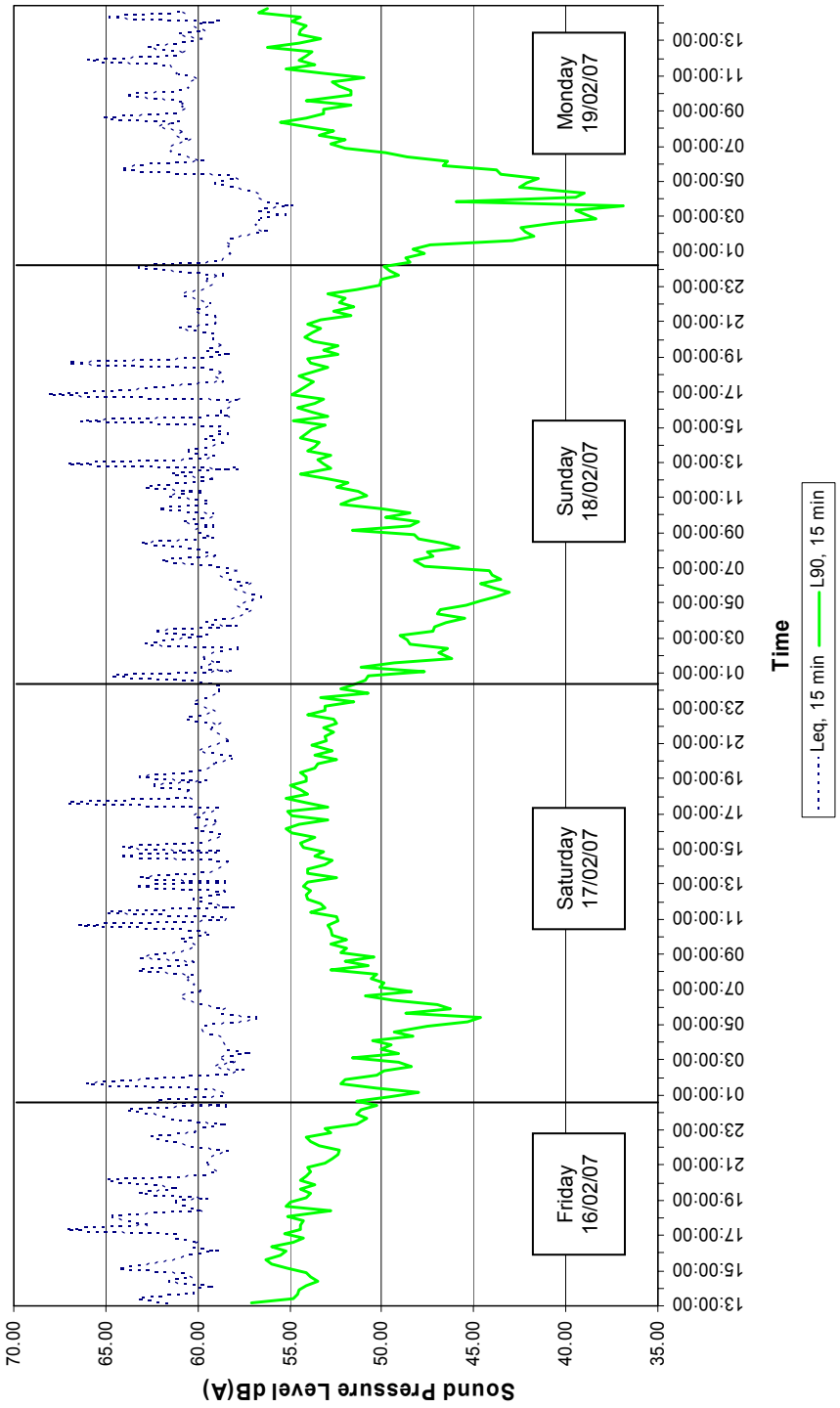

Figure 3: Glossary of Terms

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.