APPENDIX 3

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FLITCROFT HOUSE
114-116 CHARING CROSS ROAD, LONDON WC2

Environmental Noise Assessment of
Proposed Restaurant Plant

18th September 2008

Report Prepared for:

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1.0 INTRODUCTION

It is proposed to convert the basement and ground floor levels of Flitcroft House, 114-116 Charing Cross Road, from extant retail use into A3 restaurant use. This change of use will necessitate the installation of rooftop mechanical plant at 5th floor level to provide extraction air from the basement kitchen, supply air make up to the kitchen, and split system comfort cooling for patrons within the restaurant.

In connection with the proposed change of use Planning Application, assessments of atmospheric plant noise emissions are required to determine the extent of any additional noise mitigation measures that may be deemed necessary, in order to protect the amenity of nearby properties.

The Equus Partnership Ltd. has been commissioned to assess the likely environmental noise impact of the proposed rooftop plant on nearby properties. This report presents the results of an environmental noise survey undertaken to establish the background noise climate prevailing at the site, suggests suitable environmental noise emission criteria based on Local Planning Authority guidelines, and assesses atmospheric noise emissions from the proposed rooftop plant.

2.0 SUBJECT PREMISES AND SURROUNDING BUILDINGS

The subject property is located at the junction of Charing Cross Road and Flitcroft Street which is a narrow pedestrian passageway running between Flitcroft House and the Phoenix Theatre (which is currently running the musical show "Blood Brothers"). Charing Cross Road is a very busy thoroughfare during the daytime and remains busy through the early hours of the morning. The area in the general vicinity is predominantly an entertainment centre, with numerous restaurants and bars, theatres and street entertainers.

A visual inspection of the site environs has revealed the closest residential properties to the proposed rooftop plant to be as follows:

(i) *Southerly direction* - 8 no. flats situated over the front section of the Phoenix Theatre with entrance doors leading off an external walkway. These flats are approximately 30m from the proposed rooftop plant and there do not appear to be any living rooms or bedrooms in this elevation. The roof of the Phoenix Theatre contains various mechanical plant items which are much closer to these flats than the proposed rooftop plant in Flitcroft House.

(ii) *Easterly direction* - "Elms Lesters" gallery at 1-5 Flitcroft Street appears to have a residential flat on the upper floor. This is approximately 50m from the proposed rooftop plant location.

(iii) *South-easterly direction* - modern 5 storey block of quality flats with balconies at approximately 80m distance from the proposed rooftop plant.

The closest commercial/retail buildings to the proposed rooftop plant are as follows:

(a) *North-westerly direction* - neighbouring office building at 120 Charing Cross Road has rear windows that overlook the proposed rooftop plant area at approximately 15m distance. However, these windows also overlook two other roof areas that already contain numerous large mechanical plant items.

(b) *Westerly direction* - buildings on the opposite side of Charing Cross Road that are at least 50m from the proposed rooftop plant (i.e. "Central Saint Martin's College of Art and Design" at 107-111 Charing Cross Road and "Foyles Bookshop" at 113-119 Charing Cross Road).

This assessment report considers noise emissions from the proposed rooftop plant to all the above locations.

3.0 PROPOSED RESTAURANT PLANT

The proposed locations and typical plant selections required for the proposed restaurant have been confirmed by Tuckers Consultancy Ltd., as detailed below:

(i) *Kitchen Extract AHU* - the proposed unit will handle 2.0 m^3/s of extraction from the kitchen and be contained in a double skinned insulated casing within a disused lift motor room located at the rear of the 5th floor roof.

(ii) *Kitchen Supply AHU* - the proposed unit will provide 1.6 m^3/s of fresh air to the kitchen and be contained in a double skinned insulated casing adjacent to the disused lift motor room.

(iii) *Air cooled condensers (restaurant cooling)* - it is proposed to have 2 no. Mitsubishi PUMY-P140 condensers positioned in the south-east corner of the roof (i.e. adjacent to the disused lift motor room).

The following octave band sound power level data have been provided for the proposed air handling units:

	Air Handling Unit Sound Power Levels (dB re: 10^{-12} W)							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Kitchen Extract AHU	87	93	90	93	90	91	84	77
Kitchen Supply AHU	82	88	85	88	85	86	79	72

The following octave band sound pressure levels have been confirmed for each of the proposed air cooled condensers:

	Octave Band Sound Pressure Levels @ 1m (dB re: $2x10^{-5}$ Pa.)								
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**(A)**
Mitsubishi PUMY-P140	57	52	50	50	46	41	36	37	(51)

N.B. All the above plant noise data shall be specified as "limiting" (i.e. not to be exceeded) performance values within the works contract documents.

4.0 ENVIRONMENTAL NOISE SURVEYS

It is understood that the proposed restaurant will close at 23.00 hours, and hence, the proposed kitchen extract / supply plant can be controlled via timer devices to ensure they switch off at this time. The restaurant comfort cooling plant (air cooled condensers) will be required to operate until midnight when the last of the patrons would be requested to leave. The air cooled condensers can also be timer controlled.

In order to establish typical prevailing ambient and background noise levels in the locality, a fully manned "critical period" noise survey was undertaken between 15.00 hours and midnight on Wednesday 10th September 2008. The weather conditions during the survey were overcast, dry and mild, with a moderate breeze during the daytime. The cloud cover and breeze gradually reduced during the evening. There was no precipitation at any time, and hence, the surrounding road surfaces were dry throughout the noise surveys. These weather conditions were deemed perfectly acceptable for acoustical measurements.

4.1 Noise Measurement Locations

Environmental noise levels were monitored at 5th floor roof level of the subject premises at the following positions:

Position A: South-east corner of roof overlooking Flitcroft Street. This position was deemed to be reasonably indicative of the ambient noise climate that would be prevailing at the properties to the east and south-east of the subject premises.

Position B: Central are of roof. This position was deemed to be reasonably indicative of the ambient noise climate that would be prevailing at the flats over the Phoenix Theatre and also the office windows at the rear of 120 Charing Cross Road.

Position C: Western edge of roof overlooking Charing Cross Road. This position was deemed to be reasonably indicative of the ambient noise climate that would be prevailing outside the buildings on the opposite side of Charing Cross Road.

4.2 Noise Survey Procedure

Measurements of the L_{A90}, L_{Aeq} and L_{Amax} sound levels were made over at least 15 minute sample durations each hour throughout the survey period. The noise level measured during each sample period is taken to be representative of the typical noise climate that would normally prevail in that hour.

The measuring instrument was fully manned throughout the survey.

Please refer to ***Appendix A*** for an explanation of the acoustic terminology used in this Report.

4.3 Instrumentation

The following instruments were used for the noise survey and analyses:

Brüel and Kjær Precision Real Time Analyser	Type 2260B
Brüel and Kjær ½" Condenser Microphone	Type 4189
Brüel and Kjær Sound Level Calibrator	Type 4230
Brüel and Kjær ½" Windshield	Type UA 0237

The sound level analyser was calibrated prior to the survey and the calibration was checked periodically during the survey and again upon completion. No drift was found to have occurred.

4.4 Noise Survey Results

The following background / ambient noise levels were measured during the environmental noise survey:

4.4.1 Position A (Overlooking Flitcroft Street - Rear of Premises)

Measurement Period	Measured Sound Pressure Level, dB re 20μPa		
	L_{A90}	L_{Aeq}	L_{Amax}
15.00 – 16.00 hours	58.0	59.5	70.1
16.00 – 17.00 hours	-	-	-
17.00 – 18.00 hours	56.8	58.4	66.2
18.00 – 19.00 hours	56.6	58.6	72.4
19.00 – 20.00 hours	57.2	58.7	70.1
20.00 – 21.00 hours	56.3	57.7	68.7
21.00 – 22.00 hours	55.2	57.0	70.2
22.00 – 23.00 hours	53.8	56.6	72.9
23.00 – 00.00 hours	51.8	53.7	61.2

4.4.2 Position B (Central Roof Area)

Measurement Period	Measured Sound Pressure Level, dB re 20μPa		
	L_{A90}	L_{Aeq}	L_{Amax}
15.00 – 16.00 hours	55.2	58.7	77.5
16.00 – 17.00 hours	-	-	-
17.00 – 18.00 hours	55.0	56.5	64.9
18.00 – 19.00 hours	54.8	56.3	65.4
19.00 – 20.00 hours	54.9	56.8	72.1
20.00 – 21.00 hours	54.4	56.2	67.4
21.00 – 22.00 hours	54.0	55.6	64.1
22.00 – 23.00 hours	52.6	54.1	66.4
23.00 – 00.00 hours	51.2	52.8	61.4

4.4.3 Position C (Overlooking Charing Cross Road - Front of Premises)

Measurement Period	Measured Sound Pressure Level, dB re 20μPa		
	L_{A90}	L_{Aeq}	L_{Amax}
15.00 – 16.00 hours	60.4	65.1	79.8
16.00 – 17.00 hours	-	-	-
17.00 – 18.00 hours	60.4	64.5	74.0
18.00 – 19.00 hours	60.0	64.1	73.6
19.00 – 20.00 hours	60.1	64.5	73.1
20.00 – 21.00 hours	60.4	64.2	72.4
21.00 – 22.00 hours	60.2	63.9	74.9
22.00 – 23.00 hours	58.8	62.6	72.1
23.00 – 00.00 hours	58.4	62.8	73.4

4.5 Ambient Noise Climate

Position A (Overlooking Flitcroft Street - Rear of Premises)

The ambient noise levels at roof level overlooking the rear of the premises were controlled mainly by local and distant traffic noises with some influence from plant noises emanating from surrounding buildings. (A significant number of air cooled chiller plant, condenser units, ventilation fans etc., were visible on the roofs of many of the neighbouring buildings.)

Position B (Central Roof Area)

The ambient noise climate prevailing in the central area of the roof was generally similar (although slightly quieter) to that prevailing at Position A towards the rear of the roof.

Position C (Overlooking Charing Cross Road - Front of Premises)

The ambient noise levels at roof level overlooking the front of the premises were generally dominated by traffic movements along Charing Cross Road, although during the evening there was some influence from street entertainers.

5.0 PLANT NOISE EMISSION LIMITS

5.1 Residential Premises

London Borough of Camden normally requires environmental noise emissions from new plant installations to be controlled to a level at least 5 dB(A) below the lowest pre-existing L_{A90} background noise level as measured at 1m from the nearest sensitive façades. A further 5 dB(A) of noise level reduction is required 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). Furthermore, the Council would normally require the L_{eq} noise output from new plant installations to be controlled such that the octave band L_{90} background noise levels between 63 Hz and 8 kHz are not increased by more than 1 dB (at 1m from the nearest sensitive façades).

Given this guidance, a cautious approach (i.e. "safe" in Planning terms) would be to ensure that cumulative noise emissions from the proposed new rooftop plant should not exceed the following levels:

Cumulative L_{Aeq} Plant Noise Emission Limits (dB re 2 x 10^{-5} Pa.)	
Receiver Location (1m from façade)	**Plant Operating Period As Described in Section 4.0**
Outside windows of flats over Phoenix Theatre	46 dB L_{Aeq}
Outside windows of dwellings to east / south-east	47 dB L_{Aeq}

Please note that the noise emission limits tabulated above are the cumulative noise levels with all plant running simultaneously under their normal operating conditions.

5.2 Commercial Premises

It is usual for Local Authorities to make reference to BS 8233: 1999: *"Sound Insulation and Noise Reduction For Buildings - Code of Practice"* when considering plant noise emissions to commercial buildings.

This British Standard provides guidance on internal noise levels for office accommodation to preserve *"reasonable conditions for study and work requiring concentration"*. For cellular office accommodation this suggests a "good" design target of 40 dB $L_{Aeq,T}$ and a "reasonable" design target of 50 dB $L_{Aeq,T}$. For meeting rooms and executive offices, equivalent guidance values of 35 dB $L_{Aeq,T}$ and 40dB $L_{Aeq,T}$ are given. It is therefore suggested that, for the purposes of this assessment, the most stringent internal target noise level of 35 dB $L_{Aeq,T}$ should be used to provide a "safe" assessment in Planning terms.

Clearly, the level of sound transfer to internal areas of neighbouring properties will be dictated by the type and acoustic performance of the external building envelope and whether the building is air-conditioned or relies on natural ventilation. Site observations suggest that some of the offices near to the subject property rely on natural ventilation. As such, a precautionary approach has been taken and it is assumed that the windows of these properties may need to be opened.

Guidance given in the World Health Organisation document *"Guidelines For Community Noise"* suggests that an open window will provide around 15 dB(A) sound reduction from outside to inside.

It is therefore concluded that in order to preserve the amenity of neighbouring offices, incident noise levels should ideally be controlled to a level of around 50 dB(A) if internal noise intrusion is to be controlled in accordance with a "good" design standard based on the most stringent guidance given in BS 8233. It should be noted, however, that this proposed "cumulative plant noise limit" is actually quieter than the lowest measured levels of L_{A90} background noise prevailing in this location.

6.0 RESTAURANT PLANT NOISE ASSESSMENT

An assessment of cumulative noise emissions from the proposed restaurant plant has been undertaken based on the manufacturer's noise data detailed above and the measured background noise levels. Due allowance has been made for the proposed operating period of the units, the distance between the plant and neighbouring properties, plant directivity, geometrical spreading and estimated screening / reflection effects due to surrounding buildings etc.

6.1 Attenuation Requirements

Initial calculations revealed that atmospheric attenuation will be required for both the Kitchen Extract AHU and the Kitchen Supply AHU. The following atmospheric attenuation values have therefore been included within the calculations:

Atmospheric Attenuation (Duct Attenuators or Acoustic Splitters within AHU)									
Description	Nominal Length of Attenuation (% Free Area)	Minimum Octave Band Insertion Losses (dB)							
		63	125	250	500	1k	2k	4k	8k
Kitchen Extract AHU (Discharge Attenuator)	1500 mm (30%)	8	15	25	40	46	47	43	32
Kitchen Supply AHU (Intake Attenuator)	1500 mm (35%)	6	13	23	37	43	44	35	20

N.B. Depending upon the design of the kitchen extract system and type of filtration system, it is sometimes necessary for duct attenuators to be fitted with melinex film splitter facings to facilitate cleaning. However, these facings can significantly reduce the acoustic performance of the attenuators, and hence, their dimensions have to be increased to compensate for this. The Equus Partnership should be consulted for further more detailed advice if it is considered necessary for melinex faced splitters to be used.

The AHU's will need to have insulated double skinned casings designed to provide at least the following sound insulation performance. This requirement is applicable to the installed performance of the entire casing, including top, sides, floor and access doors, and is not merely for a single panel tested independently:

Minimum Apparent Sound Reduction Indices of AHU Casings								
63	125	250	500	1k	2k	4k	8k	(Hz)
10	12	15	20	25	30	35	25	(dB)

N.B. The precise atmospheric attenuation requirements will depend upon the sound power levels of the actual plant selections together with their final positioning and orientation on the roof.

6.2 Residential Premises

As stated above, the closest/most affected residential properties to the proposed restaurant plant appear to be the flats over the Phoenix Theatre (approximately 30m from the proposed plant) and, further afield, the dwellings to the east / south-east of the subject premises (approximately 50m / 80m respectively from the proposed plant). Calculations indicate the following "worst-case" cumulative plant noise emissions at 1m from these residential windows with all subject plant operating simultaneously:

Outside windows of flats over Phoenix Theatre - 43 dB L_{Aeq}.

Outside dwelling to east of subject premises - 39 dB L_{Aeq}.

Outside dwellings to south-east of subject premises - 35 dB L_{Aeq}.

The above calculated cumulative plant noise emission levels fully accord with the cumulative noise emission limits given in Section 5.1 of this Report, and as such, there should be no need for any further noise control measures to protect the amenity of nearby residential properties.

6.3 Commercial Premises

As stated above, the closest/most affected commercial premises to the proposed restaurant plant are the windows in the rear elevation of the neighbouring building at 120 Charing Cross Road, the nearest of which are approximately 15m from the proposed rooftop plant. The buildings on the opposite side of Charing Cross Road (i.e. to the west) are at least 50m away from the proposed rooftop plant and the noise survey has revealed they are exposed to much higher levels of traffic noise. As such, the plant noise emissions are very unlikely to be an issue but have been included

within the noise assessments for completeness. Calculations indicate the following "worst-case" cumulative plant noise emissions at 1m from these windows with all subject plant operating simultaneously:

Outside rear windows of 120 Charing Cross Road - 50 dB L_{Aeq}.

Outside windows of buildings on western side of Charing Cross Road - 40 dB L_{Aeq}.

The calculated plant noise emission levels comply with the most stringent cumulative plant noise limit of 50 dB(A) suggested in Section 5.2 of this Report, and should therefore be satisfactory without the need for any further noise control measures.

7.0 CONCLUSIONS

A fully manned "critical period" environmental noise survey has been undertaken in order to establish the prevailing ambient and background noise levels in the vicinity of the subject premises.

Based on manufacturer's noise data for the proposed restaurant plant, and considering the background noise levels measured, noise emissions to the closest / most affected residential and commercial properties have been assessed.

Calculations demonstrate that cumulative noise emissions from the proposed restaurant plant should comfortably comply with controls normally imposed by London Borough of Camden for residential accommodation provided that certain attenuation measures and time control devices are incorporated. Such devices are readily available and in common use.

Further calculations demonstrate that the cumulative noise emissions from the proposed restaurant plant to commercial properties nearby should be controlled in line with design guidance given in BS 8233: 1997. It should be noted that the prevailing ambient noise levels due to existing plant items on neighbouring building roofs are generally already higher than the BS 8233 guidance.

It is concluded that cumulative noise emissions from the proposed restaurant plant should satisfy London Borough of Camden's normal requirements for new plant installations, without the need for any additional noise mitigation measures.

Steven G. Gardner MIOA MSEE
THE EQUUS PARTNERSHIP LTD.

APPENDIX A

Glossary of Acoustic Terminology

Decibel (dB) The Decibel is a logarithmic unit used to express ratios of quantities such as sound pressure or sound power. The logarithmic nature of the unit means that decibel values cannot be added or subtracted in the usual way. An auditory sensation of halving or doubling of loudness equates to a decrease or increase of around 10 dB.

dB(A) or L_A "A" weighted sound pressure level (sound level) measurements correspond roughly to the subjective impression of loudness of the average listener.

L_{90} The L_{90} is the sound level that is exceeded for 90% of the measurement period, and is generally considered to describe the background noise, since it inherently excludes the sounds of transient events.

L_{eq} The L_{eq} index is used as a method of averaging temporally or spatially varying sound levels. At a given position, it may be defined as the notional sound level which contains the same amount of acoustical energy as the actual (time varying) sound level over the same measurement period.

L_{max} The L_{max} is the maximum sound level recorded during the measurement period.