Environoise Consulting Limited
Pioneer House
North Road
Ellesmere Port
Wirral CH65 1AD

www.environoise.co.uk
info@environoise.co.uk

Wednesday, 16 July 2014

Ref: 20311R31bMWpakrmw

Mr. Stephen Lloyd
The Hox
Hox House
20 – 24 Emerald Street
London WC1N 3QA

Dear Stephen,

Plant Noise Impact - The Hoxton Hotel, High Holborn, London.

1.1 Nearest Residential Receptor

1.1.1 The nearest identified residential development is to the rear of the proposed hotel, see Figure 3. The bedroom has a double glazed window unit with a trickle ventilation unit meaning that this 3rd storey receptor would be more sensitive to noise compared with a Hoxton Hotel bedroom with secondary glazing, see Figures 1 and 2.

Figures 1 and 2: Bedroom Window and building from rear hotel extension.

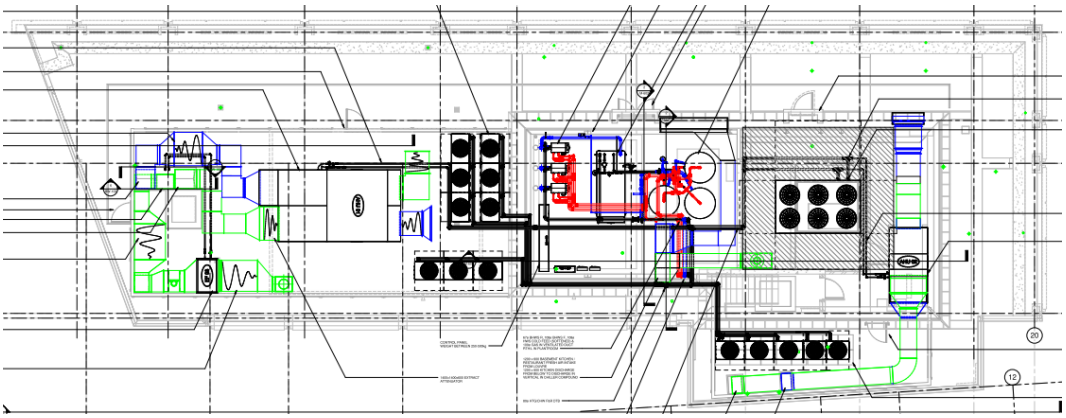
Figure 3: Location of 3rd storey Receptor (red) in relation to Hoxton Hotel (blue).

1.2 Proposed Plant Items

Main Roof-Top Plant

1.2.1 A plan of proposed roof-top plant is shown in Figure 4 which includes condensers and Air Handling Units (AHUs).

Figure 4: Proposed Roof-top Plant Plan Layout.



Sub-Station Plant

1.2.2 Six condensers and two heat dumps are to be located 4.8 metres back from the South elevation of the substation roof, see Figure 6.

1.2.3 Eight new condensers are proposed over the newly built sub-station, see Figures 5. The proposed condensers will be located in addition to plant shown in Figure 6. The same plant items are shown in Figure 7.

1.2.4 Our assessment assesses the cumulative noise impact for all roof-top and sub-station plant.

Figure 5: Proposed 8 condensers over the sub-station.

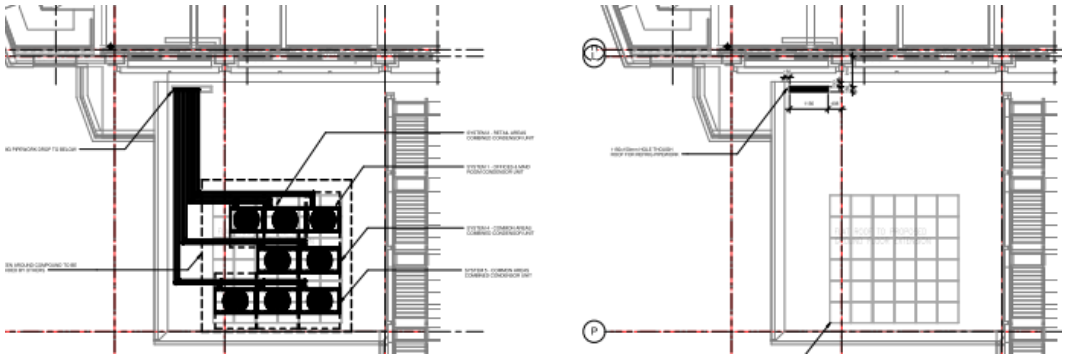


Figure 6: Proposed 6no. JEH88M1 condensers and 2 heat dumps over the sub-station.

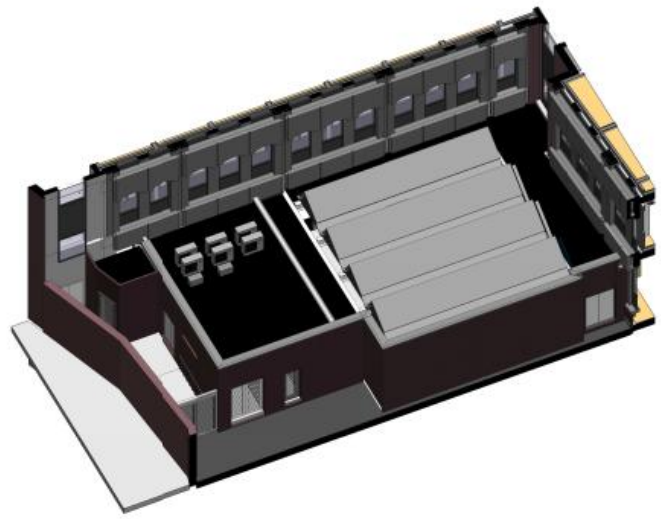
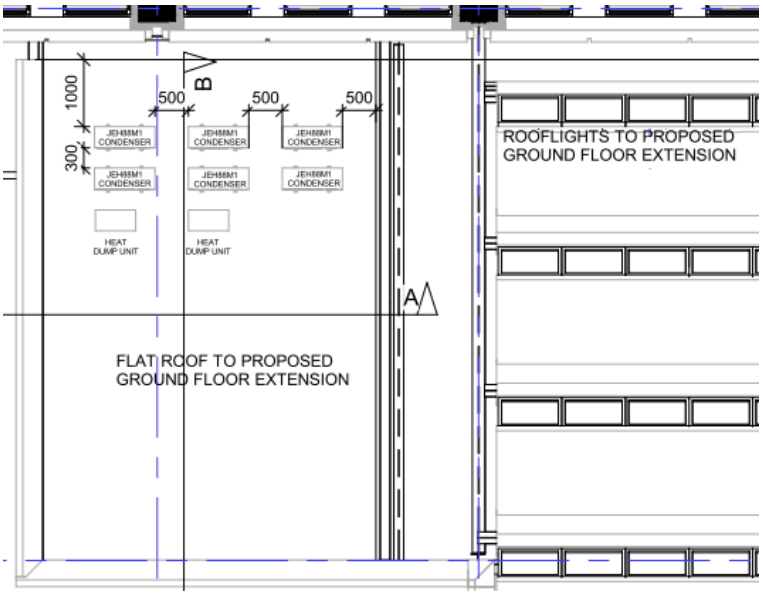


Figure 7: Proposed 6no. JEH88M1 condensers and 2 heat dumps location.



1.3 Local Authority Policy

1.3.1 Camden Development Policies forms part of the Council's Local Development Framework (LDF) under Camden Development Policies 2010-2025 Local Development Framework[i], the group of documents setting out our planning strategy and policies. The lead Local Development Framework document is the Core Strategy, which sets out the key elements of the Council's planning vision and strategy for the borough and contains strategic policies. Part of that strategy is reducing noise pollution.

1.3.2 In relation to plant noise impact the policy gives the following guidance; see their reproduced 'Table E' under Table 1.

Table 1: 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 facade	Day, evening and night	0000 - 2400	5dB(A)<L_{A90}
Noise that has a distinguishable discrete and continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive facade.	Day, evening and night	0000 - 2400	10dB(A)< L_{A90}
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive facade.	Day, evening and night	0000 - 2400	10dB(A)< L_{A90}
Noise at 1 metre external to sensitive facade where LA90>60dB	Day, evening and night	0000 - 2400	55dB L_{Aeq}

1.4 BS4142 Guidance

1.4.1 Guidance given in Table 1 is based on BS 4142:1997 'Method for Rating Industrial Noise affecting Mixed Residential and Industrial Areas'[ii] provides a method of determining the 'likelihood of complaint' due to industrial noise sources explained in section 1.5.

1.4.2 BS 4142:1997 'Method for Rating Industrial Noise affecting Mixed Residential and Industrial Areas' provides a method of determining the 'likelihood of complaint' due to industrial noise sources.

1.4.3 The basis of the BS4142 standard is a comparison between the background noise level (L_{A90}) in the vicinity of residential locations and the rating noise level of the industrial noise source under consideration. The Rating Level ($L_{Aeq,T}$) is the specific noise level plus a 5dB penalty added (if the noise is tonal or impulsive in nature).

- BS4142 suggests that a Rating Level excess of up to 5dB(A) above the background noise level at the receptor is **'of marginal significance'.**
- If the Rating Level due to the noise source exceeds the background noise level by more than 10dB(A) then the indication is that **'complaints are likely'.**
- If the Rating Level of the noise source is more than 10dB(A) below the background noise level this is a positive indication that **'complaints are unlikely'.**

1.4.4 The following noise emission limits (see Table 2) have been set based on a previous Aecom report[1] using background data at two receptor locations. A description of each measurement locations are reproduced from the report below:

2.2.3 ***At measurement Location 1*** *the microphone was extended 1m out of a window on the first floor of the existing building overlooking High Holborn. The noise levels measured at this location are considered representative of the prevailing background noise of noise sensitive properties overlooking High Holborn and Newton Street.*

2.2.4 ***At measurement Location 2*** *the microphone was extended 1m out of a window on the third floor of the existing building overlooking the delivery yard to the rear. The noise levels measured at this location are considered representative of the prevailing background noise of noise sensitive properties overlooking the courtyard accessible from Newton Street.*

1.4.5 The limits have been determined to achieve a BS4142 (see section 1.3 for guidance) Rating Level of -5 dB below the background noise level at 1m from the facades of the nearest noise sensitive properties.

1.4.6 The noise targets are based on plant noise levels not containing tonal or impulsive characteristics. Alternatively, if plant noise levels vary by 5dB or more per third octave then noise limits should be 5dB lower than given in Table 2. This is turn means that all plant noise levels would need to be 5dB lower than recommended.

Table 2: Measured Plant Noise Limits.

	Free-field Noise Emission Limit at 1m from the Facade of the Upper Floors of the Nearest Residential Property.	
Night-time (23:00 – 07:00)	Location 1 (properties overlooking High Holborn and Newton Street)	Location 2 (Properties overlooking the delivery yard)
Daytime (07:00hrs – 23:00hrs)	47dB	40dB
Night-time (23:00 – 07:00)	45dB	37dB

1.4.7 The lowest target is to the rear of the building where also the receptor is closest to the highest number of plant noise sources and therefore assessment only to this receptor is required.

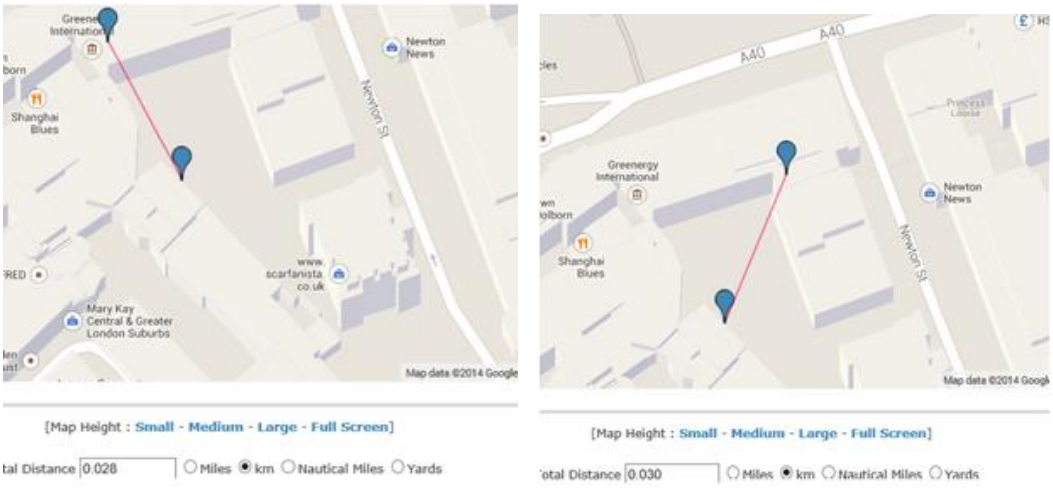
1.5 Assessment

1.5.1 All detailed calculations are shown in Appendix A.

1.5.2 Distances of proposed roof-top plant (N.B. not sub-station plant) are between 27 and 30 metres from the receptor, see Figures 8 and 9.

[1] Pages 2 and 3 of Aecom Report Job No 60147030/M041 Reference 60147030/Rp1v3 dated August 2011.

Figures 8 and 9: Distances from Proposed Main Roof to Receptor.



1.5.3 The distance from sub-station plant to the receptor (shown in Figure 3) is 28 metres.

1.5.4 All plant data has been supplied[2] and therefore we cannot be held responsible for the accuracy of plant noise data provided.

1.5.5 Sound Power Level data and the calculated sound pressure level at the receptors have been calculated as follows:

- $L_p = ((L_w – 20 \times \text{Log } (R/r)) – (11 + D.I))$.

- Where L_p or ($L_{Aeq,T}$) = sound pressure level.
- R = distance of plant from receptor.
- R = distance of measurement point from plant.
- D.I. = Directivity Index or 3dB to account for ground reflection.

1.5.6 Sound Pressure Level data and calculated sound pressure levels at the receptors have been calculated as follows:

- $L_{pR} = L_{pr} - (20 \times \text{Log } (R/r)$
  where L_{pR} = sound pressure level at distance R metres
  L_{pr} = sound pressure level at distance r metres

1.5.7 A level of 5dB attenuation has been considered for non-acoustic louvres, see Figure 10.

[2] Supplied by Andy Murray, Facilitas.

Figure 10: Part installed louvres.

1.5.8 For the enclosed parts of roof-top plant (i.e. the proposed plant that has no line of sight to the receptor due to a wall/ parapet) we expect that the level of sound insulation is sufficiently great that there will be no adverse impact at the nearby receptor. We have assumed a very conservative 15dB level of sound insulation performance which demonstrates that requirements are met for this part of the plant installation.

1.6 Predicted Plant Noise Levels at Nearest Receptor

1.6.1 The predicted combined noise level at the receptor (shown in Figure 3) is 48dB $L_{Aeq,T}$ (see Table 3) which is up to 11dB above the night-time target.

1.6.2 The night-time target (23:00hrs – 07:00hrs) will only be considered as plant runs continuously and is the more onerous target. Meeting this target would mean that all other targets are met.

Table 3: Predicted Overall Plant Noise Levels at Receptor.

Description of Plant Area Assessed	Noise level [$L_{Aeq,T}$ @1m]
Main roof with louvred facade.	45
Main roof with part enclosed plant.	34
Client & Contractors plant on sub-station roof.	45
LOG[3] TOTAL	48

[3] 'Noise' is unwanted sound. Sound is measured by a change in pressure. Given the large scale of pressure levels e.g. a whisper compared with a jet engine roar the numeric range has been logarithmically compressed to make it more manageable. Therefore we would expect an increase of 3dB for two coherent noise sources of the same level i.e. 40dBA + 40dBA = 43dBA. For incoherent noise levels such as 100dBA; 91dBA; 90 dBA and 89 dBA would result in a noise level of 101.2dBA. Given by the following formula:

$$SPL_T = 10 \times \mathrm{Log}\left(\sum_{i=1}^{n} 10^{\left(\frac{SPL_i}{10}\right)}\right)$$

= 10 × Log 10 (100/10) + 10 (91/10) + 10 (90/10) + 10 (89/10) ( )
= 10 × Log 10 10 + 10 9.1 + 10 9 + 10 8 .9 ( )
= 101 .2dB

1.7 Recommendations

1.7.1 The aim of the assessment is to meet plant noise targets at the receptor, a summary of the required ambient levels at the receptor to meet the target is shown in Table 4.

Table 4: Target Overall Plant Noise Levels at Receptor.

Description of Plant Area Assessed	Noise level [$L_{Aeq,T}$ @1m]
Main roof with louvred facade.	34
Main roof with part enclosed plant.	34
Client & Contractors plant on sub-station roof.	33
LOG TOTAL	38

Noise Reductions Required - Main Louvred Plant Enclosure.

1.7.2 The required noise reductions to meet target at the receptor are given in Table 4.

Table 4: Predicted Reduction Required from Main Louvred Plant Enclosure.

Plant No.	Plant Type	Required Noise Reduction (dBA)	Resultant Receptor Noise level [$L_{Aeq,T}$ @1m]
7	3rd Floor VRF SHRMi 14 +14+14 hp	7	27
8	2nd Floor VRF SHRMi14+14+14 hp	12	27
9	1st Floor VRF SHRMi 14+14+14 hp	12	27
10	AHU 10	0	26
11	EF03	13	28
	Total Log Noise level at Receptor [$L_{Aeq,T}$ @1m]		34

Noise Reductions Required - End Section Plant

1.7.3 The main plant roof with contained plant and exposed end section condensers (5th Floor VRF SHRMi 10 + 8hp and 4th Floor VRF SHRMi 14+14+14hp) require a louvre with insertion loss of 5dBA or greater.

Noise Reductions Required - Condensers over Sub-station.

1.7.4 The following reductions are required, see Table 5. A reduction of up to 15dBA may be achieved through the use of an acoustic louvre if there is no line of sight between plant and the residential receptor. Therefore this may mean that the acoustic louvre shall need to be positioned close to the plant or to specific items of plant. If this is not practicable, silencers should be fitted to SHRMi condensers 14 + 10 hp; 14 + 14 + 12 hp and 14 + 12 hp with a static insertion loss equivalent to the required reduction shown in Table 5 at 500Hz.

Table 5: Predicted Reduction required for all Sub-station roof plant.

Plant No.	Description of Plant	Required Noise Reduction (dB)	Noise level [$L_{Aeq,T}$ @1m]	Combined Receptor Noise level [$L_{Aeq,T}$ @1m]
1	SHRMi 10hp	5	54	24
2	SHRMi 14 + 10 hp	11	54	27
3	SHRMi 14 + 14 + 12 hp	15	53	28
4	SHRMi 14 + 12 hp	12	54	27
5	J & E Hall FUSION condensing Units No. JEH88M1	0	48	26
6	Vision Cooler Heat Dump	3	54	24
		Total Log Noise level at Receptor [$L_{Aeq,T}$ @1m]		33

Yours sincerely,

Miles Woolley MIOA
Principal Acoustics Consultant
For and behalf of Environoise Consulting Limited

Appendix A: Plant Noise Impact Assessment

Table A1: Predicted Plant Noise Levels from Open Part of Main Roof- Top Plant, see Figure 4.

Item No.	Description of Plant	Noise level [$L_{Aeq,T}$ @1m (cooling)]	Noise level [$L_{Aeq,T}$ @1m (heating)]	No. Of Units	Combined Source Noise level [$L_{Aeq,T}$ @1m]	Combined Noise level [$L_{Aeq,T}$ @1m] -5dB louvre	Resultant Level after Recommended Reduction (dB)
7	3rd Floor VRF SHRMi 14 +14+14 hp	66	68	1	68	34	27
8	2nd Floor VRF SHRMi14+14+14 hp	66	68	3	73	39	27
9	1st Floor VRF SHRMi 14+14+14 hp	66	68	3	73	39	27
		Noise level (L_{WA})	Noise level (L_{WA})				
		highest supply breakout level	highest exhaust breakout level				
10	AHU 10	65	64	1		26	26
11	EF03	83				41	28
					Total Log Noise level at Receptor [$L_{Aeq,T}$ @1m]		**34**

Table A2: Predicted Plant Noise Levels from Mid Section & part enclosed part of roof.

Item No.	Description of Plant	Noise level [$L_{Aeq,T}$ @1m (cooling)]	Noise level [$L_{Aeq,T}$ @1m (heating)]	15dB shielding	Combined Noise level [$L_{Aeq,T}$ @1m]
12	Water Heater Lochinvar ECOKNIGHT EKW145CE	69		54	25
13	MHS CHP Unit Energiser G849-90	70		55	26
14	Carrier Aquasa/ap 30RQ chiller	56			27
		Noise level (L_{WA}) highest supply breakout level	Noise level (L_{WA}) highest exhaust breakout level	5dB from louvre	
15	AHU 02	65	64		28
5	5th Floor VRF SHRMi 10 + 8hp	62		57	20
6	4th Floor VRF SHRMi 14+14+14hp	68		63	26
			Total Log Noise level at Receptor [$L_{Aeq,T}$ @1m]		**34**

1.7.5 The figure shown in red for the Carrier Aquasa/ap 30RQ chiller is highest allowable noise level in absence of data provided. This level is the combined noise levels from the chillers. A 5dB reduction from a standard louvre would mean a level of 61dB $L_{Aeq,T}$ at on metre would be acceptable. Similarly an acoustic louvre would mean that a level of 66 to 71dB $L_{Aeq,T}$ would be acceptable based on a sound reduction of 10 to 15dB.

Table A3: Predicted Plant Noise Levels from Condensers on Substation Roof.

Item No.	Description of Plant	Noise level [$L_{Aeq,T}$ @1m (cooling)]	Noise level [$L_{Aeq,T}$ @1m (heating)]	No. Of Units	Minimum Required Noise Reduction	Combined Receptor Noise level [$L_{Aeq,T}$ @1m]
1	SHRMi 10hp	57	59	1	8	22
2	SHRMi 14 + 10 hp	63	65	2	14	25
3	SHRMi 14 + 14 + 12 hp	66	68	3	17	27
4	SHRMi 14 + 12 hp	64	66	2	15	25
5	J & E Hall FUSION condensing Units No. JEH88M1	48	48	6	0	27
6	Vision Cooler Heat Dump	54	54	2	3	25
				Total Log Noise level at Receptor [$L_{Aeq,T}$ @1m]		**33**

References

[i] Camden Development Policies 2010-2025 Local Development Framework.

[ii] BS 4142:1997 'Method for rating industrial noise affecting mixed residential and industrial areas'.