PLANT NOISE ASSESSMENT

ROYA FREE HOSPITAL - PHARMACY AUTOCLAVE

The Richard Stephens Partnership Limited

2061437-RSKA-RP-002-(02)

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General notes

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Signature:	[redacted]	Signature:	[redacted]
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List of Tables & Figures

1 Introduction

It is proposed to install new mechanical services at Royal Free Hospital to serve the Pharmacy Autoclave.

RSK Acoustics have been instructed to undertake a noise survey at the site to quantify the existing background noise levels representative of those at the nearest residential receivers.

This report details the methodology used to conduct the noise survey and sets plant noise limits in line with Local Authority criteria. An evaluation of noise emissions from the proposed plant strategy to the nearest noise sensitive receivers has also been undertaken.

Where necessary, mitigation measures have been set out with performance requirements specified.

2 Site Description

The site is located at the Royal Free Hospital, Pond Street, London NW3 2QG. The site and its surrounds can be seen on the attached site plan in Appendix B.

Pond Street runs to the north of the site. Rosslyn Hill runs to the west of the site and joins Haverstock Hill to the southwest. Both Rosslyn Hill and Haverstock Hill form part of the A502. Pond Street meets Fleet Road and Rosslyn Hill to the northeast and northwest respectively. These three roads see frequent traffic and are main roads in the Camden area.

The nearest residential property is located across from the site on Pond Street. The site is within the jurisdiction of the London Borough of Camden.

3 Environmental Noise Survey

3.1 Methodology

An unattended noise survey was undertaken at the site between 1500 hours on Monday 10th October and 1500 hours on Tuesday 11th October 2022.

Measurements of noise levels were undertaken from a single measurement position indicated in the attached site plan 206/1437/SP2 and described below:

- MP1: Measurement position to the north of the site approximately 3 m from the kerb edge of Pond Street and 1.5 m above street level.

Measurements of L_{Aeq}, L_{A90}, and L_{Amax} were recorded over consecutive 15-minute periods (see Glossary of Acoustic Terms for an explanation of the noise units used) for the duration of the survey using the equipment listed within Table 1.

Item	Manufacturer	Type
Sound Level Analyser	Rion	NL-52
Acoustic Calibrator	Rion	NC-74
Weatherproof Windshield	Rion	WS-15

Table 1 Equipment used during unattended noise survey

The microphone was enclosed within a weatherproof windshield and the sound level meter was calibrated before and after the survey to confirm an acceptable level of accuracy.

The weather conditions when setting up and collecting the equipment were overcast, dry and cool with a light breeze. Publicly available weather data suggests that weather conditions throughout the survey were suitable for noise measurements.

3.2 Results

The results of the noise survey are presented in the attached time history graph in Appendix A. The representative background noise levels derived following guidance in BS 4142:2014+A1:2019 are set out in Table 2 below.

Location	Representative Background Noise Level, L_{A90} dB	
	Daytime (0700-2300 only)	Night-time (24-hour)
MP1: Pond Street	56	53

Table 2 Representative measured background noise levels, L_{A90}

4 Plant Noise Limits

4.1 Local Authority Criteria

Policy A4 of the London Borough of Camden's Local Plan 2017 relates specifically to noise:

'We will only grant permission for noise generating development, including any plant and machinery, if it can be operated without causing harm to amenity.

Planning conditions will be imposed to require that plant and equipment which may be a source of noise is kept working efficiently and within the required noise limits and time restrictions.

Conditions may also be imposed to ensure that attenuation measures are kept in place and are *effective throughout the life of the development.'*

With regard to noise from new mechanical services plant, Appendix 3 of the Local Plan sets out the following:

'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 (15 dB if tonal components are present) should be considered as the design *criterion).'*

4.2 Noise Emission Limits

Based on the results of the background noise survey set out within Table 2, in addition to the guidance set out above, we recommend that the following plant emission limits are to apply at the nearest noise sensitive premises, illustrated in Table 3.

Location	Representative Background Noise Level, $L_{Ar,Tr}$ dB (for plant with no distinguishing feature)	
	Daytime (0700-2300 only)	Night-time (24-hour)
MP1: Pond Street	46	43

Table 3 Plant noise emission limits at the nearest noise sensitive properties.

These limits are to apply to both plant items running simultaneously in the representative time periods, when running at design duty and are to apply at 1 m from the outside of nearby noise sensitive windows. Any plant with a tonal component or other distinctive feature out of character with the existing environment would be subject to a further penalty.

5 Plant Noise Assessment

5.1 Proposed Installation

The proposed units with external noise emissions are as follows:

- 1x Condenser: Mitsubishi PUZ-ZM71VHAR1
- 3x Chiller: Mitsubishi Electric NX2-G06/NR/0082

It is proposed to install the chillers at ground floor level on the northern side of the site on a lower ground floor roof and the condenser unit at service level in an opening next to the emergency staircase with no view onto Pond Street. The approximate plant locations are indicated on the attached site plan in Appendix B.

Noise data for the proposed plant can be seen in Table 4 below.

Reference	Description	Data Source	Noise Level Type	Noise level, dB @ Octave Band Centre Frequency, Hz							
				63	125	250	500	1k	2k	4k	8k
Chiller 1	Mitsubishi Electric NX2-G06/NR/0082	Manufacturer	Sound Power, L_w	81	81	78	77	76	72	66	51
Chiller 2	Mitsubishi Electric NX2-G06/NR/0082	Manufacturer	Sound Power, L_w	81	81	78	77	76	72	66	51
Chiller 3	Mitsubishi Electric NX2-G06/NR/0082	Manufacturer	Sound Power, L_w	81	81	78	77	76	72	66	51
Condenser	*Mitsubishi* PUZ-ZM71VHAR1	Manufacturer (Empirical Octave Band Spectrum)	Sound Power, L_w	63	61	65	63	63	59	54	52

Table 4 Proposed Plant Sound Power Levels (dB)

The three chillers will run in a duty, assist and standby arrangement. The standby unit will be deployed as a resilience unit therefore a maximum of two units will run simultaneously. For this reason, chiller 3 has been excluded from this assessment. It is understood the proposed plant will run 24 hours a day.

5.2 Methodology

Noise levels have been calculated to a single assessment position representing the nearest and most exposed noise sensitive receptor to the proposed plant. The assessment position is labelled in the attached site plan and described below:

- AP1: Third floor window at 37e Pond Street, overlooking the proposed installation.

The noise levels generated by all mechanical services elements have been calculated by correcting the plant noise levels for distance, screening, radiation losses and façade reflections where appropriate.

5.3 Required Mitigation

It will be necessary to install an acoustic screen between the proposed chillers and the nearest noise sensitive receiver.

The acoustic screen should be of imperforate construction and achieve a minimum surface mass of 10 kg/m2 (e.g. 19 mm marine plywood, or steel acoustic enclosure panels) for the duration of the design life.

Any butting or overlapping components of the screen should have well sealed joints to prevent leakage. This should be achieved without compromising the overall density requirement.

The screen structure is to be suitably designed and engineered with appropriate consideration for wind loading and aerodynamic forces.

The acoustic screen should extend from roof level, up to a height at least 1.3 m above the top of the proposed units (expected to be 3.2 m from roof level in total). The location of the acoustic screen can be seen in the image below.

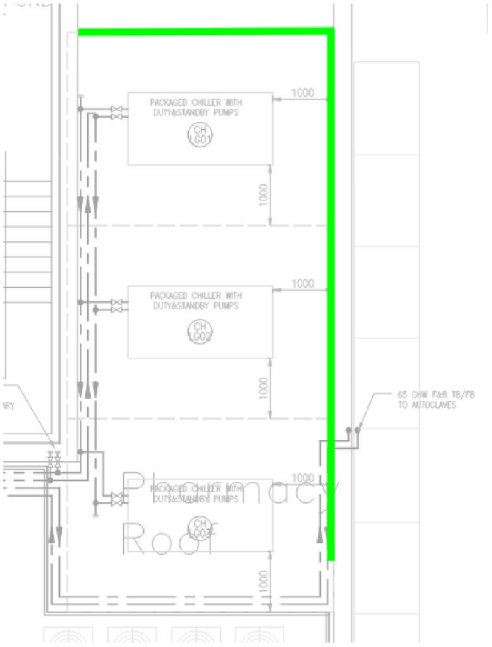

Figure 1 Image illustrating the location of the acoustic screen

No mitigation is required for the proposed condenser unit. All plant items must be installed on suitable anti-vibration mounts to control structure borne sound transmission.

5.4 Assessment Results

With the specified acoustic screen in place, the plant rating noise level seen in Table 5 has been assessed at the assessment position.

Location	Rating Noise Level, $L_{Ar,Tr}$ dB (Limit)	
	Operating Hours (0700-2200 hours)	Operating Hours (2200-0700 hours)
AP1: 37e Pond Street	41 (46)	41 (43)

Table 5 Resultant plant noise emission levels at the nearest noise sensitive property

A summary calculation sheet showing the expected noise levels at the assessment position during the operating hours of the proposed items can be seen in Appendix C.

6 Summary

It is proposed to install new mechanical services at Royal Free Hospital to serve the Pharmacy Autoclave.

This report has provided details of a noise survey conducted at the site and has set noise emission limits for the proposed plant items in line with Local Authority requirements.

A noise impact assessment has been conducted of noise from the proposed plant items. The assessment has shown that with the proposed mitigation measures in place, the plant noise limits set will be achieved.

Glossary

Term	Definition
Ambient sound	The total sound at a given place, usually a composite of sounds from many sources near and far.
Background sound, $L_{A90,T}$	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval.
dB	Decibel. Scale for expressing sound pressure level. It is defined as 20 times the logarithm of the ratio between the root mean square pressure of the sound field and a reference pressure i.e. $2x10^{-5}$ Pascal.
dB(A)	A-weighted decibel. This provides a measure of the overall level of sound across the audible spectrum with a frequency weighting to compensate for the varying sensitivity of the human ear to sound at different frequencies. Example sound levels include: 140 dB(A) Threshold of pain 120 dB(A) Threshold of feeling 100 dB(A) Loud nightclub 80 dB(A) Traffic at busy roadside 60 dB(A) Normal speech level at 1m 40 dB(A) Quiet office 20 dB(A) Broadcasting studio 0 dB(A) Median hearing threshold (1000 Hz)
Frequency	The repetition rate of a sound wave. The subjective equivalent in music is pitch. The unit of frequency is the Hertz (Hz), which is identical to cycles per second. A thousand hertz is often denoted as kHz, e.g. 2 kHz = 2000 Hz. Human hearing ranges approximately from 20 Hz to 20kHz.
$L_{Aeq,T}$	This is defined as the notional steady sound level over a stated period of time (T), would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.
Rating level	Specific sound level of a source plus any adjustment for the characteristic features of the sound.
Residual sound	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
Specific sound	Sound pressure level produced by the source being assessed at the assessment location.

Appendix A

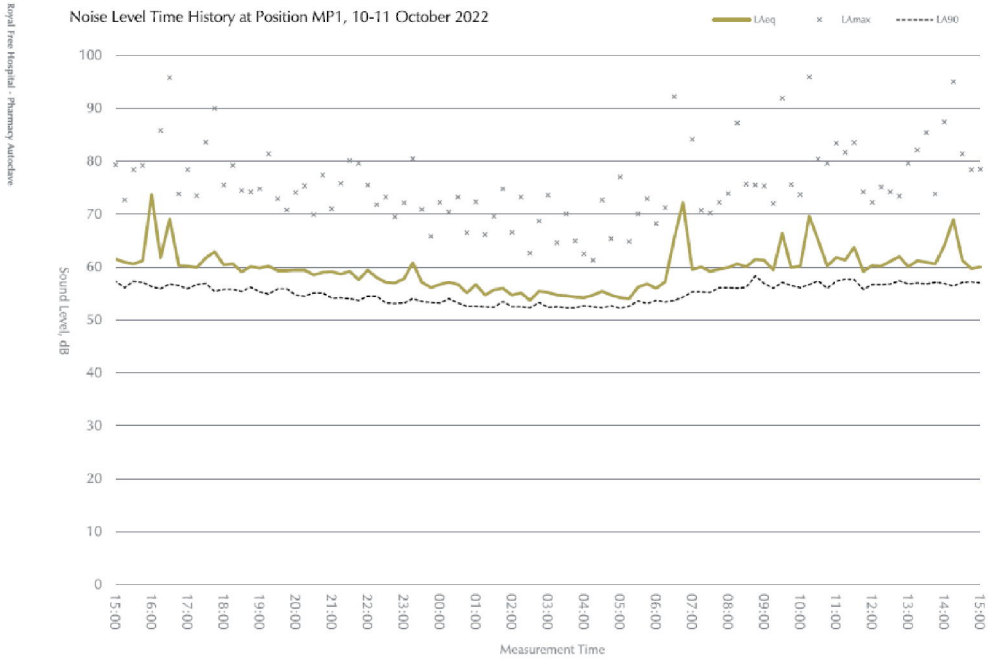

Figure 206/1437/TH01

Appendix B

Figure 206/1137/SP2

Title:
Site plan

Key:
- Measurement Position
- Assessment Position
- Approximate Location for Proposed Chillers
- Approximate Location for Proposed Condenser

Project:
RFH – Pharmacy Autoclave

Date: July 2023
Revision: –

Scale: Not to scale
Image Source: –

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Appendix C

Job No.	Job Title			
2061437	RFH - Pharmacy Autoclave			
Date Created	By	Date Revised	Rev	Sheet
26 Jul 2023	MQ	09 Oct 2023	2	1
Date Reviewed	By	Review Type	Review Status	

206/1437/CS1 - External Receiver Summary

		Rating/Broadband/Input			Octave Band Centre Frequency, Hz							
Item / Description		Rating	dB	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k
Chiller 1	Noise level at 37e Pond Street			**32 (A)**	0.0	41	39	34	31	27	20	11	-7
Chiller 2	Noise level at 37e Pond Street			**40 (A)**	0.0	42	42	39	38	36	32	25	9
Condenser	Noise level at 37e Pond Street			**16 (A)**	0.0	22	18	19	14	11	4	-2	-4
Noise Limit Day	Daytime Noise Limit			**46 (A)**									
Noise Limit Night	Night-time Noise Limit			**43 (A)**									
AP1 Day	Overall Daytime Level at 37e Pond Street			**41 (A)**		44	44	40	38	37	32	25	9
AP1 Night	Overall Night-time Level 37e Pond Street			**41 (A)**		44	44	40	38	37	32	25	9

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