Report

28 November 2016

TEMPLE

LEADERS IN ENVIRONMENT, PLANNING & SUSTAINABILITY.

Report for – Llewelyn Davies
69-75 Chenies Mews, London WC1E 6HX
Environmental Noise Assessment

Document Version Control

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1.0 Introduction

1.1 Project Background

Temple Group Ltd (Temple) has been instructed by Llewlyn Davies to undertake an environmental noise assessment for the proposed new rooftop plant at 69 -75 Chenies Mews, London WC1E 6HX.

The proposed new plant is required in order to provide cooling and ventilation for the Magnetic Resonance Imaging services at the medical research facilities at 69 -75 Chenies Mews.

The purpose of the noise assessment is to assess the impact of proposed rooftop plant to the nearest neighbour's window in line with national policy and the policy of the Local Authority, London Borough of Camden.

Note: this a revised report (version 3) including the same noise survey as version 2 of the initial report (dated 13 September 2016), but following feedback from the Local Authority, Camden Council the acoustic screening required to meet the noise criteria has been reduced by selection of quieter plant and mitigation of plant noise at source in order to reduce the impact of the acoustic screening on daylight to the surrounding buildings.

2.0 Planning Policies, Standards and Guidance

2.1 National Policy

2.1.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF)[1] was introduced by the Department of Communities and Local Government in March 2012. The document sets out the Government's planning policies for England and how these are expected to be applied.

The planning system is required to contribute to and enhance the natural and local environment. Consequently, the aim is to prevent both new and existing development from contributing to or being put at unacceptable risk from noise, or being adversely affected by unacceptable levels of noise pollution.

Therefore planning policies and decisions should aim to:

- Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;
- Mitigate and reduce to a minimum other adverse impacts on quality of life arising from noise from new development, including through the use of conditions;
- Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and
- Identify and protect areas of tranquillity that have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

2.1.2 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE)[2] seeks to clarify the underlying principles and aims in existing policy documents, legislation and guidance that relate to noise. The statement applies to all forms of noise, including environmental noise, neighbour noise and neighbourhood noise.

The statement sets out the long-term vision of the government's noise policy, which is to *"promote good health and a good quality of life through the effective management of noise within the context of policy on sustainable development".*

The guidance promotes the effective management and control of noise, within the context of Government policy on sustainable development and thereby aims to:

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and minimise adverse impacts on health and quality of life; and
- Where possible, contribute to the improvements of health and quality of life.

[1] Department for Communities and Local Government, (March 2012): 'National Planning Policy Framework'.

[2] Department for Environment, Food and Rural Affairs, (March 2010): 'Noise Policy Statement for England'.

The statement adopts established concepts from toxicology that are currently being applied to noise impacts. The concept details noise levels, at which the effects of an exposure may be classified into a specific category. The classification categories as detailed within NPSE are as follows:

- No Observed Effect Level (NOEL) - the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established;
- Lowest Observed Adverse Effect Level (LOAEL) - the level above which adverse effects on health and quality of life can be detected; and
- Significant Observed Adverse Effect Level (SOAEL) - the level above which significant adverse effects on health and quality of life occur.

It is recognised that SOAEL does not have a single objective noise-based level that is applicable to all sources of noise in all situations and therefore the SOAEL is likely to be different for different sources, receptors and at different times of the day.

No guidance has been issued at the time of writing to identify the SOAEL and LOAEL for typical noise sources and receptors.

2.1.3 Planning Practice Guidance Noise

The Planning Practice Guidance (PPG)[3] expands on the use of SOAEL: *"If the exposure is above this level the planning process should be used to avoid this effect occurring, by use of appropriate mitigation such as by altering the design and layout. Such decisions must be made taking account of the economic and social benefit of the activity causing the noise, but it is undesirable for such exposure to be caused."*

The PPG also goes on to identify unacceptable noise exposure: *"At the highest extreme, noise exposure would cause extensive and sustained changes in behaviour without an ability to mitigate the effect of noise. The impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, this situation should be prevented from occurring."*

2.2 Regional Policy

2.2.1 The London Plan – Spatial Development Strategy for Greater London

The Mayor of London has published a revised London Plan 2016. With specific reference to noise, the London Plan contains Policy 7.15: Reducing and managing noise:

"Policy

Strategic

A The transport, spatial and design policies of this plan will be implemented in order to reduce and manage noise to improve health and quality of life and support the objectives of the Mayor's Ambient Noise Strategy.

[3] Department for Communities and Local Government, (March 2014): 'Planning Practice Guidance'.

Planning decisions

B Development proposals should seek to manage noise by:

a avoiding significant adverse noise impacts on health and quality of life as a result of new development;

b mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens on existing businesses;

c improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity);

d separating new noise sensitive development from major noise sources (such as road, rail, air transport and some types of industrial development) through the use of distance, screening or internal layout – in preference to sole reliance on sound insulation;

e where it is not possible to achieve separation of noise sensitive development and noise sources, without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through the application of good acoustic design principles;

f having particular regard to the impact of aviation noise on noise sensitive development;

2.2.2 *promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver"* Sounder City: The Mayor's London Ambient Noise Strategy

The London Ambient Noise Strategy aims to minimise the adverse impacts of noise on people living, working in and visiting London by using the best available practices and technologies within a sustainable development framework.

The Strategy aims to work towards more compact city development, while minimising noise. This requires careful consideration of the adverse impact of noise on, from, within or in proximity to a development.

2.3 Local Policy

2.3.1 Camden Development Policies 2010

Camden Development Policies DP28: Noise and Vibration[4] seek to ensure that noise and vibration is controlled and managed and will not grant planning permission for developments that exceed Camden's thresholds as shown in Table 1

[4] Camden Local Development Framework (LDF), (2010): 'Camden Develop Policies'.

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	00.00 – 24.00	5 dB(A) < L_{A90}
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade	Day,evening and night	00.00 – 24.00	10 dB(A) < L_{A90}
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade	Day,evening and night	00.00 – 24.00	10 dB(A) < L_{A90}
Noise at 1 metre external to sensitive façade where L_{A90} > 60 dB	Day,evening and night	00.00 – 24.00	55 dB L_{Aeq}

In addition in terms of operational noise i.e. mechanical noise "…*A condition will be imposed to require that the plant and equipment which may be a source of noise pollution 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 effective throughout the life of the development*."

2.3.2 British Standard 4142 – Methods for Rating and Assessing Industrial and Commercial Sound

British Standard 4142 (BS 4142:2014)[5] describes methods to use outdoor sound levels to assess the likely effects of sound of an industrial and/or commercial nature on people who might be inside or outside a dwelling or premises used for residential purposes upon which the sound is incident.

The standard requires determination of the following:

- Rating level - $L_{Aeq,Tr}$ sound level produced by the specific sound source at the assessment location with any adjustment added to the specific sound level if a tone, impulse or other acoustic characteristic occurs, or is expected to be present.
- Background sound level, $L_{A90,T}$ – A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T.

T_r is the reference time interval over which the specific sound level is determined. This is 1-hour for daytime (07:00-23:00 h) and 15-minutes for night-time (23:00-07:00 h).

An estimate of the impact of the specific sound generated can be obtained by subtracting the measured background sound level from the rating level, and the following is considered:

a) Typically, the greater this difference, the greater the magnitude of the impact.
b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

[5] British Standard Institute (BSI), (2014): 'BS 4142 – Methods for rating and assessing industrial and commercial sound', BSI, London.

d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

All pertinent factors should be taken into consideration when assessing the impact, including the following:

- Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.
- The character and level of the residual sound compared to the character and level of the specific sound.
- The sensitivity of the receptor.

2.3.3 British Standard 7445 – Description and Measurement of Environmental Noise

Part 1: Guide to Quantities and Procedures

British Standard 7445 Part 1 (BS 7455-1:1991)[6] defines the basic quantities to be used for the description of noise in community environments and describes basic procedures for the determination of these quantities.

The methods and procedures described in this British Standard are intended to be applicable to sounds from all sources, individually and in combination, which contribute to the total noise at a site.

[6] British Standards Institute (BSI), (1991): 'BS 7445 – Description and Measurement of Environmental Noise. Part 1: Guide to Quantities and Procedures'. BSI, London.

3.0 Site and the Surrounding Area

The proposed plant is to serve an existing four storey medical research centre as part of refurbishment of the existing building at 69-75 Chenies Mews, London WC1E 6HX. The plant and chillers are required to cool the building and also new proposed MRI units. Building use in the surrounding area is a mixture of commercial medical buildings of University College London and residential use. The nearest residential receptor is immediately to the rear of 69-75 Chenies Mews at 64 & 66 Huntley Street. The nearest commercial offices are at 98 Chenies Mews.

Note that for this revised assessment, noise is also considered to the commercial premises to the rear of the site on Chenies Mews. Whereas initially full screening was recommended to ensure that noise criteria of Camden council were met.

3.1 Site

Appendix I shows the measurement position, the noise sensitive receptors opposite at 62-70 Huntley Street and sources of noise with 64 Huntley Street the closest residential and 98 Chenies Mews the nearest commercial receptor, currently the facilities management department for University College London and therefore these two receptors used for this noise assessment to 1m from their nearest window.

4.0 Measurement Methodology

The proposed development will be subject to noise generated by:

- Road Traffic – (Chenies Mews and surrounding roads)
- External plant at the rear of Chenies Mews (see Appendix II)

Noise levels have been measured in order to assess any potential impact the above noise sources will have on future occupants of the proposed development.

4.1 Unattended Measurements

An unattended environmental noise survey was carried out between Tuesday 23rd August and Tuesday 30th August 2016 to obtain full daytime and night-time background and ambient noise monitoring results during weekdays and weekend periods. The microphone was set up 1m from façade of 3rd floor of 69-75 Chenies Mews site.

The $L_{Aeq,T}$, $L_{AFmax,T}$ and $L_{A90,T}$ sound pressure levels were measured continuously during the survey. Measurements were logged every 5 minutes.

The unattended measurement location is shown in Appendix II.

4.2 Instrumentation

The equipment used is detailed in Table 2 below. The sound level meter was fitted with a shield against wind and rain. The measurement systems are certified to meet Class 1 of BS EN 61672 and were field calibrated with a calibrator meeting Class 1 of IEC 60942 before and after the measurements and no variation occurred. Calibration certificates showing that the equipment has undergone periodic verification to international and British standards within the last 2 years are available upon request.

Table 2– Survey Equipment

Manufacturer	Item	Type	Serial Number
Rion	Sound Level Meter	NL 52	510141
Rion	Field Calibrator	NC-74	34773047

4.3 Meteorological Conditions

The weather conditions during the surveys were predominately dry with light winds. There was occasional light precipitation but not of any noticeable impact on the results. Average wind speeds were below the recommended maximum limits of 5m/s as specified in BS 4142:2014. However, occasionally, the maximum wind speeds were higher than this, but scrutiny of the measurements

show no significant impact on the levels recorded[7]. See **Appendix III** for a more comprehensive overview of the meteorological conditions.

[7] NB: the RION NL 52 outdoor microphone kit includes a large double skinned wind protector that provides substantially more protection against wind induced microphone noise than standard e.g. < 90 mm diameter single layer microphone protection units.

5.0 Noise Survey Results

5.1 Unattended measurement results

Presented within Table 3, are a summary of the results of the long-term noise measurements at the unattended location to the rear of the site at third floor level which is considered representative of the nearest residential receptor.

A graph showing the time history of the measured results at the unattended monitoring location is given in **Appendix I**. Full details of the results of the measurement survey are available on request.

Similarly, as per the advice of BS 4142:2014, the typical L_{A90} has been derived by taking the mode of the $L_{A90,5minute}$ levels measured during the appropriate time period. Since the plant is potentially to operate 24hours, the night time period 23:00 to 07:00 is considered the appropriate period as background noise levels are lower than during the day.

Table 3 – Summary of Noise Monitoring Results – MP1

Time Period	Typical Background Mode $L_{A90,5mins}$ dB
Daytime 07:00 - 23:00	50
Night-time 23.00 – 07.00	48

6.0 Assessment

6.1 Mechanical Plant Noise

Noise levels from the proposed mechanical services plant for the commercial unit must be controlled to protect the surrounding noise sensitive receptors.

Details of the proposed mechanical services plant associated with the development are included in table 4 below. Note levels for the air handling units are summed total levels. Although 3 chillers are required, the client has advised that one is a reserve and only two will emit noise at any time. 2 chillers are therefore used in the noise calculations in Appendix IV.

Table 4 – Plant noise data

Plant	L_w in octave bands, dB.								
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	L_{WA} (overall)
Parker Hiross Chillers Model:ICE090/MRI	81	85	88	90	88	83	76	68	92
Air Handling Unit 1 (Flackt Woods bespoke)	59	59	67	62	64	63	61	60	69
Air Handling Unit 2 (Flackt Woods bespoke)	65	57	58	47	43	49	45	43	55
Heat Pump				No octave band data use typical spectrum equal to L_{WA} overall					80
Daikin REYQ16T VRF units (at 85% load)	-	-	-	No octave band data use typical VRF spectrum equal to L_{WA} overall	-	-	-	-	68
Daikin ERQ250AW1 VRF units	-	-	-	No octave band data use typical VRF spectrum equal to L_{WA} overall	-	-	-	-	66

Note: The system for MRI requires that quench pipes are provided in the unlikely event of MRI scanners lose cooling, the liquid helium would vent off as a gas and in that extremely unlikely scenario, the quench pipes would provide a route for the helium to be discharged. Because this would only occur in the unlikely event of failure of cooling to the MRI they are therefore not considered sound emitting plant for the purposes of this assessment. Octave band spectrum typical of this type of VRF units was used in lieu of manufacturer's data. Note VRF units where selected that can run at 85% load to reduce noise level.

6.1.1 Background Noise Levels

The background noise levels have been measured with a 1 m boom extension from a third floor window to the rear of Chenies Mews. The measurement position is considered representative of the residential receptor at the rear of the 69 - 75 Chenies Mews, which are exposed to the same noise sources as the measurement position.

The modal average of the background noise levels measured at night-time during the 7 day survey is shown in **Table 5.** This is used for the assessment of the plant noise at the nearest noise sensitive receptors as it is taken as being representative of typical background noise levels at the nearest residential receptor.

Table 5 – Typical Background Noise Levels for Assessment

Location	Modal Background Noise Level L_{A90} dB
3rd Floor window Chenies Mews (representitive of residential receptor)	48 (23:00-07:00)
3rd Floor window Chenies Mews (representitive of commercial receptor)	50 (07:00-23:00)

LBC require that the plant noise at the nearest noise sensitive will be at least 5 decibels below the background noise level. Based on the typical background noise level shown in table 13 above this results in a plant noise target of **43 dB** LAeq, 5 mins for the residential receptor and **45dB** for the commercial receptor.

6.1.2 Assessment and Mitigation

The predicted total noise level of all the plant operating at the same time is shown in Table 6 below. The value applies to the measured or calculated total combined rating noise level from the proposed plant, at 1m from the closest window of the nearest sensitive properties under free-field conditions.

Table 6 – Unmitigated plant noise

Mechanical Plant Description	Mechanical Plant Noise Level at 1m from the nearest noise sensitive receptor, $L_{Aeq,\ 5\ min}$ dB
	Daytime/Nightime
Initial Mechanical Plant proposed without mitigation	56

NB: The LBC requirement that if the plant is tonal or features any distinct impulses then the requirement will be 10 dB below the background is not considered applicable in this case as the data available does not indicate tonal or impulsive features to the noise emitted by the units.

The plant noise level shown in table 6 above is above the LB Camden Development Policy 28 target of 43dB, by 13dB. Consequently, mitigation of the noise emitted by the proposed plant will be required in order to achieve the LBC target level.

Modelling of the plant noise was undertaken by using CadnaA a computer based 3D modelling software which follows the methodology from ISO 9613. It has shown that the appropriate mitigation for the plant to achieve the LBC target noise level at the nearest noise sensitive receptor is the mitigation required. The receptors are modelled in positions shown in Table 7.

Table 7 – Receptor Positions

Receptor	Horizontal distance to plant roof	Building Height
98 Chenies Mews	11 m	13.5 m
64 Huntley Street	10 m	12.5 m

The modelling shows that the mitigation required to the proposed plant is as shown in Table 8 below.

Table 8 – Plant mitigation

Mechanical Plant Description	Specified Mitigation
2 x Daikin REYQ20T VRF units At 85% Load	None required
2 x Daikin ERQ250AW1	None required
1 x Heat Pump	1.8m to residential side & 1.5 to commercial side
3 x Parker Hiross ICE090/MRI Chiller	Plant Mitigation (Emerson Sound Shell) & Screened (at least 1.8m high to residential side & 1.5m to commercial side)
2 x Flakt Woods Bespoke Air Handling Units	Insulate ductwork from AHU1 For all ductwork > 60dBA

Table 9 below shows the total plant noise once the mitigation outlined as per Table 8 above has been applied.

Table 9 – Mitigated plant noise

Mechanical Plant Description	Mechanical Plant Noise Level at 1m from the nearest noise sensitive receptor, $L_{Aeq,5\,min}$ dB
	Daytime/Nightime

Mechanical Plant Description	Mechanical Plant Noise Level at 1m from the nearest noise sensitive receptor, $L_{Aeq,5\ min}$ dB
Mechanical Plant proposed with mitigation	43 nightime at nearest residential
Mechanical Plant proposed with mitigation	45 daytime at nearest commercial

Table 9 shows that with mitigation by way of screening and silencing of exhausts has been applied the predicted total noise from the plant is 43dB $L_{Aeq,5\ min}$, which is 5dB below the typical $L_{90,\ 5\ min}$ night-time and therefore complies with London Borough of Camden noise policy. Similarly the noise from the plant to the commercial building at 98 Chenies Mews is 45dB which is 5dB below the typical $L_{90,\ 5\ min}$ daytime. Note that the load on the VRF units will likely reduce out of hours when the difference in temperature between inside and outside is normally lower. The calculations are therefore considered "worse case".

6.1.3 Ductwork

Note: that in addition to the above mitigation for the plant, the ductwork itself should be either lined of lagged in areas where it has line of sight to receptors. This is considered only necessary for ductwork associated with Air Handling Unit 1. Ductwork that is only associated with air handling unit 2 will not require mitigation. This is due to the low operating levels of air handling unit 2.

7.0 Conclusion

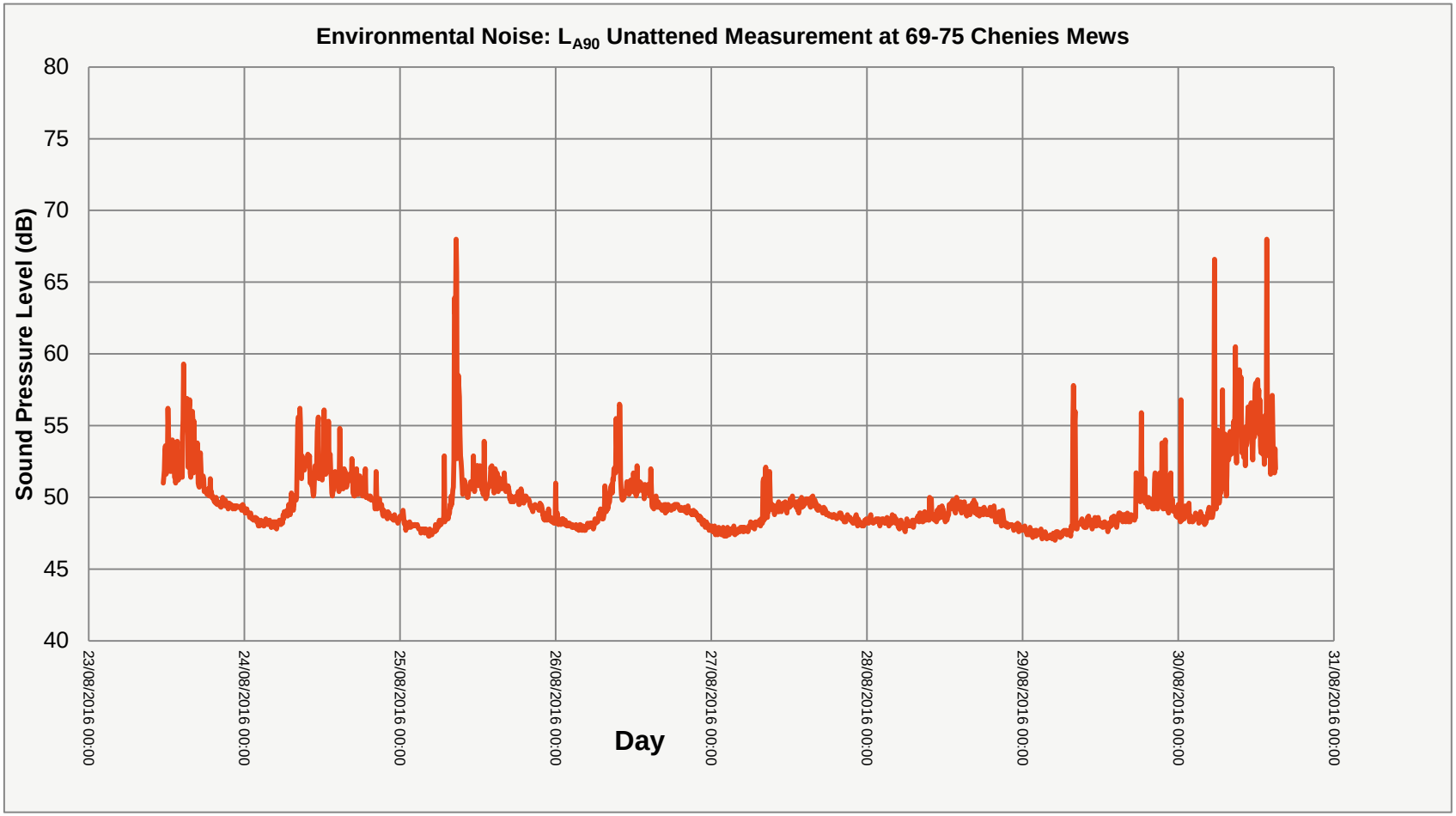
Temple Group Ltd (Temple) has been instructed by Llewelyn Davies to undertake an environmental noise assessment for the proposed rooftop plant associated with new medical equipment at 69-75 Chenies Mews, London WC1E 6HX.

Consequently, Temple undertook unattended noise survey which has been used to assess noise exposure to the development and establish operational limits for plant noise affecting the nearest noise sensitive receptor. This has been assessed in line with the London Borough of Camden's (LBC) policy and relevant national standards and guidance.

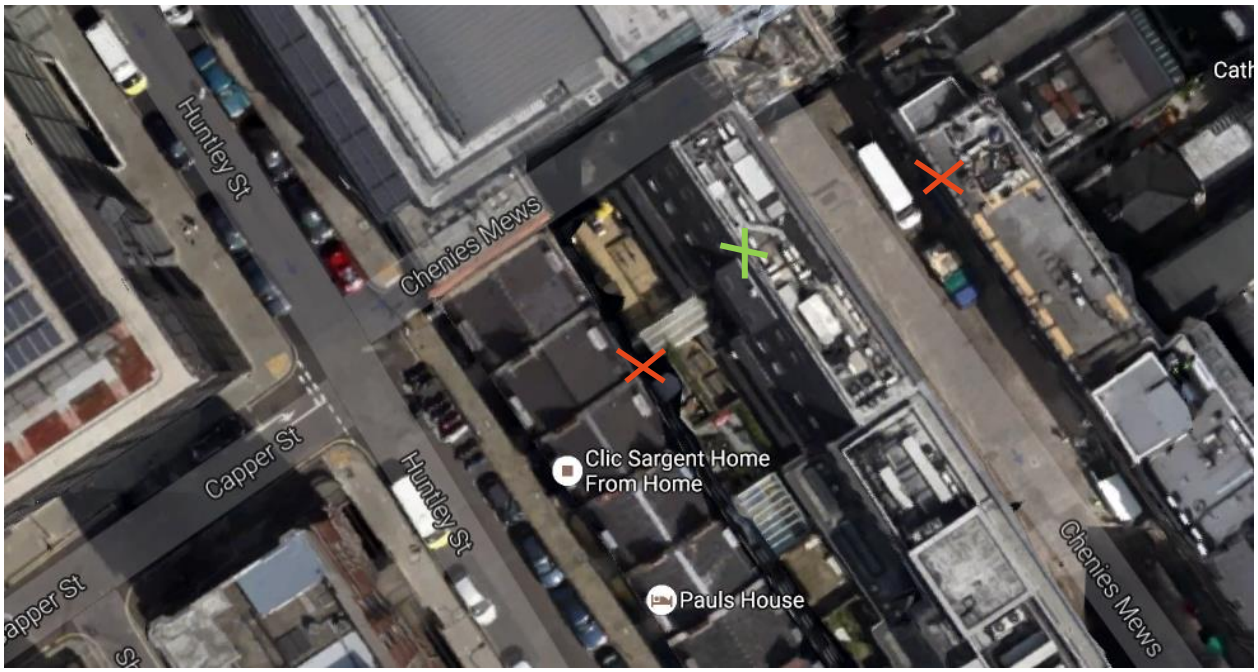
The predicted sound levels from proposed plant at the location of the rear façade of the proposed scheme are below the London Borough of Camden criteria after acoustic enclosure has been applied to the chillers.

Specification of mitigation to include screening 1.8m for chillers and heat pump to the residential side and 1.5m for the Chenies Mews side towards the commercial receptor and as well as a bespoke mitigation (acoustic shell) for the chiller units.

Appendix I – Noise Survey Results

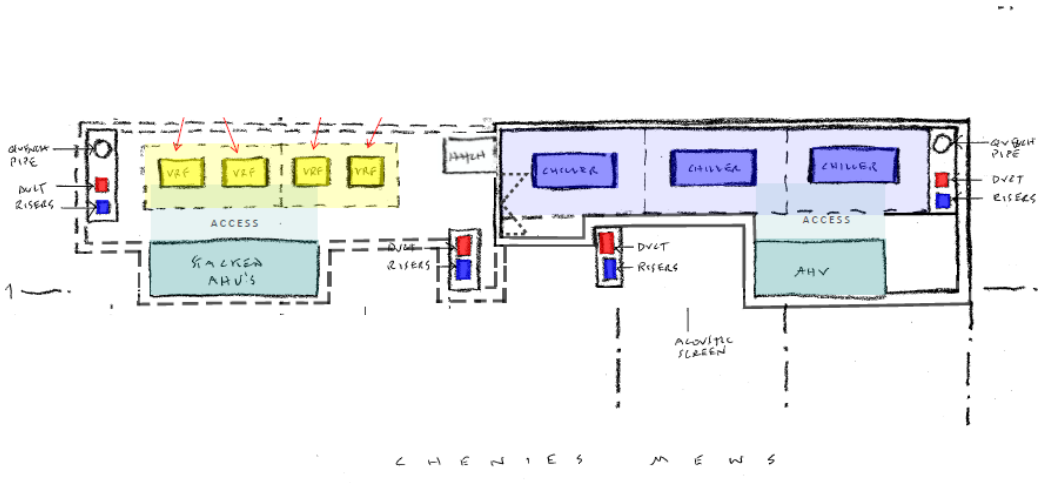


Appendix II - Site Plans



3rd floor measurement position

3rd Floor nearest residential & commercial receptors



Plant layout

Appendix III – Meteorological Conditions

Table 1 – Survey Meterological Conditions[8]

Date	Max Wind Speed (km/h)	Mean Wind Speed (km/h)	Precipitation (mm)	Events
23/09/2016	24	9	0	none
24/09/2016	22	5	0	Fog
25/09/2016	15	7	0	None
26/09/2016	17	8	0	None
27/09/2016	26	9	0	None
28/09/2016	28	15	2	Rain
29/09/2016	15	7	0	None
30/09/2016	20	7	0	None

[8] Historical weather data derived from www.wunderground.com station Warner Street, ID: ILONDON326

Appendix IV – Noise Model Output