Appendix 6: Noise Impact Assessment / Max Fordham LLP

MAX FORDHAM

UOL Town Houses

Noise Impact Assessment

Issue 02 - Draft

July 2024

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ISSUE HISTORY

Issue	Date	Description
01	08/07/2024	Draft
02	11/07/2024	Draft

CONTENTS

1.0 INTRODUCTION

1.1 Overview

Max Fordham LLP Acoustics Team has prepared this noise impact assessment for the proposed refurbishment and extension of the University of London Guildford / Lansdowne (UoL_GL) residential building located in Guildford Street, London Borough of Camden, WC1N 1AS.

Acoustic and noise aspects have been considered and integrated into the design project.

This report adopts the following format:

- **Section 2**: Design criteria on which this assessment is based.
- **Section 3**: Environmental noise survey.
- **Section 4**: Environmental noise impact assessment.
- **Section 5**: Mechanical plant noise emissions.
- **Section 6**: Summary of the main conclusions.

A glossary of acoustic terminology is included in Appendix A for reference.

1.2 Site Context

The site is in the London Borough of Camden, WC1N 1AS, and is composed of the land bounded by:

- Residential buildings (to the north and west)
- Guildford Street (to the south)
- Lansdowne Terrace (to the east)

The main sources of noise are road traffic on Guildford Street and, to a minor extent, road traffic on Lansdowne Terrace. The nearest noise sensitive receivers (NSRs) are residential units located on 88 Guildford Street (NSR1) and Great Ormand Street Hospital for Children GOSHC (NSR2) on Guilford Street, as indicated in Figure 1.1.

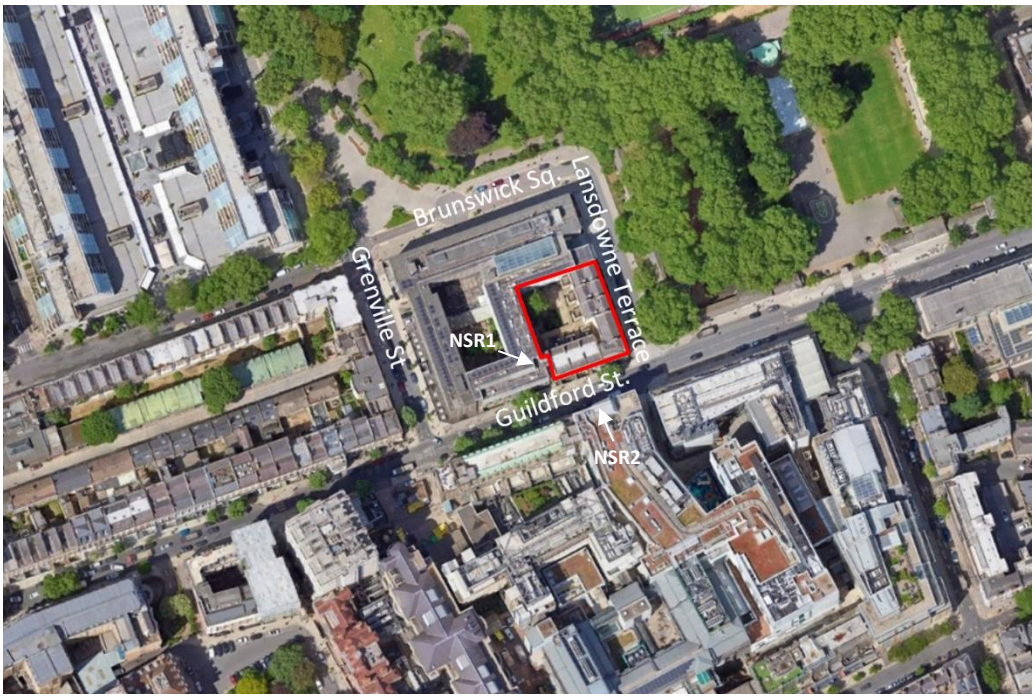

Figure 1.1: Aerial view showing site boundaries (outlined in red) and location of Noise Sensitive Receivers, NSR1 and NSR2.

2.0 DESIGN BASIS

2.1 National Planning Policy and Guidance

National Planning Policy Framework, 2021
Planning Policy Guidance Note 24 (PPG24), which was generally used for overall guidance to planners regarding environmental noise, particularly for residential sites, was replaced in March 2012 by the more general advice given in the National Planning Policy Framework (NPPF).

The NPPF (last update, July 2021) states in paragraph 174e), that planning policies and decisions should contribute to and enhance the natural and local environment by "preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability". Furthermore, it states in paragraphs 185 and 187 that planning policies and decisions should:

- mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life [paragraph 185 a)]
- identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason [paragraph 185 b)]
- be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established [paragraph 187].

Noise Policy Statement for England, 2010
The Noise Policy Statement for England (NPSE) sets out (paragraph 1.6) the long term vision of Government noise policy: "Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development."

NPSE also states: "Excessive noise can have wide-ranging impacts on the quality of human life, health (for example owing to annoyance or sleep disturbance) and use and enjoyment of

+areas of value such as quiet places and areas with high landscape quality."

The NPSE also cites (in the Explanatory Note section) the following three aims:

- First aim of the NPSE: Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- Second aim of the NPSE: Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- Third aim of the NPSE: Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

The NPSE also states (paragraph 2.2) that "examples of noise management can be found in many areas including reducing noise source; the use of the land use and transport planning systems, compensation measures, the statutory nuisance and licensing regimes and other related legislation."

The NPSE (in the Explanatory Note section) also introduces guidance to assist in defining the adverse impacts:

- 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;

- Significant Observed Adverse Effect Level (SOAEL) – the level above which significant adverse effects on health and quality of life occur.

The NPSE acknowledges (paragraph 2.15) that it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations.

Planning Practice Guidance, 2014
The Planning Practice Guidance (2014) (PPG) is a web-based resource (https://www.gov.uk/guidance/noise--2) that replaced previous planning guidance, and supports the National Planning Policy Framework, providing clarity on the practical application of the policy.

The advice (March 2014, latest update July 2019) also includes the use of 'Lowest observed adverse effect level' (LOAEL) and 'Significant observed adverse effect level' (SOAEL) and explores how actions such as a requirement for noise mitigation, or prevention of a development, might be assessed with respect to whether noise levels are considered above these LOAEL and SOAEL thresholds.

The PPG advises that noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. It also acknowledges that neither the NPSE nor the NPPF expects noise to be considered in isolation, separately from the economic, social and other environmental dimensions of the Proposed Development.

The PPG also outlines considerations for local authorities as part of the planning process:

- whether or not a significant adverse effect is occurring or likely to occur;
- whether or not an adverse effect is occurring or likely to occur;
- whether or not a good standard of amenity can be achieved.

2.2 Regional Policy and Guidance

The London Plan 2021
The new London Plan includes Policy D14 Noise, which states that in order to reduce, manage and mitigate noise to improve health and quality of life, residential and other non-aviation development proposals should manage noise by:

1) avoiding significant adverse noise impacts on health and quality of life
2) reflecting the Agent of Change principle as set out in Policy D13 Agent of Change
3) 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 existing noise-generating uses
4) improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity)
5) separating new noise-sensitive development from major noise sources (such as road, rail, air transport and some types of industrial use) through the use of distance, screening, layout, orientation, uses and materials – in preference to sole reliance on sound insulation
6) 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 applying good acoustic design principles
7) promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver.

The Mayor's Ambient Noise Strategy, 2004
The aim of the Mayor's ambient noise strategy (*Sounder City* The Mayor's Ambient Noise Strategy, Greater London Authority 2004) seeks "to minimise the adverse impacts of noise on people living and working in, and visiting London using the best available practices and technology within a sustainable development framework".

One of the three “key issues” identified by the strategy is:

- Reducing noise through better planning and design of new housing.

Other initial priorities include:

- Reducing noise through better planning and design, where London’s growth in people and jobs presents challenges, but redevelopment and refurbishment also offer opportunities – high density, mixed-use development can create quiet outdoor spaces away from traffic.

2.3 London Borough of Camden

The site lies within London Borough of Camden’s (LBC) jurisdiction. LBC have strict noise criteria with regards to developments within their borough that are detailed in Camden Development Policies 2010-2025 Local Development Framework Policy 28 ‘Noise and Vibration’ (Camden DP 28).

Among other issues this document states that where mechanical plant equipment does not exhibit any tonality or impulses, the plant noise should be controlled to 5 dBA below background sound level at noise sensitive receivers (NSR). If plant noise has a distinguishable discrete continuous note (whine, hiss, screech, hum) it should be controlled as not to exceed 10 dB below background noise level at NSR.

2.4 British Standards and Guidance

BS 8233:2014
BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings* provides guidance on sound insulation, indoor ambient noise levels and room acoustics. This standard will apply to the internal noise levels in residential units.

Internal noise levels generated by environmental noise shall not exceed the limits given in Table 2.1. These noise levels shall be achieved under background ventilation conditions, with windows closed.

Location	$L_{Aeq,16hr}$ Daytime (7am – 11pm)	$L_{Aeq,8hr}$ / L_{AFmax} Night Time (11pm – 7am)
Living Room	35dB	-
Dining Room	40dB	-
Bedroom	35dB	30dB / 45dB[1]
NOTE[1]: Not normally exceeded – 90th percentile		

Table 2.1: BS8233 recommended internal noise levels. External noise sources only.

It is also noted in the standard that ‘where a development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5dB and reasonable internal conditions still achieved’.

The standard does not recommend any specific maximum limits for individual noise events but notes that ‘a guideline value may be set in terms of SEL or L_{AFmax}, depending on the character and number of events per night’.

In addition, BS 8233 provides guidance on desirable noise levels in areas that are intended to be used for external residential amenity space (such as gardens and patios). It states it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$, which would be acceptable in noisier environments. However, it also recognises that these guidelines are not achievable in all circumstances

where development might be desirable, such as higher noise areas in cities, where a compromise between elevated noise levels and other factors may be warranted.

BS 4142:2014

BS 4142:2014+A1:2019 "Methods for Rating and Assessing Industrial and Commercial Sound" addresses the likelihood of adverse impact from noise generated by plant equipment. In the standard, a noise rating is determined and compared with the existing local background sound level, and several cumulative acoustic feature corrections to the noise rating are available to apply where appropriate. For example, if the noise includes a distinguishable tone, impulse, intermittency or other readily distinguishable sound characteristic, then additional cumulative penalties individually ranging from 0 to 9 dB may be applied depending on the type of noise.

BS 4142:2014 seeks to determine a "representative" background sound level, stating that "…the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods".

The assessment of the impact depends upon the margin by which the rating level of the specific sound source exceeds the background sound level but also promotes a consideration of the context in which the sound occurs when making an assessment. BS 4142:2014 states that an initial estimate of the impact of the specific sound is made by subtracting the measured background sound level from the rating level, while considering the following points:

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.
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.

Note then, a BS 4142:2014 assessment may deduce a low impact where the specific sound level is approaching the background sound level, and thus may conclude that the specific noise is acceptable.

3.0 ENVIROMENTAL NOISE SURVEY

3.1 Overview

A long term environmental noise survey has been undertaken from Thursday 23/11/2023 at 15:00h to Tuesday 28/11/2023 at 06:00h. A spot measurement was undertaken on the 23rdth November 2023 at 14:00h for 15 min.

Details of the monitoring equipment used in the surveys are given in Appendix B.

Measurement Locations
The location where the long term measurement took place, L1 in Figure 3.1, is directly exposed to traffic noise generated at Guildford St. The equipment has been installed on the boom arm poking out a window in Flat L604, House 6 (which is the top floor flat (4th floor) of House 6). The spot measurement, S1 in Figure 3.1, was undertaken at street level.

Photos of the microphone installation at both locations are included in Appendix B.

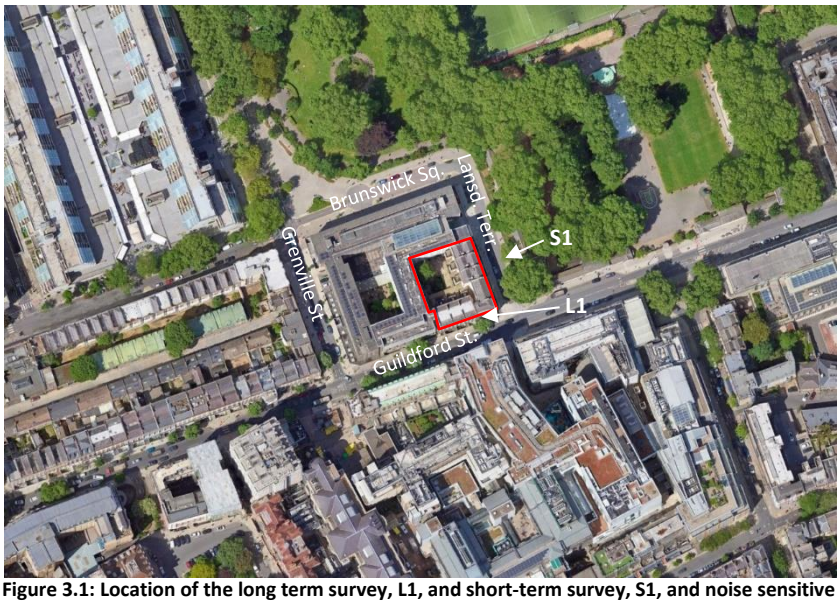

Figure 3.1: Location of the long term survey, L1, and short-term survey, S1, and noise sensitive receivers, NSR1 and NSR2.

Road Traffic Noise
The dominant noise source is traffic on Guildford St. located to the south of the proposed development. Landsdowne Terrace, located on the east boundary carries significantly lower traffic, therefore generating significantly lower noise levels than those generated at Guildford St.

Airplane Noise
The proposed development is located at approximately 10 km to the west of London City Airport and is not directly under the flight path.

London City Airport primarily serves smaller, regional flights and business jets, which tend to be less noisy than larger commercial aircraft. Additionally, the airport has strict noise regulations and operational restrictions, including a curfew between 10:30 PM and 6:30 AM on weekdays, and limited operations on weekends.

Figure 3.2 shows City Airport day time noise contours map. While the proposed development is located outside this map (at approximately a further 6 km to the west) a simple extrapolation allows concluding that day-time airplane noise is expected to be significantly below 50 dB L_{Aeq} at the proposed development. A similar exercise can be undertaken for the night-time period (see Appendix D for night time noise contours), which resulted in predicted levels significantly below 40 dB L_{Aeq} at the proposed development.

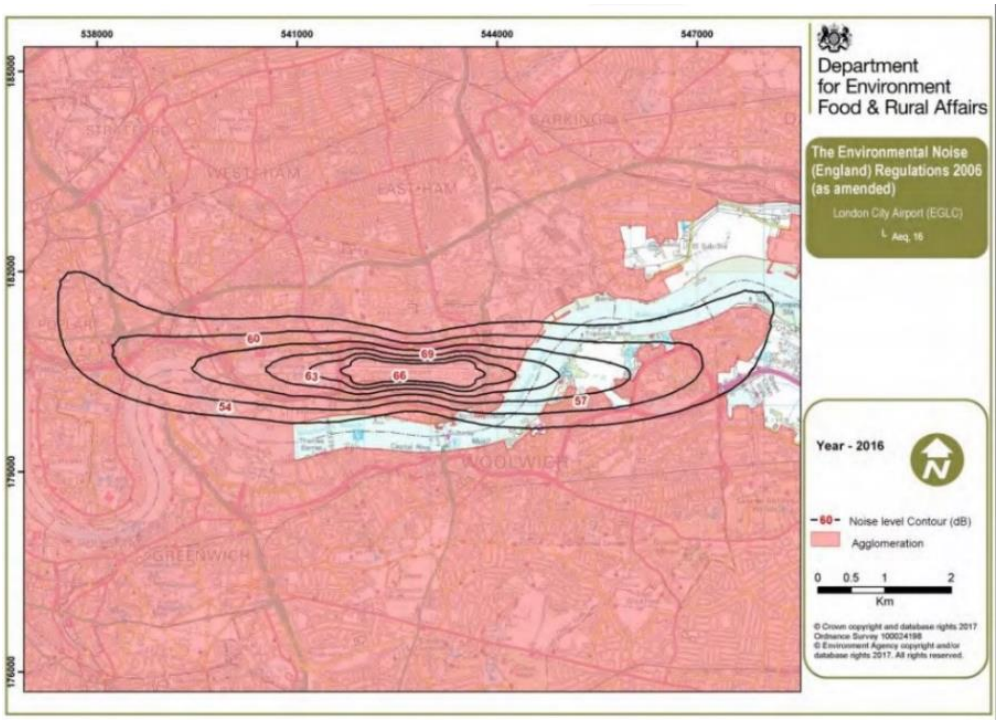

Figure 3.2: Day Time City Airport noise contours map (See Appendix D for night time noise contours map).

3.2 Noise Measurement Results

Figure 3.3 shows the long term survey graph (L1), displaying average (L_{Aeq}), background (L_{A90}) and maximum (L_{AFmax}) noise levels in 15 minutes intervals. Graphs showing histograms of maximum (L_{AFmax}) and background (L_{A90}) noise levels are included in Appendix C.

A summary of the results of the long term noise survey (L1) and of the short term noise survey (S1) is presented in Table 3.1.

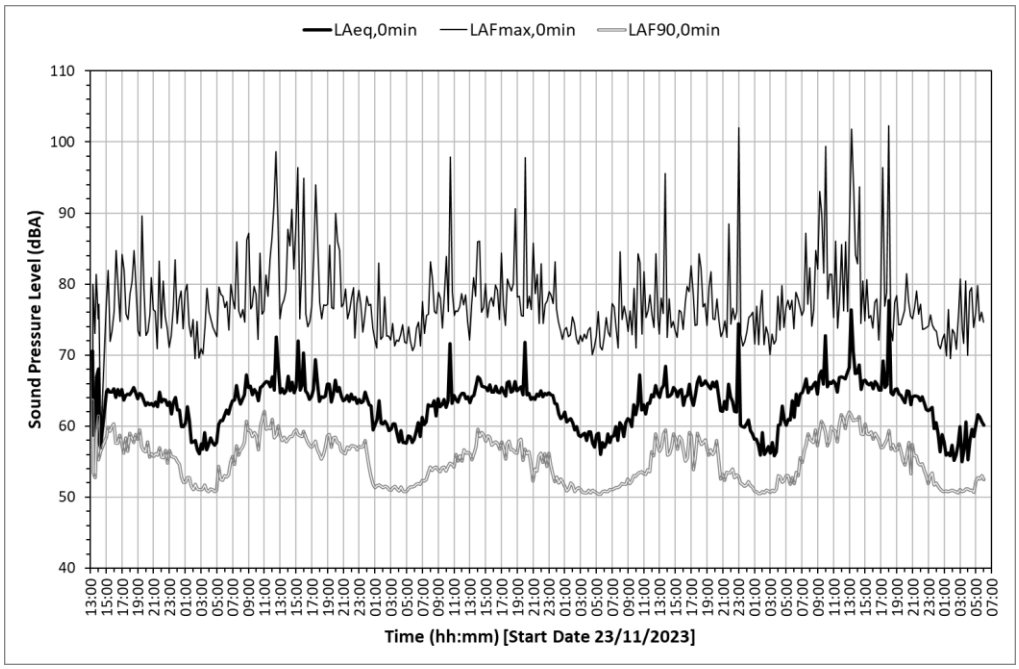

Figure 3.3: Long term survey graph showing measured average (L_{Aeq}), background (L_{A90}) and maximum (L_{AFmax}) noise levels in 15 minutes intervals.
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Measurement Position	Date and Time	Measured LAeq,T, dB	Measured LAF90,T, dB	Measured LAFmax, dB
L1	Day 07:00–23:00 23/11/23 to 28/11/23	66	57	-
	Night 23:00–07:00 23/11/23 to 28/11/23	61	51	77
S1	23/11/23 14:00 LAeq,15min	58	55	-

Table 3.1: Summary of noise survey results: long term survey, L1 and short term survey, S1.

4.0 ENVIRONMENTAL NOISE IMPACT ASSESSMENT

4.1 Noise Level at the Facades

Based on the data collected in the long term survey, L1, and in the short term survey, S1, it is concluded that at its most onerous the buildings' façades should provide an in situ level difference (outside to inside) of up to 34 dB to meet BS 8233:2014 recommended indoor ambient noise level limits in bedrooms and living rooms (Table 2.1).

If follows that to meet the proposed internal noise levels targets, glazing with a sound reduction index of up to 32 dB R_w+C_{tr} (laboratory performance) is required on the development facades exposed to Guildford Street and Lansdowne Terrace.

Although the current single glazing sash windows are not capable of achieving 32 dB Rw+Ctr a double-glazing system, such as 6mm laminated glazing / 6mm gap / 4mm glazing, would be capable of meeting this performance.

For facades exposed to the internal courtyard an in situ level difference (outside to inside) of up to 20 dB is required, which can be achieved with practically any double glazing system, such as 4mm glazing / 6mm gap / 4mm glazing.

As the (existing and proposed new built) non-glazed elements of the façade will have wall build-ups with a sound reduction index that is at least 10 dB higher than the performance of the (proposed) upgraded glazing elements it follows that the facade sound insulation performance is predominantly determined by the sound insulation performance of the glazing elements.

4.2 External Amenity Spaces

Based on the long term noise survey data and City Airport noise data the noise levels predicted at the external amenity spaces, located in the internal courtyard, are not expected to exceed 50 dB $L_{Aeq,T}$, meeting the targets indicated in section 2.4.

5.0 MECHANICAL PLANT NOISE

5.1 Mechanical Plant Noise targets

Camden Development Policies 2010-2025 Local Development Framework Policy 28 'Noise and Vibration' (Camden DP 28)) states that plant noise rating Level (L_{Ar}) should be at least 10 dB(A) below the background level L_{A90} at the noise sensitive receiver, NSR, if plant noise has a distinguishable discrete continuous note (whine, hiss, screech, hum) (see also section 2.4). This is conservatively assumed to be the case and the representative local background noise levels and maximum plant noise levels at NSR are presented in Table 5.1.

	Daytime 07:00 – 23:00	Night-time 23:00 – 07:00
Representative background sound level (dB, $L_{A90,15min}$)	57	51
Maximum plant noise levels at NSR (dB,$L_{Ar,15min}$)	47	41

Table 5.1: Representative background noise levels and proposed targets for plant noise at NSR, 10 dB below background, which assumes a worst case situation of a distinguishable discrete continuous note in the plant equipment noise.

5.2 Mechanical Plant Equipment

The equipment planned to be installed consist of Mitsubishi WM85VAA ASHP units, which generates 45 dB LAeq at 1m (see Appendix D). The proposed locations of the ASHP, on the roof of the proposed new top floor, are indicated in Figure 5.1.

Figure 5.1: Proposed location of the 8 no. ASHP on the roof of the (proposed) new built top floor. Locations of NSR1 and NSR2 are also indicated.

5.3 Noise Impact Assessment

The minimum distance between any of the proposed locations for the ASHPs and NSRs is 12m for NSR1 and 21m for NSR2. Assuming a worst case situation where all the 8 no. ASHP would be located at the minimum distances (12m from NSR1 and 21m from NSR2) the resulting noise levels are as shown in Table 5.2.

	NSR1	NSR2
Noise level generated by all 8 no. ASHP unit at NSR (dB,$L_{Aeq,15min}$)	32	28
Maximum plant noise levels at NSR (dB,$L_{Aeq,15min}$)	47	41

Figure 5.2: Predicted noise levels at NSR1 and NSR2 conservatively assuming that all units are at the minimum distance to the NSRs. It is also conservatively assumed that plant noise has a distinguishable discrete continuous note (resullting in targets 10 dB below background noise levels).

It is concluded that there is no need for noise control measures as the noise levels produced by plant equipment are significantly below the maximum noise levels stipulated by LBC.

6.0 SUMMARY

Overview

- Max Fordham LLP has prepared a noise impact assessment for the proposed refurbishment and extension of the University of London Guildford / Lansdowne (UoL_GL) residential building located in Guildford Street, London Borough of Camden, WC1N 1AS.

Design Basis

- Plant noise emissions targets have been set based on the requirements of the London Borough of Camden (LBC), namely Camden Development Policies 2010-2025 Local Development Framework Policy 28 'Noise and Vibration'.
- Maximum noise levels at noise sensitive receivers (NSRs), as generated by plant equipment, shall not exceed 10 dB below lowest background noise levels (assuming tonal plant equipment noise).
- The targets for internal noise levels were established based on guidance from LBC:
    - Bedrooms (23.00-07.00) - 30 dB LAeq (8hour) and 45 dB LAmax
    - Living Rooms (07.00-23.00) - 35 dB LAeq (16hour)
- These targets are to be met under background ventilation conditions as defined in Building Regulations Approved Document F1 'Ventilation'.

Noise Survey

- A long term noise survey has been undertaken on the top floor of International House facing Guildford Street.
- The results of the noise survey permitted establishing average and background noise levels during day-time and nigh-time periods as well as maximum noise levels during night time period.
- These are used to establish:
    - maximum noise levels from plant equipment at NSRs.
    - façade performance required to meet internal noise level targets.

Noise Sensitive Receivers (NSR)

- The nearest NSRs are i) the residential units located adjacent to the proposed development, on 88 Guildford Street, NSR1, and ii) the Great Ormond Street Hospital for Children located opposite the proposed development, also on Guildford Street, NSR2.

Plant Equipment

- 8 no. ASHP are proposed to be installed on the roof of the proposed new built top floor.
- The maximum noise levels allowed to be generated by the plant equipment at the Noise Sensitive Receivers, NSR1, and NSR2, have been defined.

Noise Impact Assessment from Plant Equipment

- Considering the location and noise level emissions of the 8 no. ASHP planned to be installed on the roof of the proposed new floor it is concluded that no noise control measures are required to be implemented to meet LBC targets at NSR1 and NSR2.

Façade Performance

- Glazing units with a sound reduction index of up to 32 Rw+Ctr are required to meet internal noise levels on the facades exposed to Guildford Street and Landsdowne Terrace. This can be achieved with, for example, 6mm laminated glazing / 6mm gap / 4mm glazing.
- For facades exposed to the internal courtyard glazing units with a sound reduction index of up to 20 20 Rw+Ctr are required. This can be achieved with practically any double glazing system, such as 4mm glazing / 6mm gap / 4mm glazing.

APPENDIX A - GLOSSARY

SOUND PRESSURE LEVEL (SPL), L (dB)
The sound level measured on a logarithmic scale, with unit decibel dB. A free-field SPL refers to a level determined far enough from surfaces or facades, apart from the ground, so as not to be influenced by reflections from those surfaces.

A-WEIGHTED SOUND PRESSURE LEVEL, L_A (dBA)
A-weighted sound pressure level values are frequency-weighted in a way that approximates the frequency response of the human ear and allows sound levels to be expressed as a single figure value.

EQUIVALENT CONTINUOUS A-WEIGHTED SPL, $L_{Aeq,T}$ (dBA)
Energy average of the A-weighted sound pressure level over a time period, T. The level of a notional continuous sound that would deliver the same A-weighted sound energy as the actual fluctuating sound over the course of the defined time period, T.

MAXIMUM A-WEIGHTED SPL, L_{AFMax} (dBA)
Maximum A-weighted sound pressure level measured with fast time weighting.

10% NOISE LEVEL, $L_{AF10,T}$ (dBA)
The A-weighted sound pressure level exceeded for 10% of a given time period T. The 'F' subscript indicates the meter used a standard 'fast' time constant of 1/8th of a second.

BACKGROUND NOISE LEVEL, $L_{AF90,T}$
The A-weighted sound pressure level exceeded for 90% of a given time period, T. The 'F' subscript indicates the meter used a standard 'fast' time constant of 1/8th of a second.

Lday
The A-weighted equivalent sound pressure level over the 16-hour day period of 07:00 – 23:00 hours. Can also be expressed as LAeq,16hr(7am-11pm).

Lnight
The A-weighted equivalent sound pressure level over the 8-hour night period of 23:00 – 07:00 hours. Can also be expressed as LAeq,8hr(11pm-7am).

BS 8233
British Standard 8233 (2014): "Sound insulation and noise reduction for buildings – Code of practice" (ISBN 0 580 33009 5)

BS 4142
British Standard 4142 (2014): "Method for rating industrial noise affecting mixed residential and industrial areas" (ISBN 0 580 28300 3)

APPENDIX B - NOISE SURVEY EQUIPMENT

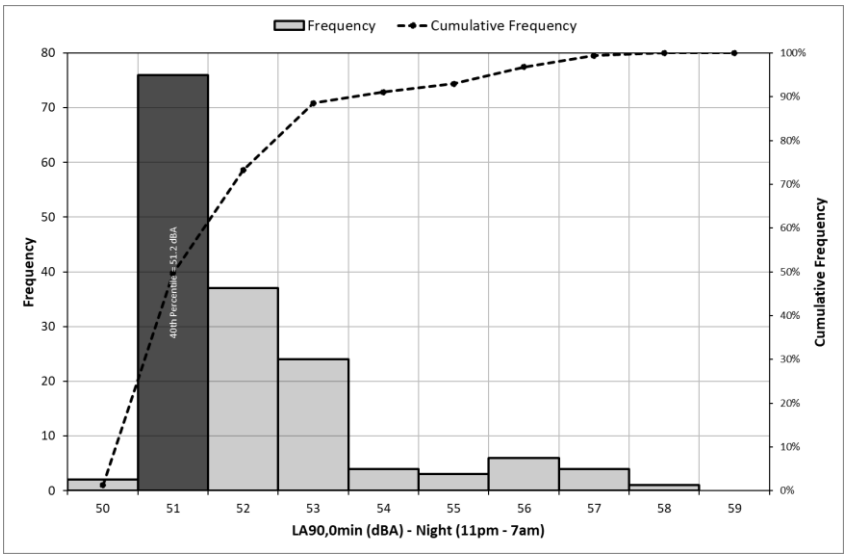
The measurements were undertaken with 1 no. Norsonic 140 precision sound level analyser. This equipment complies with BS EN IEC 61672 class 1. Suitable Norsonic weather protection kits were used. These sound level meters use Nor 1225 free-field response microphones with NOR 1209 (Norsonic 140) microphone pre-amplifiers. The calibration of the sound level meters was checked at the beginning and end of measurements with Nor 1251 sound calibrators, complying with BS EN IEC 60942 class 1. No significant calibration deviation occurred. Further details are available on request, including the calibration certificate for the equipment used.

Item	Make	Type	Serial no.
Class 1 sound level meter	Norsonic	140	1405942
Microphone	Norsonic	1225	208215
Microphone preamplifier	Norsonic	1209	15804
Calibrator	Norsonic	1251	34059

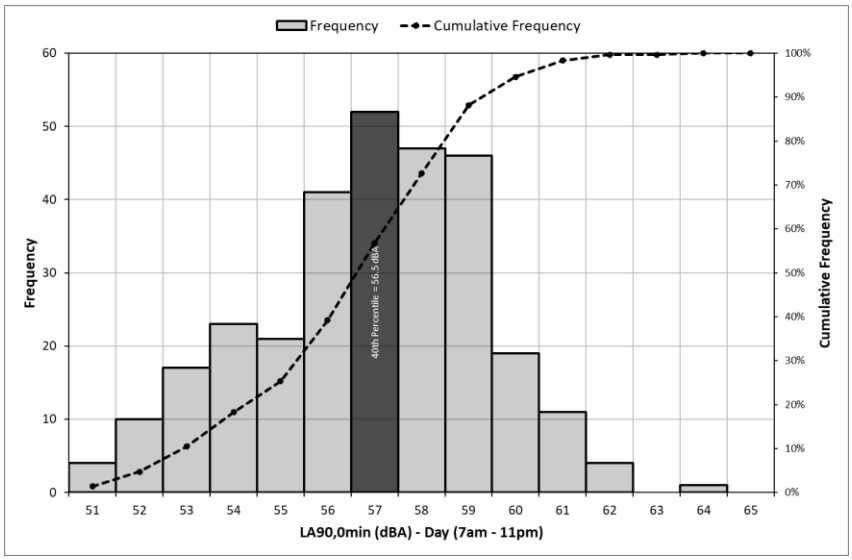
Figure B.1: Microphone installation in long term survey (L1) – see also Figure 3.1.

Figure B.2: Microphone installation in short terms survey (S1) – see also Figure 3.1.

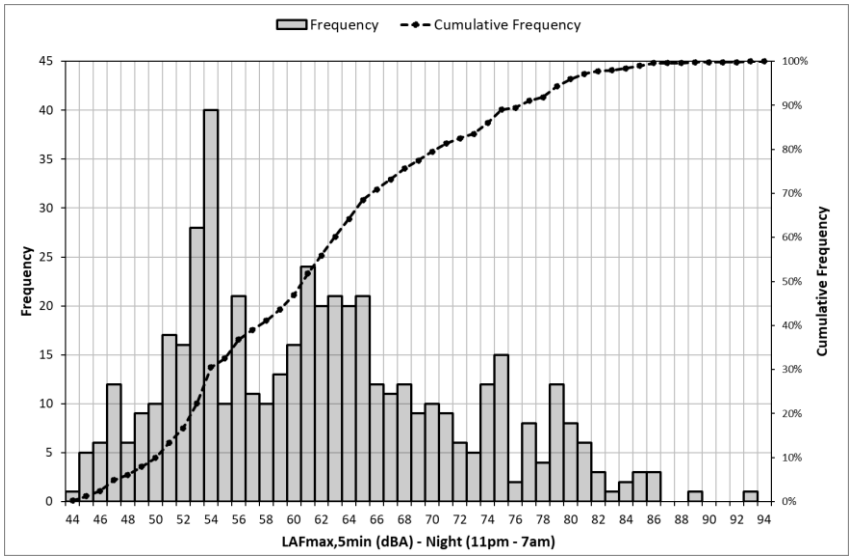
APPENDIX C - NOISE MEASUREMENTS HISTOGRAMS



Night-Time measured Background Noise Levels

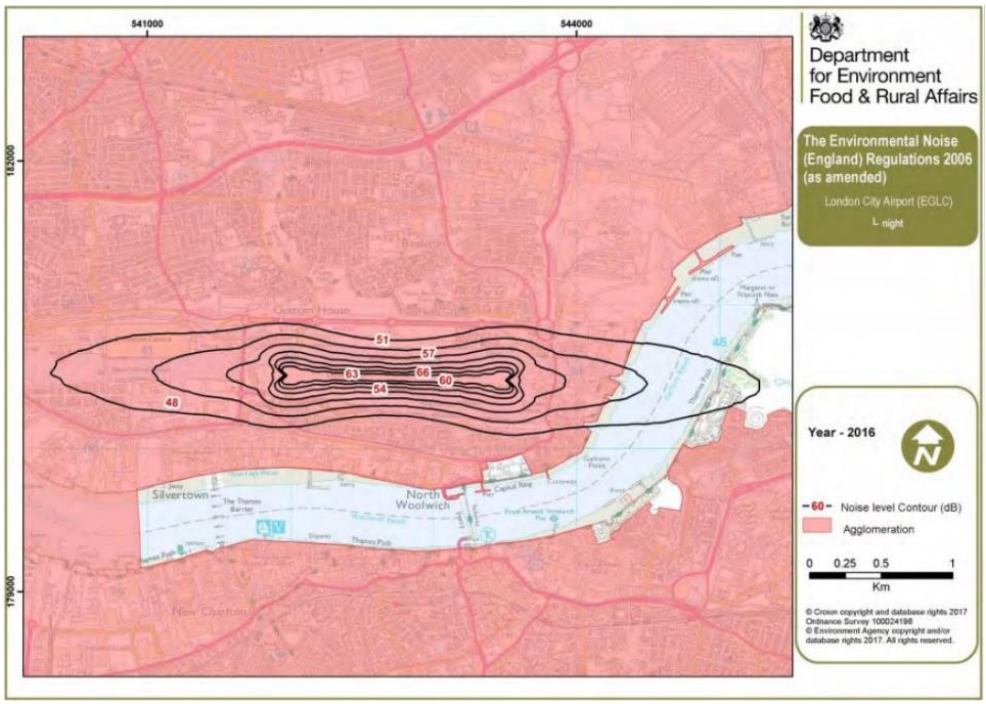


Day-Time measured Background Noise Levels



Night-Time measured Maximum Noise Levels

APPENDIX D - CITY AIRPORT NOISE CONTOURS



Night time City Airport noise contours map.

APPENDIX E - MECHANICAL EQUIPMENT

Air Source heat Pump

OUTDOOR UNIT		PUZ-WM85VAA(-BS)
HEAT PUMP SPACE HEATER - 55°C	ErP Rating	A++
	η_s	139%
	SCOP (MCS)	3.48
HEAT PUMP SPACE HEATER - 35°C	ErP Rating	A+++
	η_s	193%
	SCOP (MCS)	4.84
HEAT PUMP COMBINATION HEATER - Large Profile*1	ErP Rating	A+
	η_{wh}	145%
HEATING*2 (A-7/W35)	Capacity (kW)	8.5
	Power Input (kW)	3.27
	COP	2.60
OPERATING AMBIENT TEMPERATURE (°C DB)		-20 ~ +35
SOUND DATA*3	Pressure Level at 1m (dBA)	45
	Power Level (dBA)*4	58
WATER DATA	Pipework Size (mm)	28
	Flow Rate (l/min)	24
	Water Pressure Drop (kPa)	15.0
DIMENSIONS (mm)	Width	1050
	Depth	480
	Height	1020
WEIGHT (kg)		98
ELECTRICAL DATA	Electrical Supply	220-240v, 50Hz
	Phase	Single
	Nominal Running Current [MAX] (A)*5	9.1 [22]
	Fuse Rating - MCB Sizes (A)*6	25
REFRIGERANT CHARGE (kg) / CO_2 EQUIVALENT (t)	R32 (GWP 675)	2.2 / 1.49