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NOISE EXPOSURE ASSESSMENT

Report **16202-NEA-01**

Prepared on 20 October 2020

Issued For

Sentware Ltd

Executive Summary

This noise exposure assessment has been undertaken so appropriate external building fabric elements can be specified in order to meet appropriate internal noise criteria at 1 Parson Street, Hendon, London NW4 1QD.

The assessment adheres to the Local Authority requirements, the principles provided by the *National Planning Policy Framework*: 2019 (NPPF) and internal noise criteria stated within BS 8233: 2014 *'Guidance on sound insulation and noise reduction for buildings'*.

The site currently comprises a cluster of existing buildings forming an 'L' shape between Parson Street and Florence Street. Proposals include the demolition of existing buildings and construction of a new residential block.

A noise survey has been undertaken as detailed in the report, in order to establish the prevailing environmental noise levels at the site.

A subsequent detailed analysis has been carried out of road traffic and existing commercial noise intrusion through the external building fabric. Sound insulation performance specifications have been proposed for glazing systems and trickle ventilators.

The assessment has demonstrated that appropriate internal noise levels should be achievable with the installation of nominal and high performing glazing systems and typical and acoustic trickle ventilators on different facades of the proposed residential building.

It is essential that certificated performances should be sought from the manufacturers of the proposed glazing systems and trickle ventilators.

This report is designed to be suitable to discharge typical noise planning conditions, as per our original scope of work. The report should not be relied upon for further reasons, such as the detailed design of mitigation measures.

Clement Acoustics has used all reasonable skill and professional judgement when preparing this report. The report relies on the information as provided to us at the time of writing and the assumptions as made in our assessment. This report contains confidential information and should not be disclosed to third parties.

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16202-SP1 & SP2	Indicative Site Plans
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Document Revision	Date of Revision	Reasons for Revision	Revision By
0	20/10/2020	First Issue	Duncan Martin MIOA

1.0 INTRODUCTION

Clement Acoustics has been commissioned by Sentware Ltd to assess the suitability of the site at 1 Parson Street, Hendon, London NW4 1QD for residential development.

Proposals are to demolish an existing cluster of buildings, to allow for construction of a new residential building with some office use also created.

This report presents the results of environmental noise surveys undertaken in order to measure prevailing background levels and details the proposed internal noise level criteria.

Full details of necessary mitigation measures in order to meet the proposed criteria are also provided.

2.0 SITE DESCRIPTION

The proposed development site currently comprises a cluster of buildings including a workshop, car garage and a single residential flat , with plans to construct a new development of residential flats and mews houses, with office accommodation created at ground and first floors.

The site is in a mixed residential and commercial area facing on to Parson Street, a street largely populated by commercial buildings and residential houses and flats. The site is bound by Parson Street to the east, Florence Street to the north and existing residential buildings to the south and west.

At the time of the survey, the background noise climate was dominated by road traffic noise from Parson Street, with occasional contribution from existing commercial premises, such as a nearby tyre shop.

3.0 ARCHITECTURAL ASSUMPTIONS

3.1 Drawings

The following drawings have been used in our assessment:

- Drawing PARST-L101: Location Plans
- Drawing PARST-E101: Parson Street Elevation
- Drawing PARST-E102: Rear Elevation
- Drawing PARST-P102: Typical Residential Floor Plan (1st Floor)

3.2 Room Volume and Window Dimensions

Based on the above drawings we have based our calculations on the following worst-case bedroom and window dimensions:

- Bedroom Volume: 29 m^3
- Bedroom Window Area: 2.2 m^2

3.3 Room Finishes

Our assessment assumes that bedrooms and living rooms will contain typical amounts of soft furnishings, including sofas, chairs, beds and curtains.

4.0 CRITERIA

4.1 Local Authority Requirements

It is understood that the following guidance has been advised by the London Borough of Barnet:

"The applicant is advised to engage a qualified acoustic consultant to advise on the scheme, including the specifications of any materials, construction, fittings and equipment necessary to achieve satisfactory internal noise levels in this location.

In addition to the noise control measures and details, the scheme needs to clearly set out the target noise levels for the habitable rooms, including for bedrooms at night, and the levels that the sound insulation scheme would achieve. The Council's Sustainable Design and Construction Supplementary Planning Document requires that dwellings are designed and built to insulate against external noise so that the internal noise level in rooms does not exceed 30dB(A) expressed as an Leq between the

hours of 11.00pm and 7.00am, nor 35dB(A) expressed as an Leq between the hours of 7.00am and 11.00pm (Guidelines for Community Noise, WHO). This needs to be considered in the context of room ventilation requirements."

4.2 National Planning Policy Framework: 2019 (NPPF)

The NPPF, which was first published in 2012 with the latest revision in 2019, outlines the Government's environmental, economic and social policies for England. The NPPF aims to enable local authorities to produce their own distinctive local and neighbourhood plans, which should be applied in order to meet the needs and priorities of their communities.

Paragraph 180 of The *Ground Conditions and Pollution* section of the NPPF relates specifically to noise stating that:

'Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should: a) 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; b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason…'

4.3 BS 8233: 2014 Internal Noise Criteria

BS 8233: 2014: '*Guidance on sound insulation and noise reduction for buildings*' describes recommended acceptable internal noise levels for residential spaces during daytime and night-time hours. These levels are shown in Table 4.1.

Activity	Location	Design range $L_{eq,T}$ Daytime (07:00-23:00)	Night-time (23:00-07:00)
Resting	Living Room	35 dB(A)	-
Dining	Dining Room/Area	40 dB(A)	-
Sleeping	Bedroom	35 dB(A)	30 dB(A)

Table 4.1: BS 8233: 2014 recommended internal background noise levels

4.4 World Health Organisation Guidelines

The World Health Organisation (WHO) document on *'Guidelines for Community Noise'* 1999 states the internal noise level guidelines as summarised in Table 4.2.

Specific Environment	Critical Health Effects	$L_{eq,T}$	$L_{max,F}$
Dwelling, Indoors	Speech Intelligibility and moderate annoyance, daytime and evening	35 dB(A)	-
Inside Bedrooms	Sleep disturbance, night-time	30 dB(A)	45 dB(A)

Table 4.2: WHO Internal noise level guidelines

The document also states *'For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dBA LAmax more than 10-15 times per night, (Vallet & Varnet 1991).'*

4.5 Proposed Noise Level Criteria

On the basis of Sections 4.1 to 4.4 above, Table 4.3 presents our proposed minimum design targets to be achieved in the worst affected dwellings.

Location	Period	Design Target	
		$L_{eq,T}$	$L_{max,F}$
Living Rooms	Daytime (07:00-23:00 hours)	35 dB(A)	-
Bedrooms	Night-time (23:00-07:00 hours)	30 dB(A)	45 dB(A)*

Table 4.3: Proposed noise level criteria

***Please note that this is not an absolute limit, however, $L_{max,F}$ 45 dB(A) should not be regularly exceeded.**

The external building fabric would need to be carefully designed to achieve these recommended internal levels.

4.6 Guidance on Ventilation

Guidance on ventilation and associated acoustic considerations is given in Acoustic Ventilation and Overheating – Residential Design Guide [AVO] issued jointly by the Association of Noise Consultants and the Institute of Acoustics.

In this guide, the need for ventilation (as falls under the requirements of Approved Document F [ADF]) is covered in three main requirements as follows:

- Whole Dwelling Ventilation
    - General ventilation – continuous ventilation of rooms or spaces at a relatively low rate.
- Extract Ventilation
    - Removal of air from a space or spaces (typically stale air from bathrooms or kitchens) to outside.
- Purge Ventilation
    - Manually controlled removal of air at a high rate to eliminate fumes and odours, e.g. during painting and decorating or from burnt food. May be provided by natural or mechanical means.

Four main template systems for providing each of the above ADF ventilation requirements are summarised in the AVO guide as shown in Table 4.4.

Ventilation System	Method of Whole Dwelling Ventilation	Method of Extract Ventilation	Method of Purge Ventlilation
System 1 [*Background ventilators and intermittent extract fans*]	Background ventilators (trickle vents)	Intermittent extract fans	Typically provided by opening windows
System 2 [*Passive Stack*]	Background ventilators (trickle vents) & passive stack	Continuous via passive stack	Typically provided by opening windows
System 3 [*Continuous Mechanical Extract (MEV)*]	Continuous mechanical extract (low rate), trickle vents provide fresh air	Continuous mechanical extract (high rate), trickle vents provide fresh air	Typically provided by opening windows
System 4 [*Continuously mechanical supply and extract with heat recovery (MVHR)*]	Continuous mechanical supply and extract (low rate)	Continuous mechanical supply and extract (high rate)	Typically provided by opening windows

Table 4.4: Summary of template systems for ADF ventilation requirements

Where possible, natural forms of ventilation are typically preferred. However, in high noise areas, it may be necessary to recommend System 4, in order to minimise penetrations through the external building façade, which weaken the overall sound reduction performance.

Ventilation requirements will be assessed with consideration to the above systems.

5.0 ENVIRONMENTAL NOISE SURVEY

5.1 Unattended Noise Survey Procedure

Measurements were undertaken at one position as shown on indicative site drawing 16202-SP1. The choice of this positions was based both on accessibility and on collecting representative noise data in relation to the identified significant noise sources.

The surroundings and position used for the monitoring location are described in Table 5.1.

Position No.	Description
1	The microphone was mounted on a 1st storey flat roof at the rear of the building. The microphone was mounted on a tripod. [1]

Table 5.1: Description of unattended monitoring locations

Note [1]: The position was considered to be free-field according to guidance found in BS 8233: 2014, and a correction for reflections has therefore not been applied.

Continuous automated monitoring was undertaken for the duration of the survey between 12:45 on 6 October 2020 and 09:45 on 9 October 2020.

The measurement procedure generally complied with BS 7445: 1991: '*Description and measurement of environmental noise, Part 2- Acquisition of data pertinent to land use*'.

5.2 Attended Noise Survey Procedure

Attended noise measurements were undertaken on 12 October 2020 between 11:30 and 12:30 to provide further understanding of the prevailing noise environment close to Parson Street.

Sound level meters were mounted on a tripods under free-field conditions at the locations described in Table 5.2.

Position No.	Description
1	The microphone was mounted on a 1st storey flat roof at the rear of the building. The microphone was mounted on a tripod.
2	The microphone was mounted at street level adjacent to Parson Street. The microphone was mounted on a tripod.

Table 5.2: Description of attended monitoring locations

The locations of the measurement positions are shown on attached site plan 16202-SP1. Position 1 was chosen to ensure levels adjacent to the road could be compared with the concurrent levels measured at the unattended survey position.

5.3 Weather Conditions

At the time of set-up of the monitoring equipment and during the attended measurements, the weather conditions were generally dry with light winds. On Friday 9 October, there was observed to be precipitation.

Weather conditions during the survey period have been obtained from the internet resource www.wunderground.com, which identified Heathrow Airport as the nearest weather station. Wunderground.com indicates the remainder of the survey conditions were generally dry with light to moderate wind speeds.

It is considered that the weather conditions did not significantly adversely affect the measurements and are therefore considered suitable for the measurement of environmental noise.

5.4 Equipment

The equipment calibration was verified, by means of a field verification check, before and after use and no abnormalities were observed.

The equipment used was as follows.

- 1 No. Svantek Type 957 Class 1 Sound Level Meter
- 1 No. Svantek Type 958 Class 1 Sound Level Meter
- 1 No. Norsonic Nor 145 Class 1 Sound Level Meter
- Svantek Type SV33B Class 1 Calibrator

6.0 RESULTS

6.1 Unattended Noise Survey

The $L_{Aeq:\ 5min}$, and $L_{Amax:\ 5min}$ acoustic parameters were measured throughout the duration of the unattended survey.

Measured levels are shown as a time history in Figure 16202-TH1. A summary of the measured noise levels are presented in Table 6.1.

Period	Ambient Noise Level $L_{eq,T}$	Typical Maximum Noise Level $L_{Fmax,\ 5min}$
	POSITION 1	
Daytime [07:00 - 23:00]	54 dB(A)	-
Night-time [23:00 - 07:00]	47 dB(A)	62 dB(A)

Table 6.1: Site noise levels for daytime and night time

6.2 Attended Noise Survey

Attended surveys were undertaken at the side of Parson Street and at the unattended survey position, in order to establish representative noise levels at the noisiest part of the development.

Monitoring Position	Measured Ambient noise level $L_{Aeq,T}$	Measured Maximum Noise Level $L_{AMax,F}$
Position 1	53.3 dB(A)	67.7 dB(A)
Position 2	72.7 dB(A)	85.7 dB(A)

Table 6.2: Difference in noise levels between monitoring positions

Based on the levels measured simultaneously at the two positions, the identified increases required to measured data at the rear of the site to assess roadside noise levels are as follows:

- Increase to ambient noise levels: 19 dB
- Increase to maximum noise levels: 18 dB

During the attended measurements, it was noted that there was a high volume of traffic and nearby commercial uses were observed to be operating. This indicates that measured levels are representative of typically worst-case noise levels.

The levels presented above are as expected considering the site location on a busy road with existing commercial uses. Provided adequate mitigation measures are put in place during the design and construction phase of the development, recommended internal noise levels can be achieved. Outline mitigation measures are described in Section 7 of this report.

Maximum noise levels shown in Table 6.1 are deemed to be 'not regularly exceeded' as required for maximum internal noise level specification purposes.

7.0 NOISE EXPOSURE ASSESSMENT

7.1 External Building Fabric - Non Glazed Elements

It is currently assumed that the non-glazed external building fabric elements of the proposed development would be comprised of masonry cladding systems. This would contribute towards a significant reduction of ambient noise levels in combination with a good quality window configuration, as shown in Section 7.2.

All non-glazed elements of the building facades should be designed to provide a sound reduction performance of at least the figures shown in Table 7.1 when tested in accordance with BS EN ISO 140-3: 1995.

Element	Octave band centre frequency SRI, dB					
	125	250	500	1k	2k	4k
Non glazed element SRI	41	43	48	50	55	55

Table 7.1: Minimum required sound reduction performance from non-glazed elements

7.2 External Building Fabric - Specification of Glazed Units

Sound reduction performance calculations have been undertaken in order to specify the minimum performance required from glazed elements in order to achieve recommended internal noise levels shown in Table 4.3. This specification therefore presents the most robust assessment, for BS 8233: 2014 criteria for internal noise levels in a bedroom at all affected facades.

The minimum sound reduction index (SRI) value required for all glazed elements to be installed is shown in Table 7.2. **The performance is specified for the whole window unit, including the frame and other design features.**

Type	Façade	Minimum Sound Reduction Index (dB) at Octave Band Centre Frequency (Hz)					
		125	250	500	1k	2k	4k
A	Road Facing	26	27	34	40	38	46
B	Rear Facades	24	20	25	34	37	35

Table 7.2: Required glazing performance

Where non-vision spandrel panels are proposed, they should provide sound reduction performance at least equal to that required of the glazing in order to maintain the acoustic integrity of the external building fabric.

The attached site plan indicates 16202-SP2 indicates the location of the proposed glazing types.

It is essential that prospective cladding system suppliers can demonstrate compliance with the acoustic performance detailed in our specification rather than simply offering a generic glazing configuration. The complete cladding system should achieve the performance requirements stated in Table 7.2 when tested in accordance with BS EN 10140-2: 2010.

It is essential that the performance presented in Table 8.2 is met. However, the following typical configurations would be expected to meet the required levels of sound insulation.

- Type A: R_w 38 dB Glazing, 10 mm glass / 12 mm air / 6 mm glass
- Type B: R_w 31 dB Glazing, 4 mm glass / 12 mm air / 4 mm glass

N.B. Type B is a nominal glazing configuration; however, Type A is a high performance glazing system

Please note that the above guidance only considers acoustic performance. Other disciplines, which consider thermal, safety, durability etc. should be consulted to ensure suitability.

7.3 External Building Fabric - Specification of Trickle Ventilators

It is understood the proposal on this site it to use System 1 ventilation as summarised in Table 4.4.

In order to comply with Building Regulations (Part F), fresh air ventilation to habitable rooms is required via trickle ventilators.

The trickle ventilators should comply with the minimum octave band normalised weighted level differences stated in Table 7.3.

Type	Façade	Minimum $D_{n,e,}$ Values (dB) at Octave Band Centre Frequency (Hz)					
		125	250	500	1k	2k	4k
A	Road Facing	32	33	42	45	52	56
B	Rear Facades	20	22	32	30	29	23

Table 7.3: Required trickle ventilator performance

It should be ensured that all mechanical extract and any supply ventilation is designed to not exceed the internal noise criteria stated in Table 4.3.

N.B. Type B should be achievable with standard units; however, Type A performance may call for an acoustic trickle ventilator.

8.0 CONCLUSION

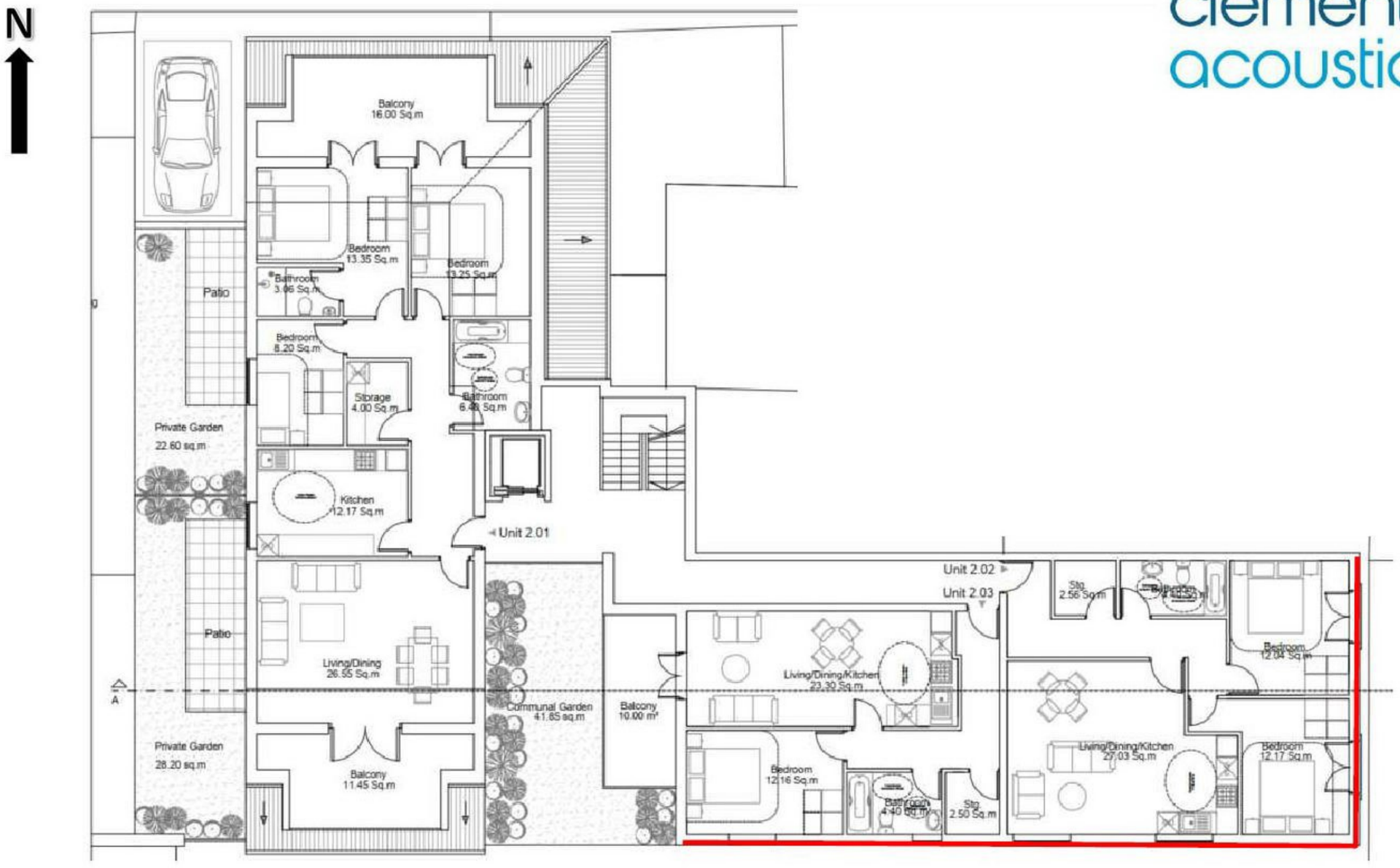
An environmental noise survey has been undertaken at 1 Parson Street, Hendon, London NW4 1QD in order to measure ambient noise levels in the area.

Measured noise levels have allowed an assessment of the level of exposure to noise of the proposed development site to be made.

Outline mitigation measures, including a glazing specification and the use of appropriate ventilation have been recommended and should be sufficient to achieve recommended internal noise levels for the proposed development according to BS 8233: 2014, WHO and the requirements of the Local Authority.

Author	**Duncan Martin** Director BSc (Hons) MIOA	[redacted]	20 October 2020
Reviewed	**Josh Wilson** Consultant BSc (Hons) MIOA		20 October 2020

16202-SP1 Indicative site plan indicating noise monitoring position and nearest noise sensitive receiver **Date:** 20 October 2020



16202-SP2 Indicative layout plan showing proposed acoustic treatments

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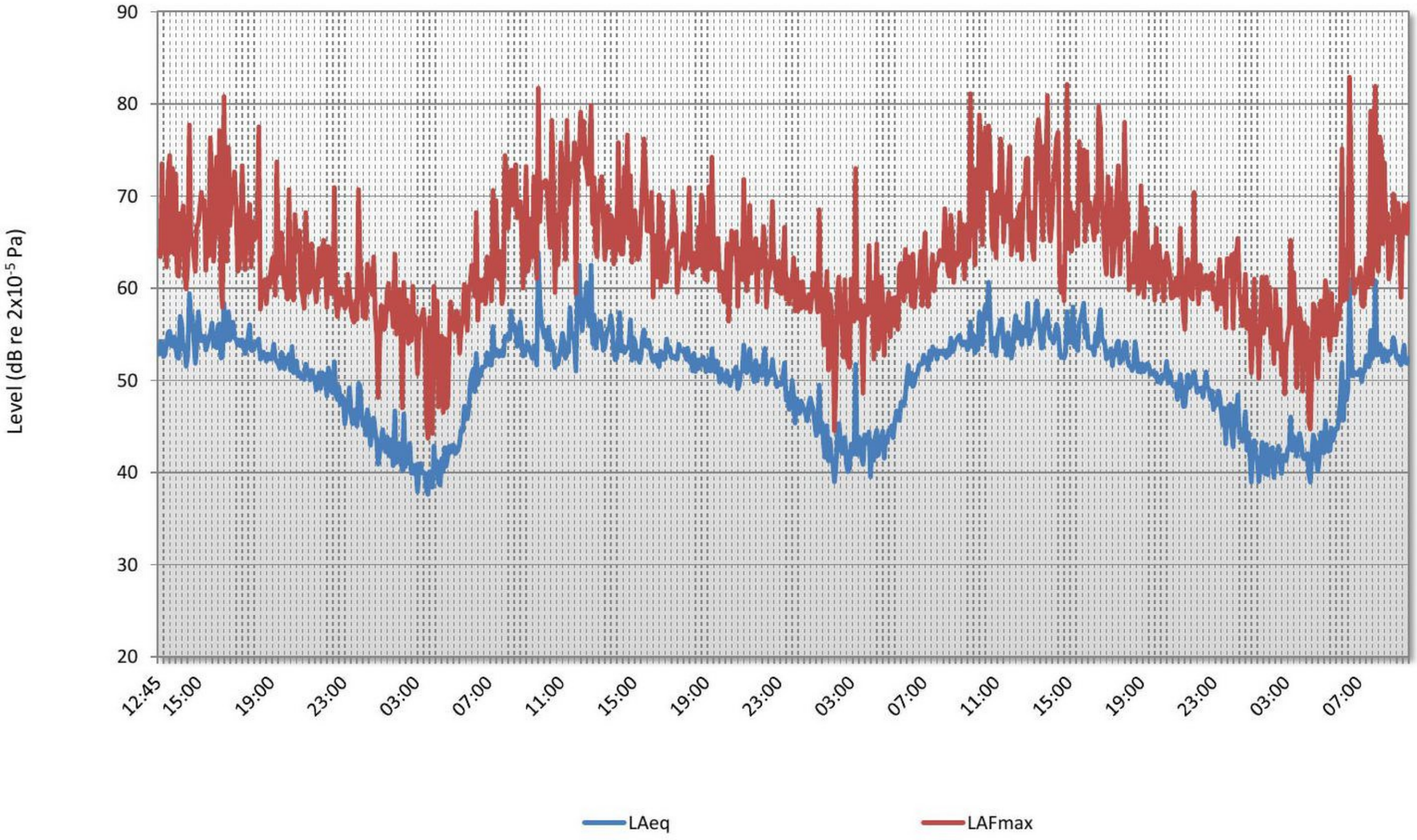
1 Parson Street, Hendon, London

Environmental Noise Time History
6 October 2020 to 9 October 2020



16202-TH1

APPENDIX A

GLOSSARY OF ACOUSTIC TERMINOLOGY

dB(A)

The human ear is less sensitive to low (below 125Hz) and high (above 16kHz) frequency sounds. A sound level meter duplicates the ear's variable sensitivity to sound of different frequencies. This is achieved by building a filter into the instrument with a similar frequency response to that of the ear. This is called an A-weighting filter. Measurements of sound made with this filter are called A-weighted sound level measurements and the unit is dB(A).

L_{eq}

The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level L_{eq}. The L_{eq} is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period.

L_{10}

This is the level exceeded for not more than 10% of the time. This parameter is often used as a "not to exceed" criterion for noise

L_{90}

This is the level exceeded for not more than 90% of the time. This parameter is often used as a descriptor of "background noise" for environmental impact studies.

L_{max}

This is the maximum sound pressure level that has been measured over a period.

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 10 such octave bands whose centre frequencies are defined in accordance with international standards.

Addition of noise from several sources

Noise from different sound sources combines to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than one alone and 10 sources produce a 10 dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3dB for each doubling of distance.

Subjective impression of noise

Sound intensity is not perceived directly at the ear; rather it is transferred by the complex hearing mechanism to the brain where acoustic sensations can be interpreted as loudness. This makes hearing perception highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a reasonable guide to help explain increases or decreases in sound levels for many acoustic scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud
20	About 4 times as loud

Barriers

Outdoor barriers can be used to reduce environmental noises, such as traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and its construction.

Reverberation control

When sound falls on the surfaces of a room, part of its energy is absorbed and part is reflected back into the room. The amount of reflected sound defines the reverberation of a room, a characteristic that is critical for spaces of different uses as it can affect the quality of audio signals such as speech or music. Excess reverberation in a room can be controlled by the effective use of sound-absorbing treatment on the surfaces, such as fibrous ceiling boards, curtains and carpets.