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# 90 Alma Road
# Windsor

**Noise Impact Assessment Report**
**Report 27245.NIA.01 – Rev. B**

**Mr. Hietesh Shridhar**
**90 Alma Road**
**Windsor**
**SL4 3ET**

| Report 27245.NIA.01<br>Revision History | | | |
|---|---|---|---|
| First Issue Date: 02/10/2023 | | | |
| A | 28/11/2023<br>Sections 4.3 and 7.0 added due to comments from the Local Authority | D | |
| B | 11/01/2024<br>Section 6.0 amended due to new information provided by the client | E | |
| C | | F | |

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## Contents



**List of Attachments**

# 1.0 INTRODUCTION

KP Acoustics Ltd has been commissioned by Mr. Hietesh Shridhar, 90 Alma Road, Windsor, SL4 3ET, to assess the suitability of the site at 90 Alma Road, Windsor, SL4 3ET, for a residential development in accordance with Permitted Development rights as outlined in Class MA (offices to dwelling/houses) of The Town and Country Planning (General Permitted Development) (England) Order 2021.

This report presents the results of internal noise surveys undertaken in order to measure the current internal noise climate for compliance with current guidance, and present the results of the external environmental survey undertaken in order to measure the prevailing background noise levels.

# 2.0 SITE SURVEYS

## 2.1 Site Description

The site is bounded by residential buildings including associated garage storage to the north, residential and office buildings to the west, and residential properties and Alma Road to the south and east.

Entrance to the site is located at Alma Road. At the time of the survey, the background noise climate was dominated by intermittent road traffic noise from surrounding roads, intermittent air traffic noise originating from Heathrow Airport.

Further to the site visit and visual inspection, it was observed that there are neighbouring air-conditioned units situated to the west of the proposed development. It's important to highlight that the only identified commercial premises on site are positioned to the west and southwest of the proposed development, and they serve a dental clinic and therapy facilities.

## 2.2 Internal Noise Survey Procedure

Noise surveys were undertaken within internal areas of the building (as shown in Figures 2.1 and 2.2) in order to assess worst-case levels with the current external building fabric configuration.

Continuous automated monitoring was undertaken for the duration of the survey between 13:01 on 08/09/2023 and 15:06 on 11/09/2023.

Microphones installed internally were positioned within the diffuse field of the room, ensuring the microphone was at least 1.5m from any reflective surface. Noise measurement positions are detailed in Table 2.1 and shown in Figure 2.1.

## 2.3 Environmental Noise Survey Procedure

External noise survey was undertaken on the proposed site as shown in Figure 2.1. The location was chosen in order to collect data representative of the worst-case levels expected on the site due to all nearby sources, including those from nearby plant units and commercial premises.

Continuous automated monitoring was undertaken for the duration of the survey between 12:02on 08/09/2023 and 15:02 on 11/09/2023.

Weather conditions were generally dry with light winds and therefore suitable for the measurement of environmental noise. The measurement procedure complied with ISO 1996-2:2007 Acoustics '*Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels'*.

## 2.4 Measurement Positions

Measurement positions are as described within Table 2.1 and shown within Figure 2.1.

| Icon | Descriptor | Location Description |
|---|---|---|
| | Internal Noise Measurement Position 1 | Located on the Ground floor of the building within the open plan room overlooking the Front Elevation (West), as shown in Figure 2.1. The microphone was installed on a tripod at a distance of 1.5m from the window on the external façade and positioned at 1.5m above ground floor |
| | Internal Noise Measurement Position 2 | Located on the First floor of the building within the room overlooking the Front Elevation (West), as shown in Figure 2.2. The microphone was installed on a tripod at a distance of 1.5m from the window on the external façade and positioned at 1.5m above ground floor |
| | External Noise Measurement Position 1 | The microphone was installed on a window on the First floor of the Front Elevation (West), as shown in Figure 2.3.<br>The microphone was located within 1.5 metres of the nearest surface and therefore includes local reflections. |

**Table 2.1 Measurement positions and descriptions**

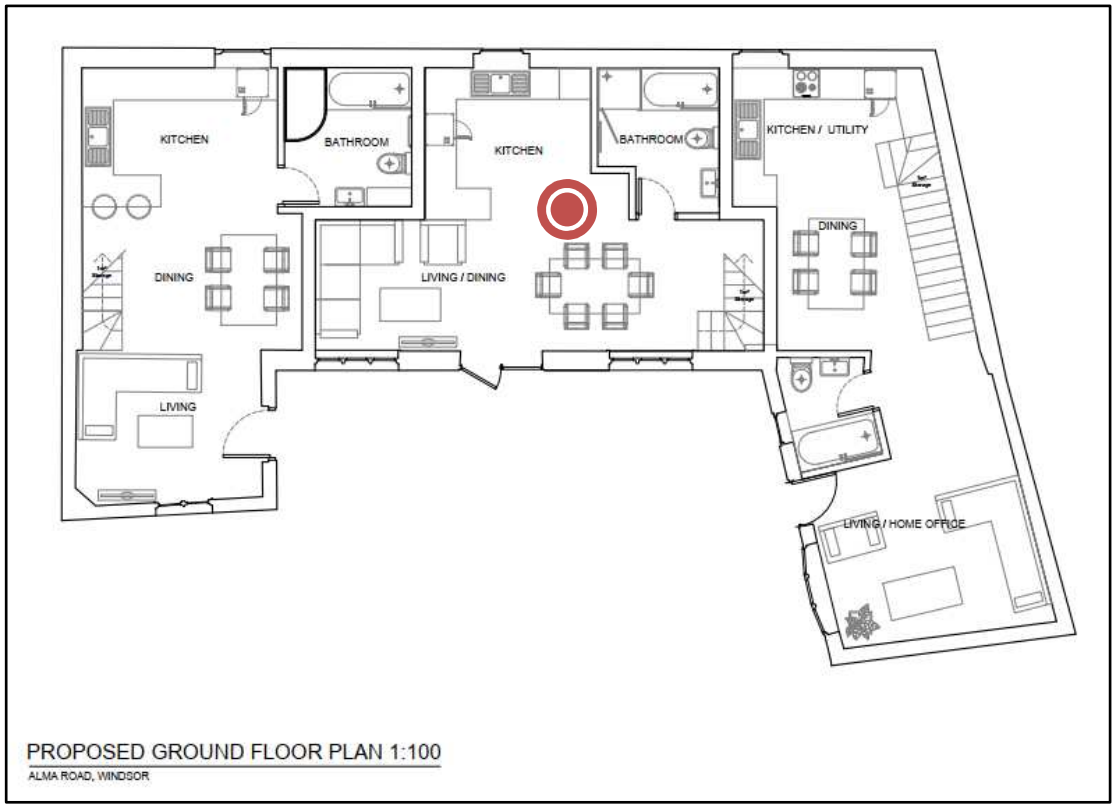


**Figure 2.1 Internal measurement position 1 at Ground Floor Level (Image Source: Inhabitat Architects Designers)**

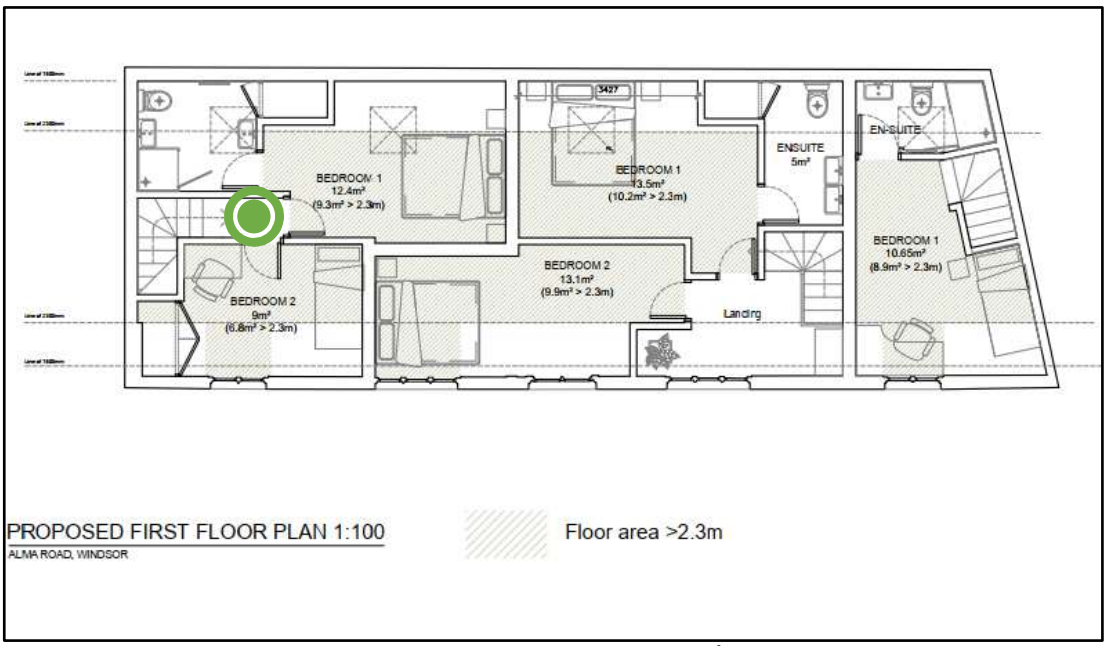


**Figure 2.2 Internal measurement position 2 at First Floor Level (Image Source: Inhabitat Architects Designers)**

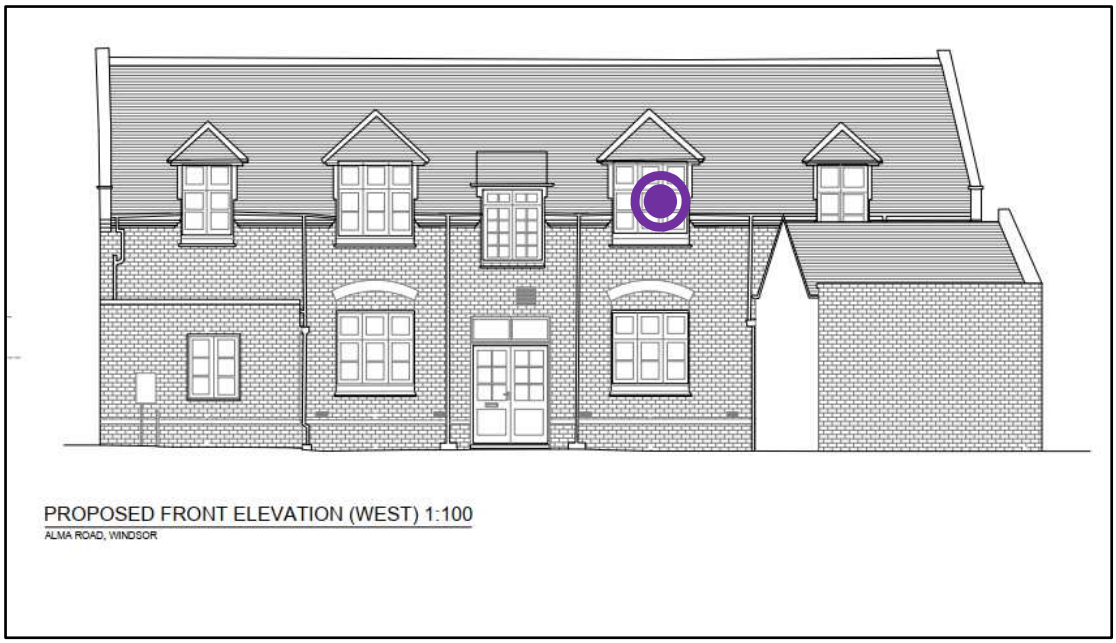


**Figure 2.3 External measurement position 1 at First Floor Level (Image Source: Inhabitat Architects Designers)**

## 2.5 Equipment

The equipment calibration was verified before and after use and no abnormalities were observed. The equipment used is described within Table 2.2.

| Measurement instrumentation | | Serial no. | Date | Cert no. |
|---|---|---|---|---|
| Noise & Vibration Kit 1 | Svantek Type 958A Class 1 Sound & Vibration Level Meter | 34580 | 10/03/2022 | 1502001-2a |
| | Free-field microphone PCB 377B02 | 169019 | | |
| | Preamp PCB 426M07 | 041446 | | |
| | Svantek External windshield | - | - | - |
| Noise Kit 24 | NTI Audio XL2 Class 1 Sound Level Meter | A2A-21175-E0 | 21/07/2022 | UK-22-066 |
| | Free-field microphone NTI Acoustics MC230A | A23577 | | |
| | Preamp NTI Acoustics MA220 | 10999 | | |
| | NTI Audio External Weatherproof Shroud | - | - | - |
| Noise Kit 30 | NTI Audio XL2 Class 1 Sound Level Meter | A2A-21149-E0 | 04/08/2022 | UK-22-079 |

| Measurement instrumentation | | Serial no. | Date | Cert no. |
|---|---|---|---|---|
| | Free-field microphone NTI Acoustics MC230A | A23572 | | |
| | Preamp NTI Acoustics MA220 | 10997 | | |
| | NTI Audio External Weatherproof Shroud | - | - | - |
| B&K Type 4231 Class 1 Calibrator | | 2147411 | 05/06/2023 | UCRT23/1739 |

**Table 2.2 Measurement instrumentation**

## 3.0 RESULTS

### 3.1 Internal Noise Surveys

The $L_{Aeq: 5min}$ and $L_{Amax: 5min}$ acoustic parameters were measured throughout the duration of the internal noise surveys. Measured levels are shown as time histories in Figures 27245.TH1-2 for internal monitoring positions 1 and 2 respectively. It should be noted that the building services were switched off and trickle vents (where applicable) were open for the duration of the internal noise survey.

Measured noise levels are representative of noise exposure levels expected to be experienced in all spaces on all façades of the development, and are shown in Table 3.1.

| Time Period | Internal Noise Measurement Position 1 (Measured Noise level – dBA) | Internal Noise Measurement Position 2 (Measured Noise level – dBA) |
|---|---|---|
| Daytime $L_{Aeq,16hour}$ | 48 | 40 |
| Night-time $L_{Aeq,8hour}$ | 37 | 30 |

**Table 3.1 Current internal average noise levels for daytime and night time**

### 3.2 External Noise Surveys

The $L_{Aeq: 5min}$, $L_{Amax: 5min}$, $L_{A10: 5min}$ and $L_{A90: 5min}$ acoustic parameters were measured throughout the duration of the survey. Measured levels are shown as time history in Figure 27245.TH1.

Measured noise levels are representative of noise exposure levels expected to be experienced by all façades of the proposed development, and are shown in Table 3.1.

| Time Period | External Noise Measurement Position 1 (Measured Noise level – dBA) |
|---|---|
| Daytime $L_{Aeq,16hour}$ | 58 |
| Night-time $L_{Aeq,8hour}$ | 50 |

**Table 3.2 Site average noise levels for daytime and night time**

Please note that measurements at Noise Measurement Position 1 is located at a distance less than 1.5 metres from the nearest reflective surface and therefore a 3dB correction has been applied to the results in Table 3.2 to obtain a free-field measurement as per ISO1996 Part 2.

## 4.0 NOISE ASSESSMENT GUIDANCE

### 4.1 Permitted Development Rights

It is understood that the office development would be converted into residential units under the Permitted Development Rights. Therefore, this assessment would be targeted to demonstrate the noise requirement as per Citation *"Amendments in relation to change of use of offices to dwelling houses"* of The Town and Country Planning (General Permitted Development) (England) (Amendment) Order 2021:

*"(2) Before beginning development under Class MA, the developer must apply to the local planning authority for a determination as to whether the prior approval of the authority will be required as to –*

*(a) transport impacts of the development, particularly to ensure safe site access;*

*(b) contamination risks in relation to the building;*

*(c) flooding risks in relation to the building;*

*(d) impacts of noise from commercial premises on the intended occupiers of the development;"*

The measurements undertaken on site would not only encompass noise generated by any nearby commercial units, but it would also encompass the full spectrum of noise sources in the area affecting the premises, such as neighbouring plant units.

In order to demonstrate if the current external building fabric of the site would be sufficient to protect the future residents, the measured internal noise levels would be assessed against the recommendations of the British Standard BS8233:2014 *"Sound insulation and noise reduction for buildings"*.

## 4.2 BS8233:2014

BS8233:2014 *'Sound insulation and noise reduction for buildings'* describes recommended internal noise levels for residential spaces. These levels are shown in Table 4.1.

| Activity | Location | 07:00 to 23:00 | 23:00 to 07:00 |
|---|---|---|---|
| Resting | Living Rooms | 35 dB(A) | - |
| Dining | Dining Room/area | 40 dB(A) | - |
| Sleeping (daytime resting) | Bedrooms | 35 dB(A) | 30 dB(A) |

**Table 4.1 BS8233 recommended internal background noise levels**

It should be noted that the recommended internal noise levels outlined above are not applicable under "purge ventilation" conditions as defined by Approved Document F of the Building Regulations, as this should only occur occasionally (e.g. to remove odour from painting or burnt food). However, the levels above should be achieved whilst providing sufficient background ventilation, either via passive or mechanical methods.

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

## 4.3 Comments from the Local Authority

The Local authority has provided the following comments following receipt of the initial report titled 27245.NIA.01 dated 2 October 2023:

**Condition 2 - noise impact assessment**

*To satisfy the requirements of this condition, a Noise Impact Assessment by KP Acoustics Ltd, dated 02/10/23, has been submitted. The report findings state that internal noise levels would exceed those recommended by BS8233:2014, and that in order to be suitable for residential use the fabric of the existing building would need to be upgraded. Details of how the fabric of the existing building would be upgraded to comply with the noise levels recommended by BS8233:2014 have not been supplied, nor have details of ventilation to habitable rooms. In the absence of such information, the condition cannot yet be fully approved.*

Further to the Local Authority comments above, it's important to highlight that the specifications for upgrading the fabric of the existing building to comply with the BS8233:2014 requirements are detailed in Section 6.0 below.

## 5.0 DISCUSSION

As indicated in Table 3.1, the internally measured noise levels exceed the recommended levels outlined in BS8233:2014, except during the night-time period at the first-floor level. Therefore, in order to ensure that the development is suitable for residential use, the existing building fabric should be upgraded as outlined within Section 6.0.

## 6.0 GLAZED EXTERNAL BUILDING FABRIC SPECIFICATION

Sound reduction performance calculations have been undertaken in order to specify the required performance from glazed elements in order to achieve the recommended internal noise levels shown in Table 4.1, taking into account average and maximum noise levels monitored during the environmental noise survey as well as the non-glazed external building fabric construction.

Further discussions with the client, it is understood that the existing windows are being replaced. Therefore, the minimum octave band sound reduction values outlined in Table 6.1 should be met for all new window systems to achieve the recommended internal noise levels shown in Table 4.1. The performance is specified for the whole window unit, including the frame, seals, etc. as appropriate. Sole glass performance data would not demonstrate compliance with this specification.

| Elevation | Octave band centre frequency SRI, dB | | | | | | $R_w$ ($C;C_{tr}$), dB |
|---|---|---|---|---|---|---|---|
| | 125Hz | 250Hz | 500Hz | 1kHz | 2kHz | 4kHz | |
| All elevations | 28 | 23 | 32 | 38 | 42 | 44 | 35 (-1;-4) |

**Table 6.1 Required glazing performance**

## 7.0 VENTILATION

### 7.1 Ventilation Strategy

Based on the noise levels measured on site, appropriate ventilation systems are outlined in Table 7.1 below in order to ensure the internal noise environment is not compromised.

| Ventilation System | Whole Dwelling Ventilation | Extract Ventilation |
|---|---|---|
| ADF System 1 | Trickle vents providing a minimum performance of 35dB $D_{,n,e,w}$ | Intermittent extract fans |
| ADF System 3 | Continuous mechanical extract (low rate) and trickle vents for supply providing a minimum performance of 35dB $D_{,n,e,w}$ | Continuous mechanical extract (high rate) with trickle vents providing inlet air |
| ADF System 4 | Continuous mechanical supply and extract (low rate) | Continuous mechanical supply and extract (high rate) |

**Table 7.1 Ventilation systems**

Where trickle vents are proposed, a typical number has been assumed based on the room size and number of windows. As trickle vents introduce a weak point in the building façade, it should be noted that increasing the number of trickle vents will reduce the composite performance of the facade. If more trickle vents are required, the required insulation should be increased by '+10*LOG(N)' where N is the number of vents proposed. If trickle vents are proposed, the total number of trickle vents for each sensitive space should be confirmed so that calculations can be accurately revised.

In the case of mechanical ventilation, systems should be designed to meet the internal noise levels as defined in CIBSE Guide A (2015), as shown in Table 7.2.

| Room Type | $L_{Aeq}$, dB | NR |
|---|---|---|
| Bedrooms | 30 | 25 |
| Living Rooms | 35 | 30 |
| Kitchen | 45-50 | 40-45 |

**Table 7.2 CIBSE Guide A 2015 guidance levels for mechanical building services**

In all cases, purge ventilation would be provided by openable windows. As outlined in Section 4.2, the internal noise level requirement would not be applicable during purge conditions as this would only occur occasionally.

## 8.0 CONCLUSION

Internal noise surveys and environmental noise surveys have been undertaken at 90 Alma Road, Windsor, SL4 3ET allowing the assessment of daytime and night-time levels likely to be experienced by the proposed development.

Noise levels measured internally demonstrate that the existing external building fabric would be insufficient in providing internal noise levels commensurate to the design criteria of BS8233:2014.

Mitigation measures have been provided to meet the recommended internal noise levels provided in BS8233 and to protect the proposed habitable spaces from external noise intrusion.

90 Alma Road, Windsor
Environmental Noise Time History
From 08 September 2023 To 11 September 2023

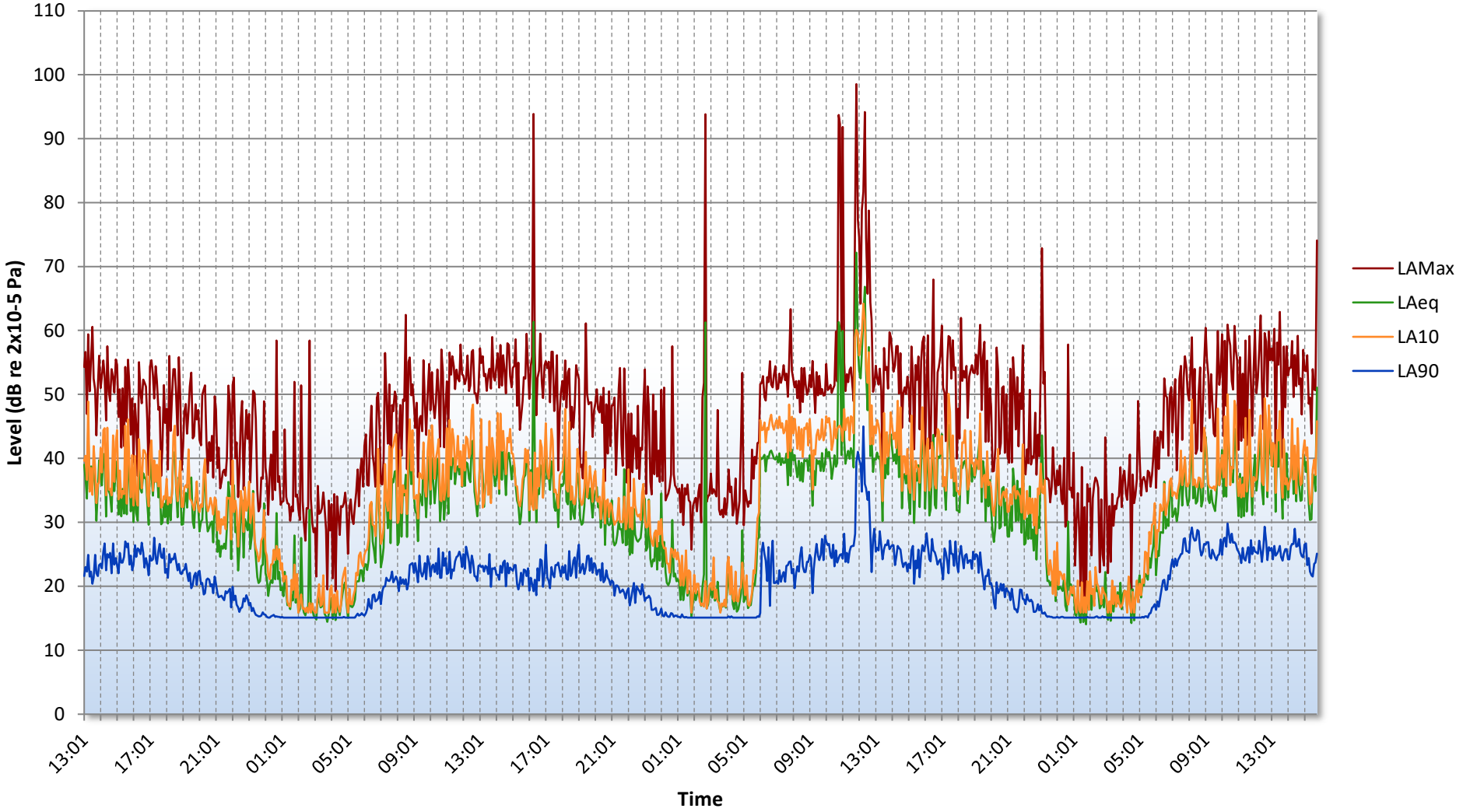


**Figure 27245.TH1 - Internal**

90 Alma Road, Windsor - Position 2 Internal
Environmental Time History
08/09/2023 to 11/09/2023

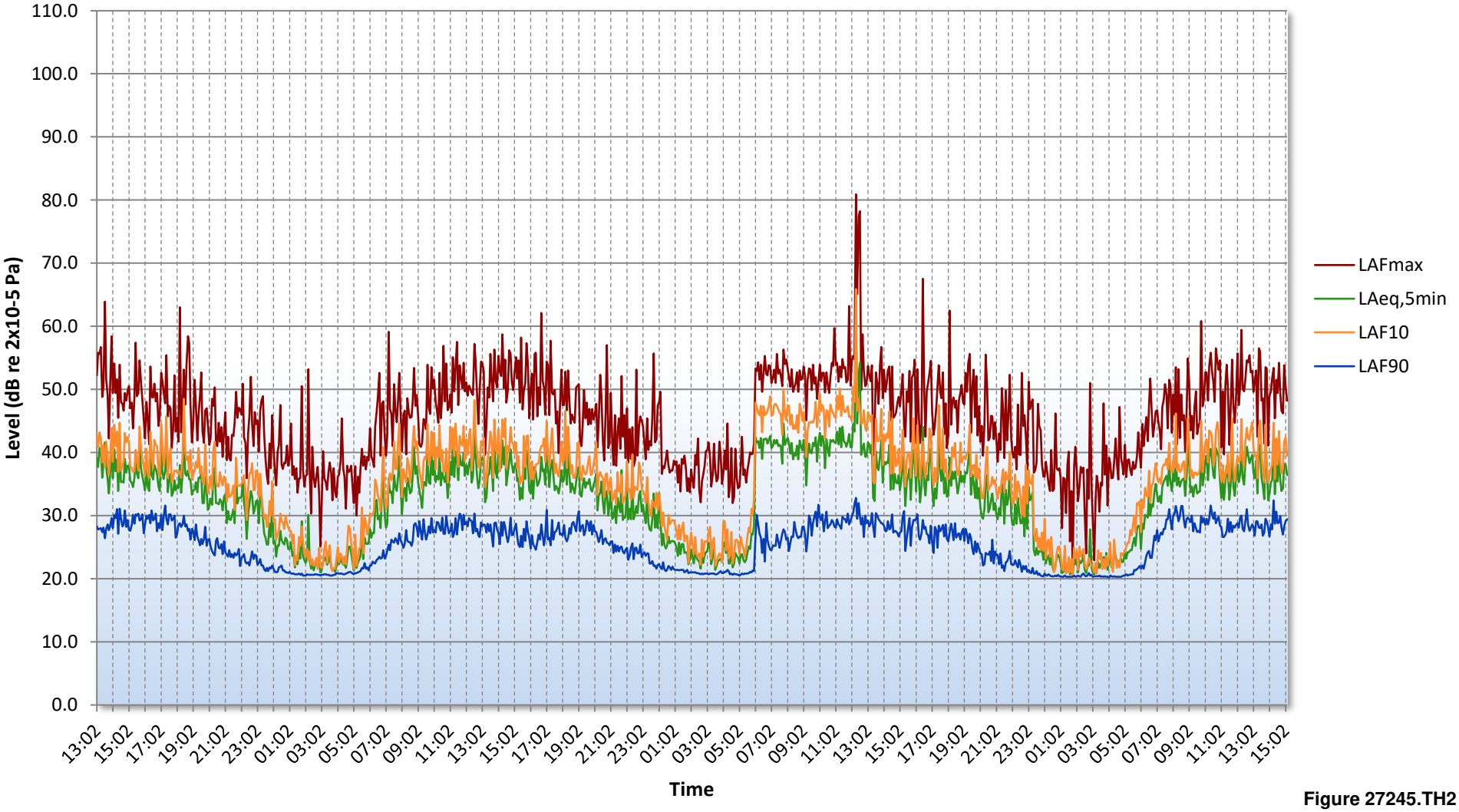


**Figure 27245.TH2**
**Internal**

90 Alma Road, Windsor - Position 3 External
Environmental Time History
08/09/2023 to 11/09/2023

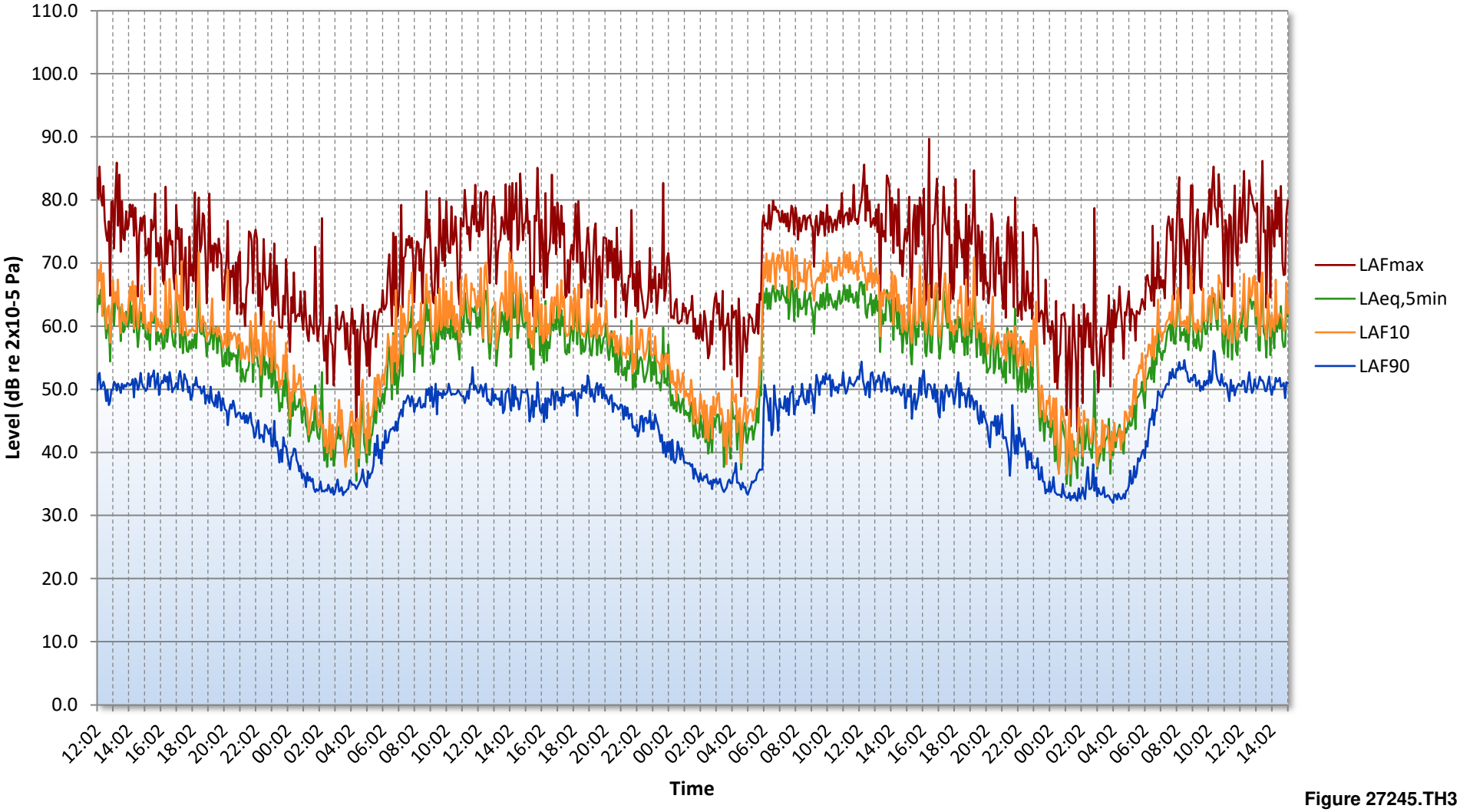


**Figure 27245.TH3**
**External**

# APPENDIX A

## GENERAL ACOUSTIC TERMINOLOGY

### Decibel scale - dB

In practice, when sound intensity or sound pressure is measured, a logarithmic scale is used in which the unit is the 'decibel', dB. This is derived from the human auditory system, where the dynamic range of human hearing is so large, in the order of $10^{13}$ units, that only a logarithmic scale is the sensible solution for displaying such a range.

### Decibel scale, 'A' weighted - dB(A)

The human ear is less sensitive at frequency extremes, below 125Hz and above 16Khz. A sound level meter models the ears variable sensitivity to sound at different frequencies. This is achieved by building a filter into the Sound Level Meter with a similar frequency response to that of the ear, an A-weighted filter where 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 no 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 no 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 11 such octave bands whose centre frequencies are defined in accordance with international standards. These centre frequencies are: 16, 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000 and 16000 Hertz.

Environmental noise terms are defined in BS7445, *Description and Measurement of Environmental Noise*.

# APPENDIX A

## APPLIED ACOUSTIC TERMINOLOGY

### 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 a single source and 4 sources produce a 6dB 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

Hearing perception is 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 guide to explain increases or decreases in sound levels for many scenarios.

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

### Transmission path(s)

The transmission path is the path the sound takes from the source to the receiver. Where multiple paths exist in parallel, the reduction in each path should be calculated and summed at the receiving point. Outdoor barriers can block transmission paths, for example traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and construction.

### Ground-borne vibration

In addition to airborne noise levels caused by transportation, construction, and industrial sources there is also the generation of ground-borne vibration to consider. This can lead to structure-borne noise, perceptible vibration, or in rare cases, building damage.

### Sound insulation - Absorption within porous materials

Upon encountering a porous material, sound energy is absorbed. Porous materials which are intended to absorb sound are known as absorbents, and usually absorb 50 to 90% of the energy and are frequency dependent. Some are designed to absorb low frequencies, some for high frequencies and more exotic designs being able to absorb very wide ranges of frequencies. The energy is converted into both mechanical movement and heat within the material; both the stiffness and mass of panels affect the sound insulation performance.