

**Report VA4297.220923.NIA1.5**

**Soane Point, 3-10 Market Place,  
Reading**

**Noise Impact Assessment**

**23 September 2022**

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## Executive Summary

This noise impact assessment report discusses outline specifications for additional mitigation measures to achieve suitable internal noise levels, and comments on external noise levels in amenity spaces. Noise has been assessed against the requirements of the relevant British Standards, Guidelines and the Reading Local Plan.

Measures to control noise to the new dwellings have been considered with performance requirements for glazing and ventilators provided.

Following implementation of the mitigation measures recommended in this report, internal noise levels would achieve the recommended limits from BS8233: 2014 *Guidance on sound Insulation and noise reduction for buildings*.

The applicant has confirmed that an Approved Document F approach to whole dwelling ventilation will be adopted for all apartments. Control of noise through different elements of the façade has been discussed and a review of the external building fabric proposals has been undertaken. Specifications have been provided for glazing and background attenuators on the different elevations of the building.

Private and communal terraces and balconies are provided for the apartments. Whilst noise levels in some external amenity areas are anticipated to exceed the aspirations of the WHO Guidelines, recommendations have been made to provide mitigation to reduce noise levels as far as practicable.

In summary, the proposed residential scheme complies fully with the recommendations of BS8233, the WHO Guidelines and the overarching requirements of national policy enshrined in the NPSE and NPPF.

## 1. Introduction

An application is being made for external works to existing building, including partial replacement of the existing façades fronting Market Place and Abbey Square alongside other external works to the building; set back single-storey extension above part of block fronting Market Place, part two part three storey extensions above other blocks; and conversion and alterations to ground floor reception and car parking area; together the works will deliver 38 new homes and (internal and external) residential amenity areas with associated car parking.

Venta Acoustics has been commissioned by Tene Living UK (Reading) Ltd to undertake an assessment of the current environmental noise impact on the site and provide recommendations of acoustic mitigation, where required, in support of an application for planning permission.

An environmental noise survey has been undertaken to determine the noise levels affecting the site. These levels are then used to undertake an assessment of the likely impact in accordance with the National Planning Policy Framework with reference to relevant standards, guidance and the planning requirements of Reading Borough Council.

Outline mitigation measures are considered and an appraisal of the requirements of external building fabric elements are provided, where appropriate.

## 2. Guidance and Legislation

### 2.1 The National Planning Policy Framework (2021)

The revised *National Planning Policy Framework* (NPPF), published in July 2021, sets out the Government's planning policies for England, superseding all previous planning policy statements and guidance.

In respect of noise, the NPPF states that the planning system should contribute to and enhance the natural and local environment by preventing both new and existing developments from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of noise pollution.

Hence, Paragraph 185 states that *planning policies and decisions should also ensure 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*

In regards to the term adverse impact, reference is made to the Noise Policy for England:

## 2.2 Noise Policy Statement for England (2010)

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

This vision is supported by the following aims:

- *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 improvement of health and quality of life.*

The terms “significant adverse” and “adverse” are related to the following concepts:

- No Observed Effect Level (NOEL) - the level below which no effect on health and quality of life can be detected.
- 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 guidance acknowledges that it is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations, but will be different for different noise sources, receptors and times.

In order to enable assessment of impacts in line with these requirements, reference should be made to other currently available guidance.

## 2.3 WHO Guidelines for Community Noise (1999)

The guidance in this document details suitable noise levels for various activities within residential and commercial buildings.

The relevant sections of this document are shown in Table 2.1.

| Criterion                                                                         | Environment | Design range $L_{Aeq,T}$ dB |
|-----------------------------------------------------------------------------------|-------------|-----------------------------|
| Maintain speech intelligibility and avoid moderate annoyance, daytime and evening | Living Room | 35 dB                       |
| Prevent sleep disturbance, night time                                             | Bedrooms    | 30 dB                       |

**Table 2.1 – Excerpt from WHO**

**[dB ref. 20µPa]**

This guidance also states:

*For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dB  $L_{Amax}$  more than 10-15 times a night (Vallet & Vernet 1991).*

For outdoor living areas, it is stated that:

*To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55dB  $L_{Aeq}$  on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50dB  $L_{Aeq}$ . Where it is practical and feasible, the lower outdoor sound level should be considered the maximum desirable sound level for new development.*

For sleep disturbance, i.e. in bedrooms at night, the NOEL can, therefore, be taken as anything below 30dB(A), whilst the onset of the LOAEL occurs at 30dB(A) and above. The SOAEL cannot be inferred from this information.

During daytime periods, for avoidance of annoyance, the NOEL relates to anything up to 50dB(A) (typically applied to external areas, such as gardens), whilst the onset of the LOAEL occurs at 50dB(A) and above.

## 2.4 BS8233:2014

BS8233 *Guidance on sound insulation and noise reduction for buildings* provides guidance as to desirable internal ambient noise levels for different areas within residential buildings.

The relevant section of the standard is shown below in Table 2.2.

| Activity                   | Location    | 07:00 to 23:00                   | 23:00 to 07:00                  |
|----------------------------|-------------|----------------------------------|---------------------------------|
| Resting                    | Living Room | 35 dB $L_{Aeq, 16 \text{ hour}}$ | -                               |
| Dining                     | Dining Room | 40 dB $L_{Aeq, 16 \text{ hour}}$ | -                               |
| Sleeping (daytime resting) | Bedroom     | 35 dB $L_{Aeq, 16 \text{ hour}}$ | 30 dB $L_{Aeq, 8 \text{ hour}}$ |

**Table 2.2 – Excerpt from BS8233:2014 - Indoor ambient noise levels for dwellings**

**[dB ref. 20μPa]**

For external areas the standard states the following:

*For traditional external areas that are used for amenity space, such as gardens and patios, 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 is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.*

## 2.5 BS4142:2014+A1:2019

British Standard BS4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound* describes a method for rating and assessing sound of an industrial and/or commercial nature, which includes sound from fixed installations comprising mechanical and/or electrical plant and equipment.

The assessment methodology considers the Specific Sound Level, as measured or calculated at a potential noise sensitive receptor, due to the source under investigation. A correction factor is added to this level to account for the acoustic character of the sound as follows:

**Tonality** – A correction of up to 6dB depending on the prominence of tones;

**Impulsivity** - A correction of up to 9dB depending on the prominence of impulsivity;

**Other sound characteristics** - A 3dB correction may be applied where a distinctive acoustic character is present that is neither tonal nor impulsive;

**Intermittency** - A 3dB correction may be applied where the specific sound has identifiable on/off conditions.

An estimate of the impact of the source is obtained by subtracting the typical background noise level from the corrected Specific Sound Level.

- Typically, the greater this difference, the greater the magnitude of the impact.
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB could be an indication of an adverse impact, depending on the context.
- The lower the rating level is relative to the measured background sound level, the less likely it is that there will be an adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound having a low impact, depending on the context.

## 2.6 Reading Borough Council Plant Noise Requirements

Reading Borough Council's planning policy requirements for noise emissions from plant is understood to be at least 10dB below the local background noise level as assessed at the most affected noise sensitive receivers.

The scheme is understood to only have external emergency plant, with all other equipment located internally. As this is used for life safety purposes and for daytime testing only, it is proposed that a relaxed noise limit for the equipment of 10dB above background noise level would be suitable.

### 3. Site Description

The existing building overlooks Market Place at the front, with some of the rear of the building overlooking Abbey Square, and the rest overlooking internal courtyards and a rear access road that is accessed via Abbey Square.

There is cooling plant located at 4<sup>th</sup> floor level on the adjacent hotel building, and a kitchen extract system servicing the adjacent restaurant to the south.

At ground floor of the building there is a small Tesco supermarket, which has deliveries to the rear, in the covered underground car park at lower ground/basement level, which is accessed via Abbey Square.

Market Place is predominantly commercial and retail in nature, with some residential uses in the area overlooking Market Place.

### 4. Environmental Noise Survey

#### 4.1 Survey Procedure & Equipment

In order to establish the existing noise levels at the site, noise surveys were carried out in March 2021, September 2021, October 2021 and May 2022 in various locations around the building. These locations were chosen to be representative of the noise level at the proposed new noise sensitive receivers.

Continuous 5-minute samples of the  $L_{Aeq}$ ,  $L_{Amax}$ ,  $L_{A10}$  and  $L_{A90}$  sound pressure levels were undertaken at each of the measurement locations.

The weather during the survey period was generally dry with light winds. The background noise data is not considered to have been compromised by these conditions.

Measurements were made generally in accordance with ISO 1996 2:2017 *Acoustics - Description, measurement and assessment of environmental noise – Part 2: Determination of sound pressure levels*.

The following equipment was used in the course of the survey:

| Manufacturer                    | Model Type | Serial No    | Calibration     |         |
|---------------------------------|------------|--------------|-----------------|---------|
|                                 |            |              | Certificate No. | Date    |
| NTi Class 1 Integrating SLM     | XL2        | A2A-11461-E0 | UCRT20/1699     | 27/7/20 |
| NTi Class 1 Integrating SLM     | XL2        | A2A-11586-E0 | UCRT20/1565     | 29/6/20 |
| NTi Class 1 Integrating SLM     | XL2        | A2A-12202-E0 | UCRT21/1102     | 21/1/21 |
| Svantek Class 1 Integrating SLM | 958A       | 59177        | UCRT21/1107     | 21/1/21 |
| Larson Davis calibrator         | CAL200     | 13049        | UCRT19/1501     | 18/4/19 |
| Larson Davis calibrator         | CAL200     | 13049        | UCRT21/1385     | 22/3/21 |

**Table 4.1 – Equipment used for the survey**

The calibration of the sound level meters was verified before and after use with no significant calibration drift observed.

## 4.2 Results

The measured sound levels are shown as time-history plots on the attached charts VA4297/TH1-5 for position 1, VA4297/TH6-7 for position 2, VA4297/TH8-10 for position 3 and VA4297/TH11-14 for position 4.

The background noise level is determined by road traffic noise on Market Place and Abbey Square, with plant noise being dominant within the internal courtyard areas, with some contribution from traffic in the general area when the plant is turned off.

Sound level meters were located in the positions shown in Figure 4.1.



**Figure 4.1 – Meter locations**

The background noise levels measured during the surveys are shown in Table 4.2.

| Monitoring Period   | Typical <sup>1</sup> L <sub>A90,T</sub> |            |            |            |
|---------------------|-----------------------------------------|------------|------------|------------|
|                     | Position 1                              | Position 2 | Position 3 | Position 4 |
| 07:00 – 23:00 hours | 45 dB                                   | 49 dB      | 48 dB      | 46 dB      |
| 23:00 – 07:00 hours | 42 dB                                   | 48 dB      | 45 dB      | 40 dB      |

**Table 4.2 – Typical background and ambient noise levels**

<sup>1</sup> The typical L<sub>A90</sub> value is taken as the 10<sup>th</sup> percentile of all L<sub>A90</sub> values measured during the relevant period

The average (L<sub>Aeq</sub>) noise levels are reported in Table 4.3.

| Monitoring Period   | L <sub>Aeq,T</sub> |            |            |            |
|---------------------|--------------------|------------|------------|------------|
|                     | Position 1         | Position 2 | Position 3 | Position 4 |
| 07:00 – 23:00 hours | 52 dB              | 56 dB      | 54 dB      | 65 dB      |
| 23:00 – 07:00 hours | 46 dB              | 52 dB      | 49 dB      | 59 dB      |

**Table 4.3 – Average ambient noise levels at measurement locations**

[dB ref. 20μPa]

The typical night time L<sub>Amax</sub> events were recorded to be in the order of 82 dB L<sub>Amax,fast</sub> on the Market Street façade and 67 dB L<sub>Amax,fast</sub> on the internal façades of the building.

When compared to other city centre sites, the noise levels on the internal façades of the building are relatively quiet for a busy location.

## 5. BS4142 Noise Impact Assessment

The northern part of the inner courtyard areas overlook the top of the adjacent hotel plant area, with the more southerly element of the inner courtyard overlooking the adjacent restaurant plant area, and the southern end of the courtyard would experience noise from lorries manoeuvring into the ground floor parking area to access the rear of Tesco, which is located in the covered area of the carpark.

As these are related to commercial premises, they should be assessed using the methodology of BS4142: 2014 *Methods for rating and assessing industrial and commercial sound*.



Figure 5.1 – Plant areas and areas open to ground floor carpark

## 5.1 Source Noise Levels

The following source noise levels have been used for the assessment.

| Noise Source      | Location                       | L <sub>Aeq</sub> |       | Notes                                                                                          |
|-------------------|--------------------------------|------------------|-------|------------------------------------------------------------------------------------------------|
|                   |                                | DT               | NT    |                                                                                                |
| Hotel Plant       | At façade of rooftop extension | 49 dB            | 49 dB | Plant operational 24 hours                                                                     |
| Restaurant Plant  | At façade of rooftop extension | 50 dB            | 41 dB | Turns off at 22:45, dropping to 41dB at night                                                  |
| Lorry manoeuvring | 8m                             | 73dB             |       | Deliveries understood to occur during the daytime. Long periods of respite between deliveries. |

Table 5.1 – Noise sources used for assessment

## 5.2 Acoustic Character Correction

The subjective method of allocating corrections to the sound source has been used following the methodology provided in BS4142:2014 and as summarised in section 2.5.

| Noise Source      | Subjective Description                                                        | Allocated Corrections                                     |
|-------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------|
| Lorry Manoeuvring | Intermittent deliveries, diesel engine broadband, not tonal and not impulsive | Tonality: 0dB<br>Impulsivity: 0dB<br>Intermittency: +3dB  |
| Hotel Plant       | Operates intermittently. Survey data indicated some tones                     | Tonality: +2dB<br>Impulsivity: 0dB<br>Intermittency: +3dB |
| Restaurant Plant  | Constant operation when in use, some tonality                                 | Tonality: +2dB<br>Impulsivity: 0dB<br>Intermittency: 0dB  |

**Table 5.2 – Acoustic character corrections**

These penalties are applied to the specific noise level in section 5.3 to obtain the rating level.

## 5.3 Rating Level and Assessment

The rating levels at the assessment locations are compared against the relevant background noise levels to assess the notional significance of the noise impact as follows. Operations are adjusted to the appropriate times and periods for which each noise type occurs.

### 5.3.1 Hotel Plant – Location 2

| Results                                               |                                                                                       | Relevant Clause | Commentary                                 |
|-------------------------------------------------------|---------------------------------------------------------------------------------------|-----------------|--------------------------------------------|
| Specific Sound Level                                  | $L_{Aeq}$ 49 dB                                                                       |                 | Hotel plant level at façade                |
| Continuous Operation                                  | 0 dB                                                                                  | 7.2             |                                            |
| Acoustic feature correction                           | +5 dB                                                                                 | 9.2             | +3dB for intermittency, +2 dB for tonality |
| Rating level                                          | $L_{Ar}$ 54 dB                                                                        | 9.2             |                                            |
| Background sound level                                | $L_{A90}$ 48 dB                                                                       | 8               | Night-time                                 |
| Excess of rating over background sound level          | +6 dB                                                                                 | 11              |                                            |
| Assessment indicates a marginal to significant impact |                                                                                       | 11              | Depending on context                       |
| Uncertainty and Context                               | The survey indicated that the plant operates consistently through day and night-time. |                 |                                            |

**Table 5.3 – BS4142 Assessment – Hotel Plant**

### 5.3.2 Restaurant Plant – Location 3

| Results                                      |                                                                                          | Relevant Clause | Commentary                       |
|----------------------------------------------|------------------------------------------------------------------------------------------|-----------------|----------------------------------|
| Specific Sound Level                         | $L_{Aeq}$ 50 dB                                                                          |                 | Restaurant plant level at façade |
| Continuous Operation                         | 0 dB                                                                                     | 7.2             |                                  |
| Acoustic feature correction                  | +2 dB                                                                                    | 9.2             | +2 dB for tonality               |
| Rating level                                 | $L_{Ar}$ 52 dB                                                                           | 9.2             |                                  |
| Background sound level                       | $L_{A90}$ 48 dB                                                                          | 8               | Daytime                          |
| Excess of rating over background sound level | +4 dB                                                                                    | 11              |                                  |
| Assessment indicates a marginal impact       |                                                                                          | 11              | Depending on context             |
| Uncertainty and Context                      | The survey indicated that the plant operates consistently during the daytime until 22:45 |                 |                                  |

**Table 5.4 – BS4142 Assessment – Restaurant Plant**

### 5.3.3 Delivery Noise – Location 3

| Results                                      |                                                                                                | Relevant Clause | Commentary             |
|----------------------------------------------|------------------------------------------------------------------------------------------------|-----------------|------------------------|
| Lorry Manoeuvring                            | 73dB @ 8m                                                                                      | 7.3.4           |                        |
| Distance Loss (10m)                          | -2 dB                                                                                          | 7.3.5           | Assumed a point source |
| Specific Sound Level                         | L <sub>Aeq</sub> 71 dB                                                                         |                 |                        |
| 2 minute per 60 minutes                      | -15 dB                                                                                         | 7.2             |                        |
| Acoustic feature correction                  | +3 dB                                                                                          | 9.2             | +3dB for intermittency |
| Rating level                                 | L <sub>Ar</sub> 59 dB                                                                          | 9.2             |                        |
| Background sound level                       | L <sub>A90</sub> 48 dB                                                                         | 8               | Daytime                |
| Excess of rating over background sound level | +11 dB                                                                                         | 11              |                        |
| Assessment indicates a significant impact    |                                                                                                | 11              | Depending on context   |
| Context                                      | Deliveries understood to occur during the daytime. Long periods of respite between deliveries. |                 |                        |

**Table 5.5 – BS4142 Assessment – Deliveries**

## 5.4 Context

The site is located in a town centre location in Central Reading.

Within this context, the estimated impact of the sound sources is expected to remain valid.

The BS4142 standard aims to cover a wide variety of situations under the same base assessment methodology and so has some inherent shortcomings. To allow for this, the guidance encourages consideration of the site context as a means of adapting the base assessment to specific scenarios.

The base assessment methodology is considered to be weighted towards the more sensitive case of assessing industrial and commercial noise upon an existing residential receiver. The introduction of a new residential use to an area with existing sources of commercial noise provides an opportunity to provide appropriate mitigation against the noise sources.

The extension of the building provides an opportunity to provide mitigation in the form of appropriately specified external building fabric elements. This would allow appropriate internal noise levels to be achieved such that the commercial noise source is not considered to be disruptive.

This allows the impact to be significantly reduced for occupants within the dwellings and is considered in section 6.

## 5.5 Uncertainty

This section considers the variable in the assessment that may cause variations within the final results and describes how these have been addressed.

- Use of a Class 1 sound level meter is considered to reduce instrument error to insignificant levels as compared with environmental variations. The calibration of the instrumentation was confirmed before and after the noise surveys.
- The background measurements were undertaken under suitable weather conditions over a period designed to include reasonable temporal variations in background noise levels,

including a weekend period. Multiple monitoring locations and time periods were selected to minimise local acoustic phenomenon that may affect a single measurement location, including the noise from the nearby road. These measurement locations were selected to be representative of the background noise levels expected to be experienced by the proposed dwellings without being unduly influenced by extraneous noise sources.

- Source data of particular noise sources was measured on site at the receiver, where possible. These measurements were undertaken in a manner that best represented noise emissions from the source to the assessment locations without being unduly influenced by extraneous noise sources. This methodology minimised the uncertainty introduced in sound propagation calculations.
- Where library data has been used, propagation calculations have been used to correct noise levels to the relevant distance at the receiver.

Overall, the uncertainty is considered to have been minimised to a suitable range so as not to risk significant variations in the impact assessment of typical operations.

## 6. Internal Noise Assessment

To control sound from the commercial uses, the sound insulation performance of the building glazing will be specified to control the Rating level (including BS4142 penalties) to below the recommended values in BS8233. This hybrid approach of assessing commercial noise with a BS4142 penalty against the BS8233 criteria (over a shortened assessment period) is endorsed in the ProPG (Professional Practice Guidance on Planning and Noise prepared by the Institute of Acoustics, the Chartered Institute of Environmental Health and the Association of Noise Consultants). In addition to this, the  $L_{Aeq}$  and night-time  $L_{AFmax}$  levels, predominantly due to traffic noise, will also be compared with the requirements of BS8233 and the WHO Guidelines.

This will result in actual noise levels from the commercial noise being significantly lower than the recommended levels in BS8233, due to the acoustic penalties which have been applied. It should be remembered that the acoustic penalties are an assessment tool, and so are not, in themselves, audible.

The approach of controlling external noise sources through the use of the building envelope and ventilation is very common, for both road noise, and also commercial noise, especially in vibrant areas, such as town centres.

This is highlighted in the Reading Borough Local Plan paragraph 5.3.25 where it is stated for Central Reading that:

*... in order for the internal noise levels to be reasonable and not adversely affect health it would be necessary to provide a system of ventilation that entirely removes the necessity to open windows, even in very hot weather.*

## 6.1 Sound Reduction Performances of Building Elements

For the purposes of the calculations, it has been assumed that all the non-glazed elements, i.e. walls and roof systems, will be capable of providing the following minimum sound insulation performance, when tested in accordance with BS EN ISO 10140-2:2010 *Acoustics - Laboratory measurement of sound insulation of building elements – Part 2: Measurement of airborne sound insulation*.

| Building Element | Single figure weighted sound reduction index, dB |
|------------------|--------------------------------------------------|
| Masonry          | R <sub>w</sub> 51                                |

**Table 6.1 – Assumed sound reductions performances of non-glazed elements**

## 6.2 Sound Reduction Performance of Windowsets

The following minimum glazing specification would be required to ensure that internal noise levels achieve the required levels for average and maximum events.

| Glazing Location             | Required Glazing SRI, dB | Ventilator Performance, dB |
|------------------------------|--------------------------|----------------------------|
| Area 1 – Yellow, All Rooms   | R <sub>w</sub> 29 dB     | D <sub>n,e,w</sub> 29 dB   |
| Area 2 – Blue – Living Rooms | R <sub>w</sub> 33 dB     | D <sub>n,e,w</sub> 35 dB   |
| Area 2 – Blue – Bedrooms     | R <sub>w</sub> 30 dB     | D <sub>n,e,w</sub> 32 dB   |
| Area 3 – Green, All Rooms    | R <sub>w</sub> 38 dB     | D <sub>n,e,w</sub> 40 dB   |

**Table 6.2 – Required minimum sound reduction indices for glazing**

Figure 6.1 shows the locations where each glazing type would be required.

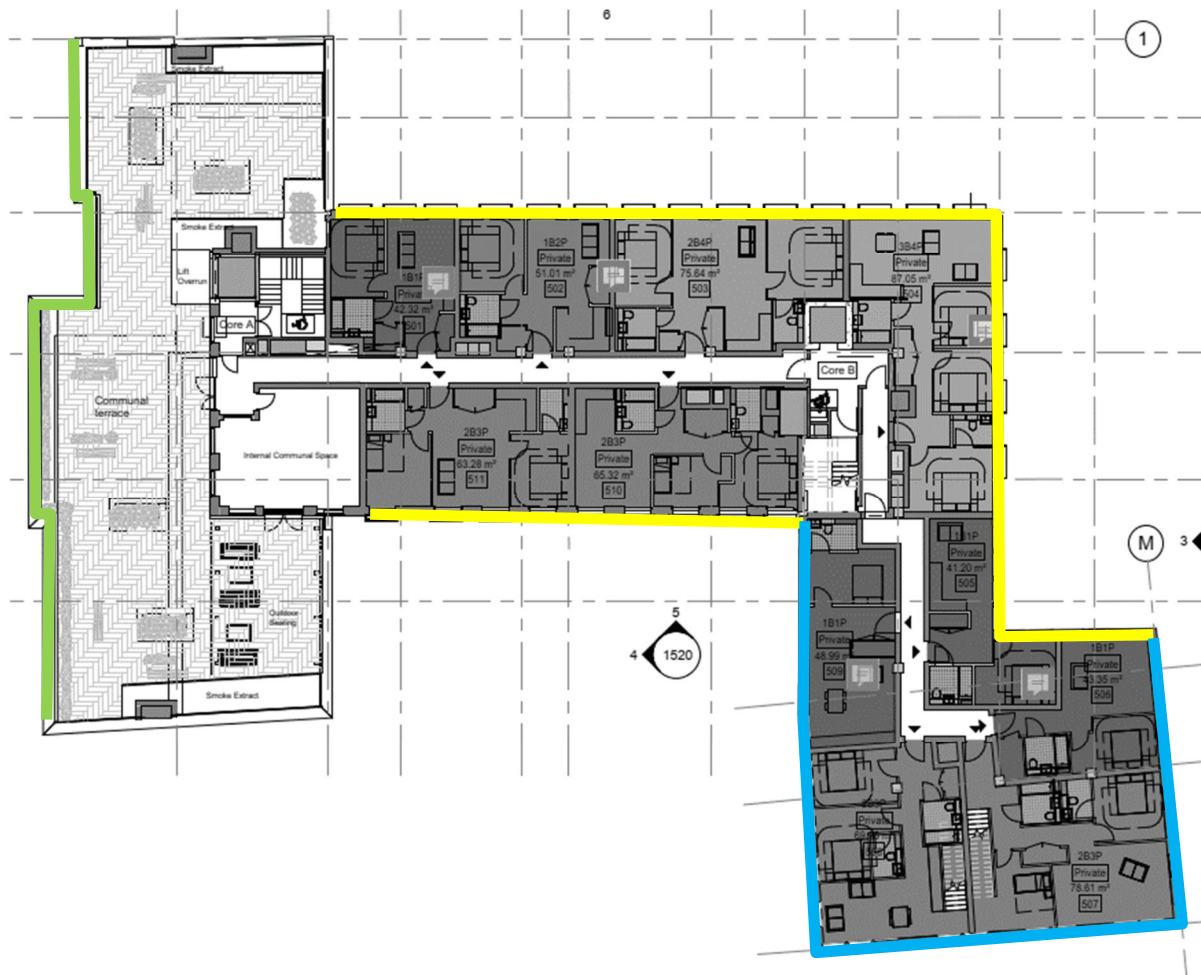


**Figure 6.1 - Different locations for glazing types**

It is important that the performances shown in Table 6.2 are achieved by the entire windowset including frames, seals, etc. Glass performance alone would not be likely to show compliance with the specification as the other elements typically provide the weakest noise transmission path.

With the above recommendations implemented, the average, maximum and character-corrected BS4142 rating levels within the proposed dwellings would be expected to be in line with recommendations given in the WHO 1999 and BS8233:2014 guidance. Internal noise levels can therefore be considered to be between the NOEL the LOAEL levels.

### 6.3 Ventilation

The intent is that ventilation will be achieved using a mechanical ventilation solution.

The MVHR system will be designed to meet Building Regulations for new properties under System Four of Building Regulations Part F.

The system will simulate an open window, enabling windows to remain shut. MVHR is a continuous source of ventilation that extracts stale, moisture-laden air from a building and resupplies fresh, filtered air back in, resulting in a comfortable and condensation free environment all year round.

This air is passed over a heat exchange cell which recovers and retains the heat that would otherwise be lost from the extracted air. This heat is then transferred to incoming fresh, filtered air that the unit is resupplying back into the units resulting in well ventilated units with minimal heat losses in winter and cool rooms in summer.

MVHR systems are commonplace in locations where the surrounding noise levels are such that windows need to remain shut. This is recognised in the Reading Borough Local Plan where it is stated for Central Reading and in relation to specific developments sites (including this site) that: ‘... *in order for the internal noise levels to be reasonable and not adversely affect health it would be necessary to provide a system of ventilation that entirely removes the necessity to open windows, even in very hot weather.*’ (paragraphs 5.3.25 and 5.4.35)

The Planning Practice Guidance also advocates the use of ventilation systems where windows have to be kept closed because of noise arising from existing businesses.

## 6.4 Areas of External Amenity

External noise levels comply with the World Health Organisation guideline value for external amenity of  $L_{Aeq,16\text{hour}}$  55dB. Figure 6.2 to Figure 6.4 show the different amenity areas at fourth to sixth floor level. Areas shown highlighted in green already meet the WHO Guideline levels of 55dB, with the areas highlighted in orange being above these levels.



Figure 6.2 – Fourth floor amenity areas



**Figure 6.3 – Fifth floor amenity areas**



**Figure 6.4 – Sixth floor amenity areas**

At fourth and fifth floor level, a solid balcony screen should be installed to increase the western edge of the building to reduce traffic noise from Market Place.

In addition to this, the south eastern portion of the fifth floor amenity area should have a screen installed to the parapet of the communal terrace to the area overlooking the hotel plant area to remove line of sight to the hotel plant, approximately along the line shown in purple in Figure 6.5.

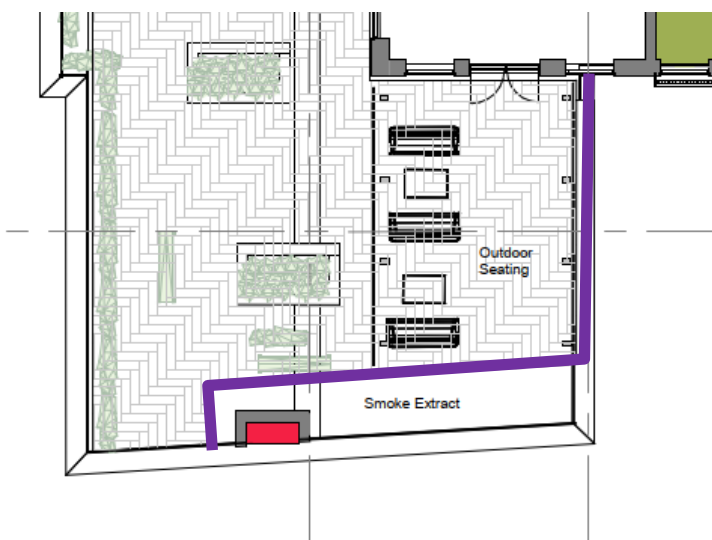


Figure 6.5 – Approximate amenity space screen

With these measures in place, the outdoor noise levels across the site can therefore be considered to fall between the LOAEL and SOAEL levels, generally being below the level that is expected to cause significant annoyance.

## 7. Plant Noise Emissions

### 7.1 Emergency Plant

Based upon the proposed limit in section 2.6, emergency plant noise level should not exceed the levels shown in Table 7.1. Testing should only take place during the working day, nominally between 09:00 and 17:00, Monday to Friday.

| Monitoring Period   | Design Criterion ( $L_{Aeq}$ ) |
|---------------------|--------------------------------|
| 07:00 – 23:00 hours | 55 dB                          |
| 23:00 – 07:00 hours | 52 dB                          |

Table 7.1 – Emergency plant sound pressure levels not to be exceeded at most affected noise sensitive receivers

### 7.2 Fixed Plant

Although it is understood that the only external plant would be for emergency purposes, should there be an intent to install external plant in the future, the following plant specific sound levels should not be exceeded at the most affected noise sensitive receivers:

| Monitoring Period   | Design Criterion ( $L_{Aeq}$ ) |
|---------------------|--------------------------------|
| 07:00 – 23:00 hours | 35 dB                          |
| 23:00 – 07:00 hours | 32 dB                          |

Table 7.2 – Specific sound pressure levels not to be exceeded at most affected noise sensitive receivers

Any air handling and extract plant will need to be fitted with acoustically specified splitter silencers in order that the cumulative noise level at noise-sensitive receptors does not exceed the relevant design noise criterion.

## 8. Conclusion

Noise surveys have been undertaken by Venta Acoustics to establish the noise climate in the locality of Soane Point, 3-10 Market Place, Reading.

The measured noise levels have been assessed against BS4142:2014 *Methods for rating and assessing industrial and commercial sound*, BS8233: 2014 *Guidance on sound insulation and noise reduction for buildings* and the World Health Organisation *Guidelines for Community Noise* (1999) to assess potential noise impacts on the new apartments in the rooftop extension and the converted elements of the existing car park.

When assessed using BS4142, noise from hotel plant, kitchen plant and HGV noise associated with deliveries have been shown to have a marginal/significant impact on the new dwellings.

Traffic and general ambient noise has been assessed against the requirements of BS8233 and the WHO Guidelines.

Appropriate external and internal noise criteria have been considered to minimise adverse impacts on health and quality of life as a result of the new development.

A discussion regarding the control of noise in the form of building envelope performance and mechanical ventilation has been included and through the use of this, it is considered that external noise source can be reduced to acceptable internal noise levels.

For external amenity areas, screens have been recommended to control noise levels on the western terraces at fourth and fifth floor level.

With the recommended mitigation measures in place, the proposed residential dwellings are not expected to experience a significant adverse noise impact from commercial premises or the general noise levels in the area, would be considered to comply with the intents of the NPPF and the Reading Local Plan, and the site is considered acceptable for the proposed residential use.

**Jamie Duncan MIOA**

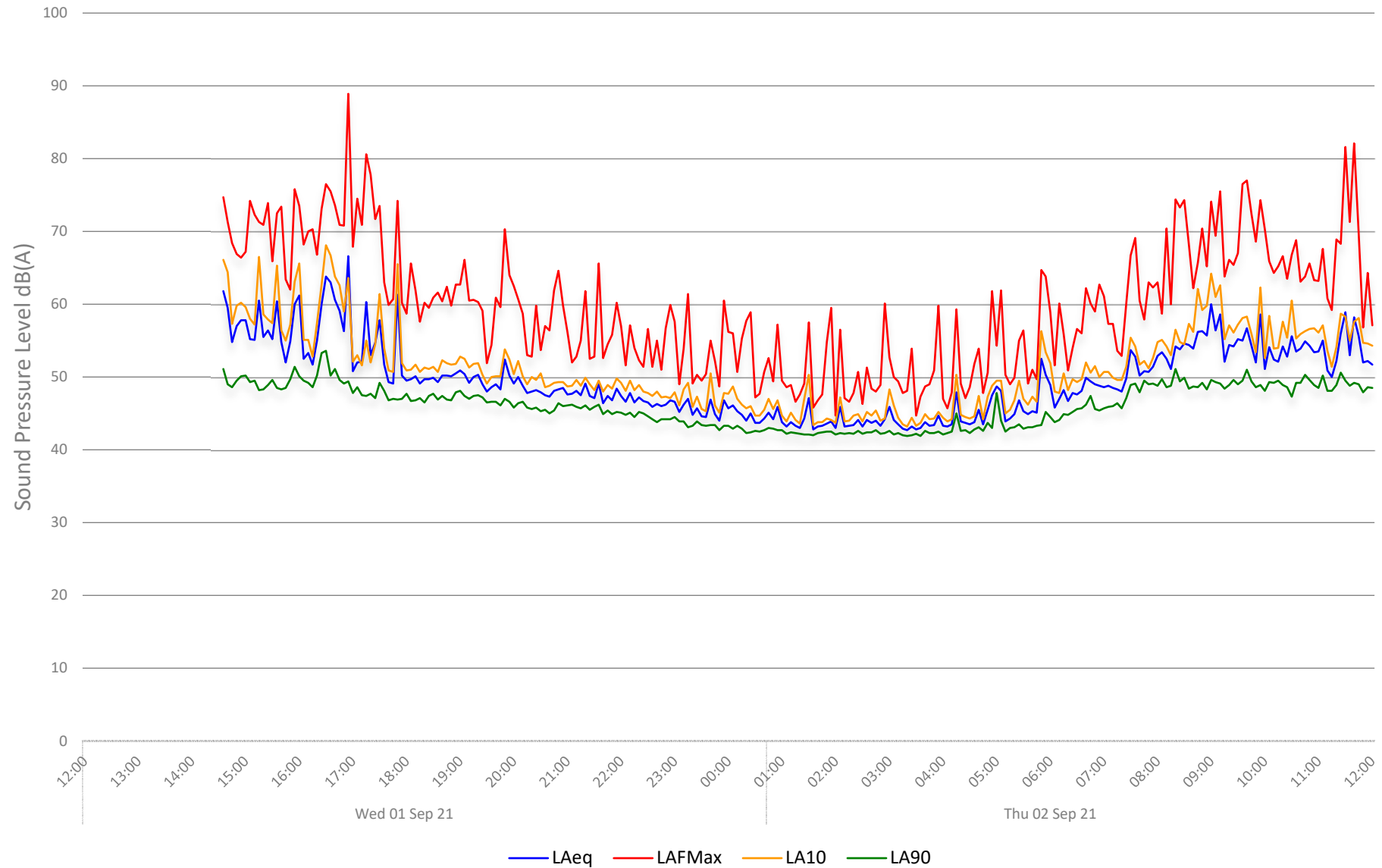
Soane Point, 3-10 Market Place, Reading

Environmental Noise Time History: 1

Position 1



Figure VA4297/TH1



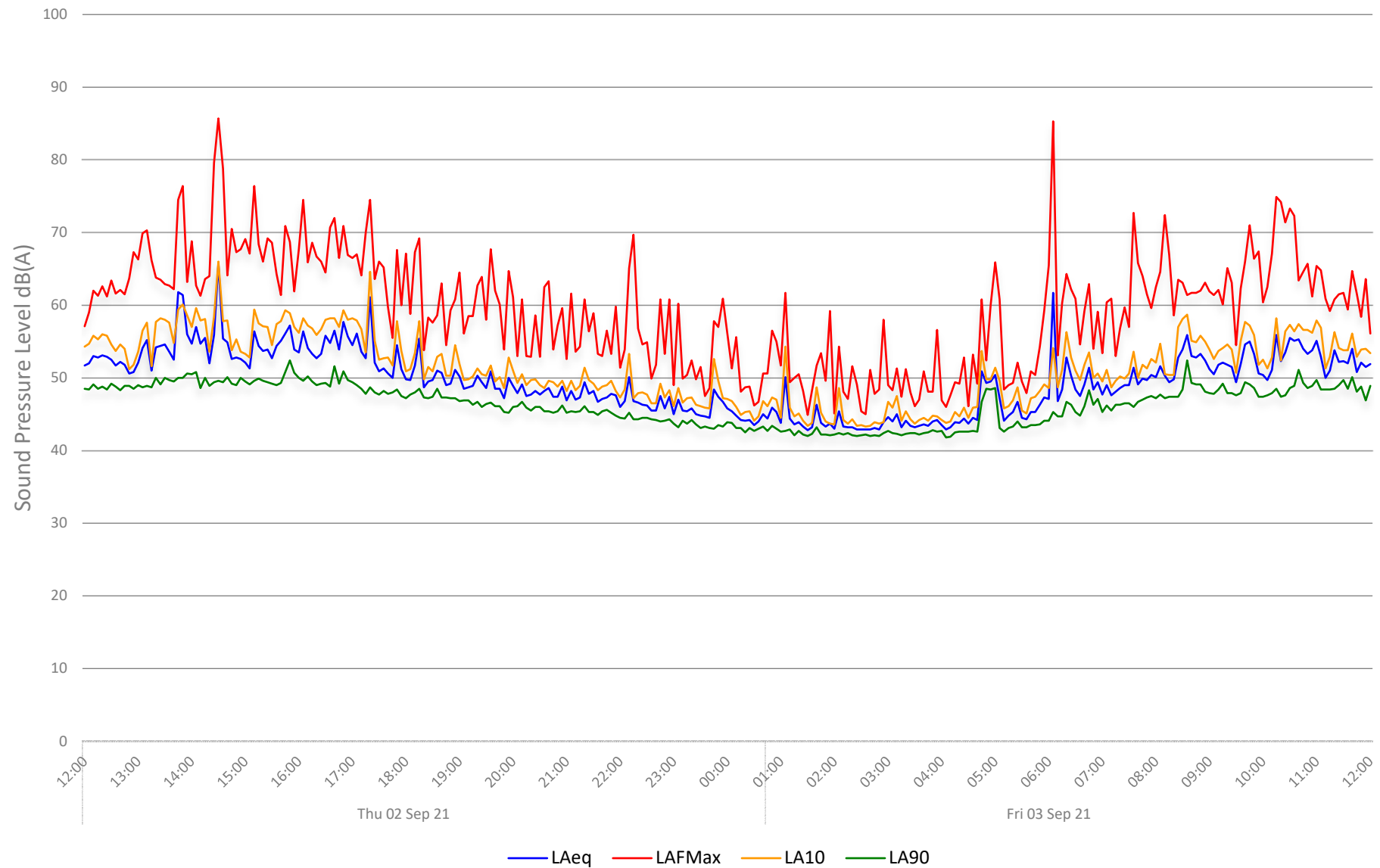
Soane Point, 3-10 Market Place, Reading

Environmental Noise Time History: 2

Position 1



Figure VA4297/TH2



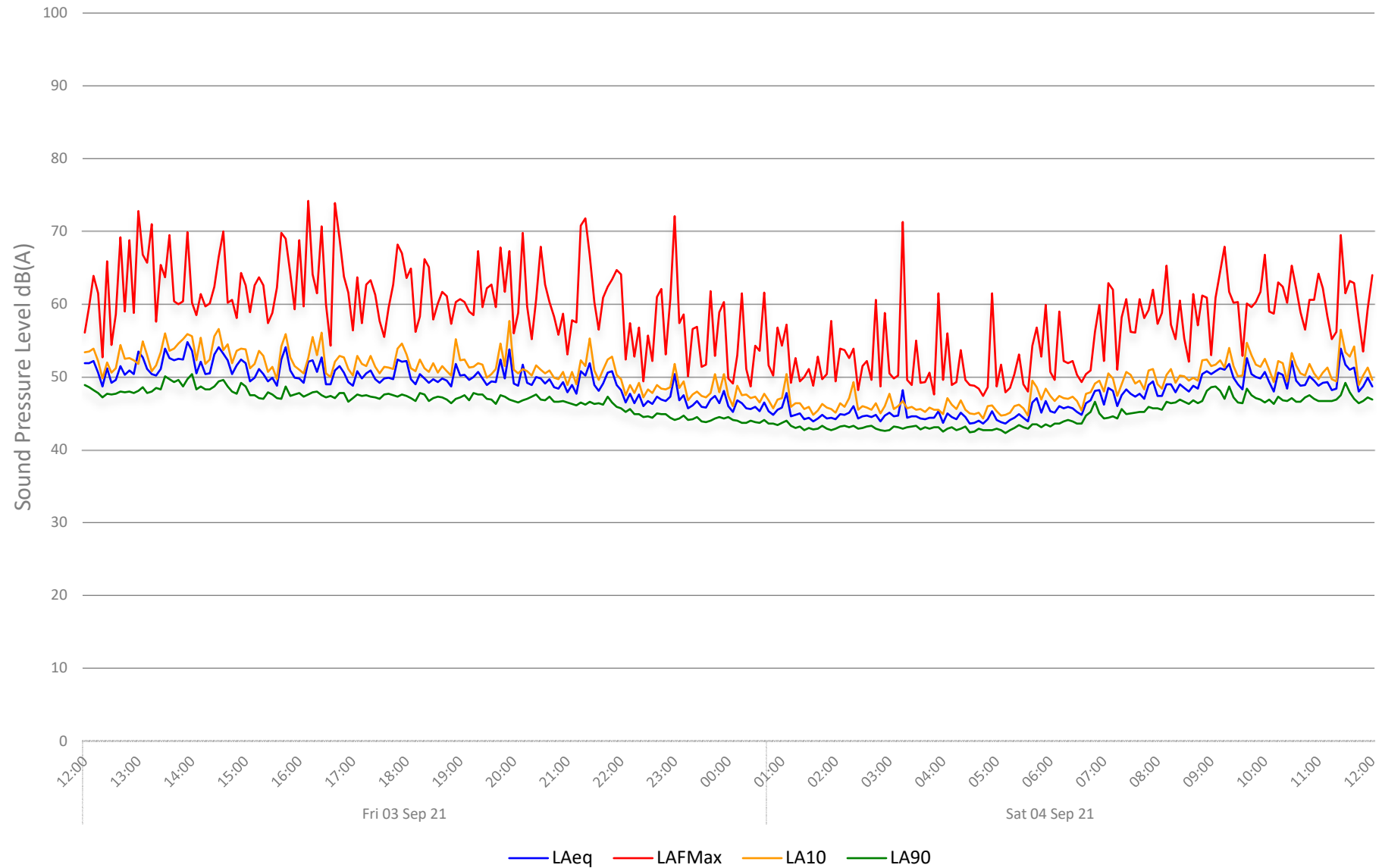
Soane Point, 3-10 Market Place, Reading

Environmental Noise Time History: 3

Position 1



Figure VA4297/TH3



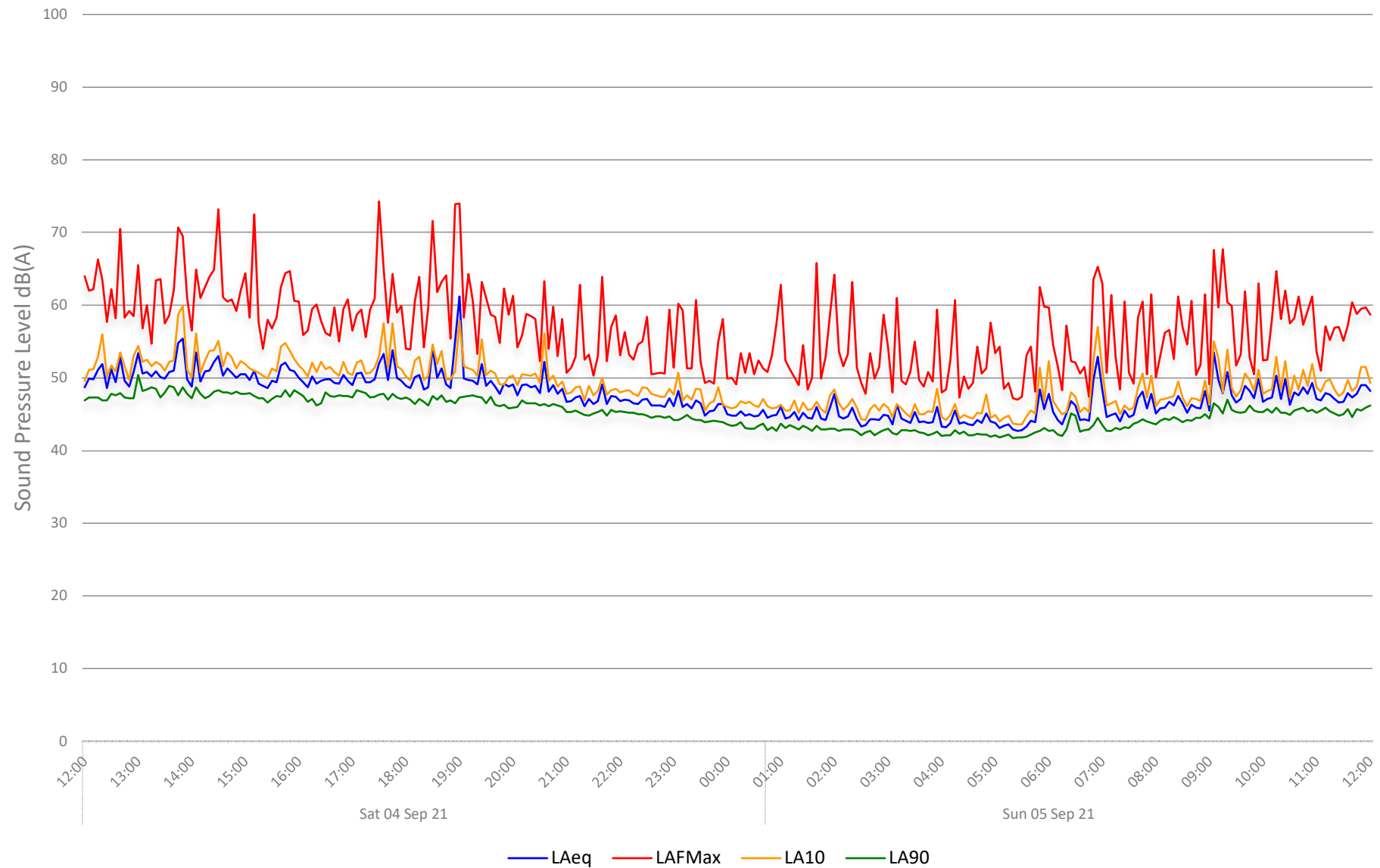
Soane Point, 3-10 Market Place, Reading

Environmental Noise Time History: 4

Position 1



Figure VA4297/TH4



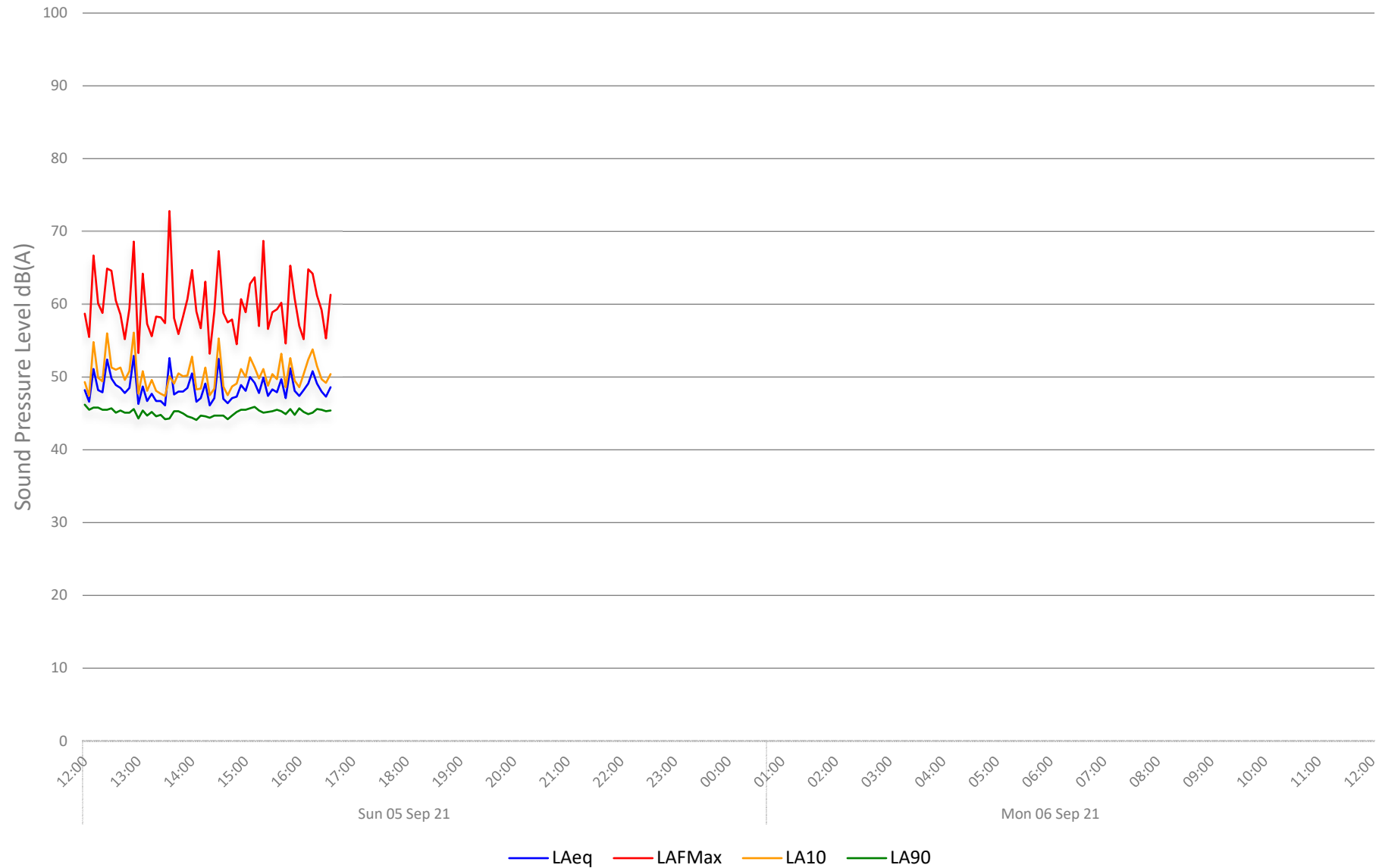
Soane Point, 3-10 Market Place, Reading

Environmental Noise Time History: 5

Position 1



Figure VA4297/TH5



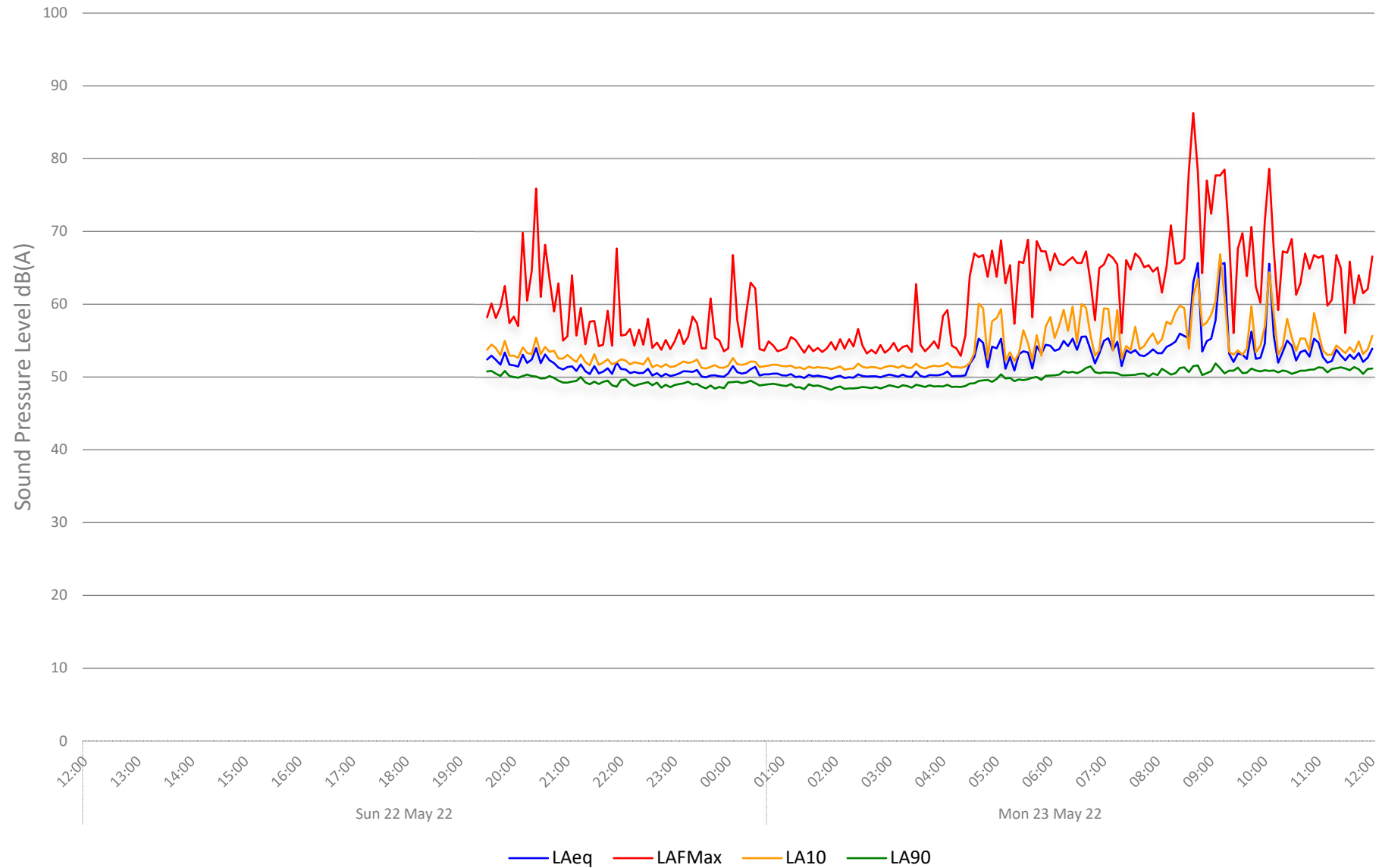
Soane Point, 3-10 Market Place, Reading

Environmental Noise Time History: 6

Position 2



Figure VA4297/TH6



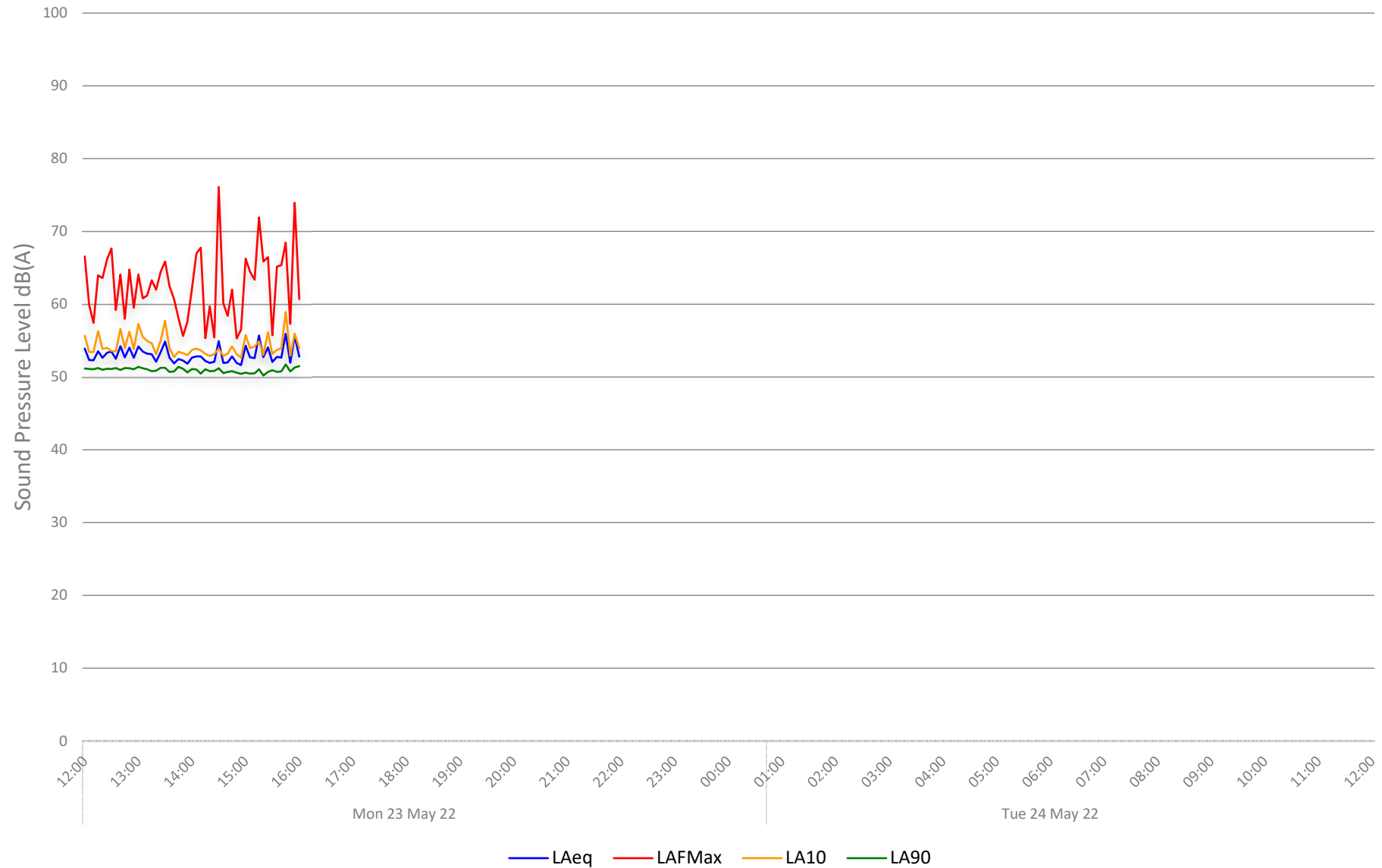
Soane Point, 3-10 Market Place, Reading

Environmental Noise Time History: 7

Position 2



Figure VA4297/TH7



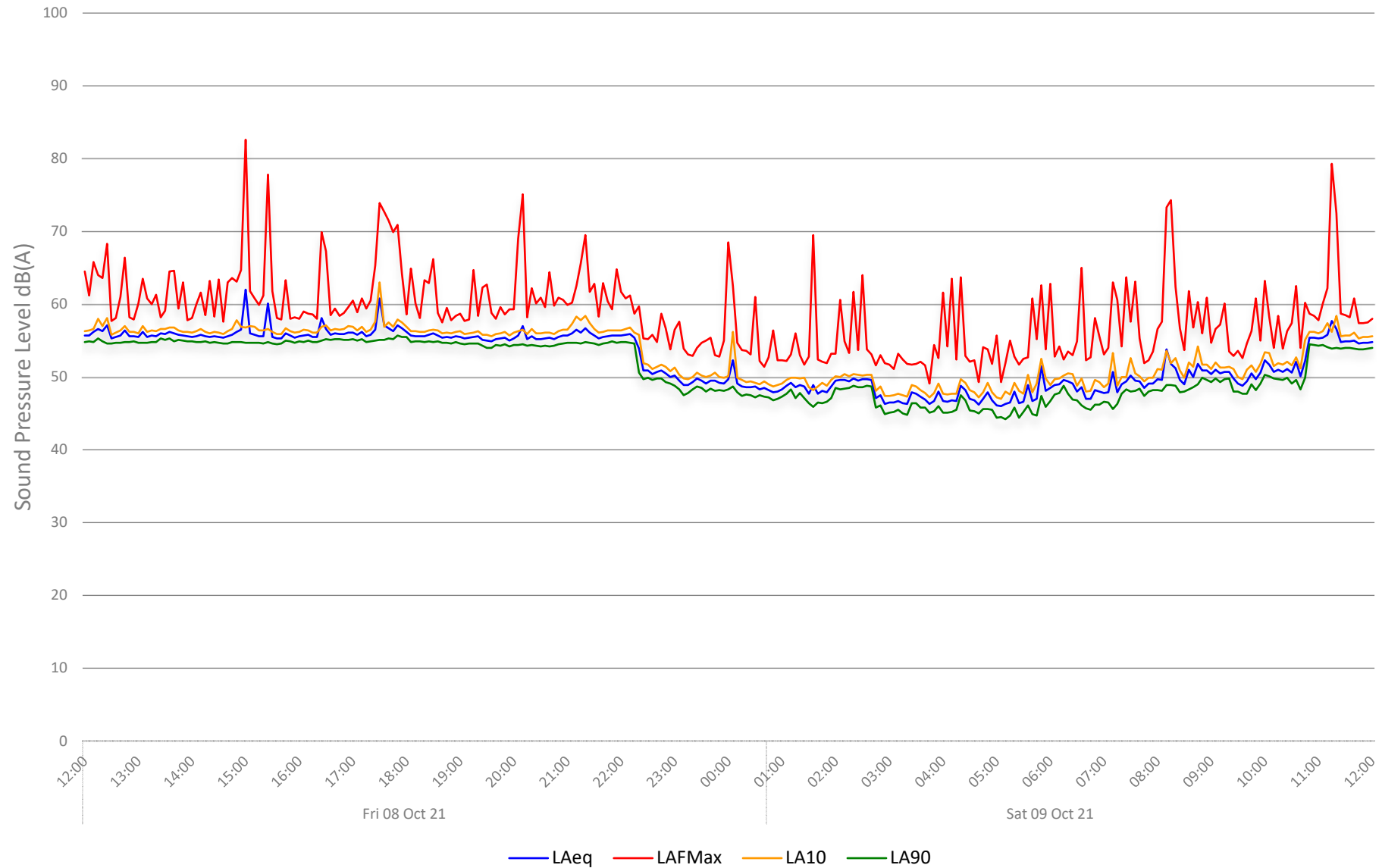
Soane Point, 3-10 Market Place, Reading

Environmental Noise Time History: 8

Position 3



Figure VA4297/TH8



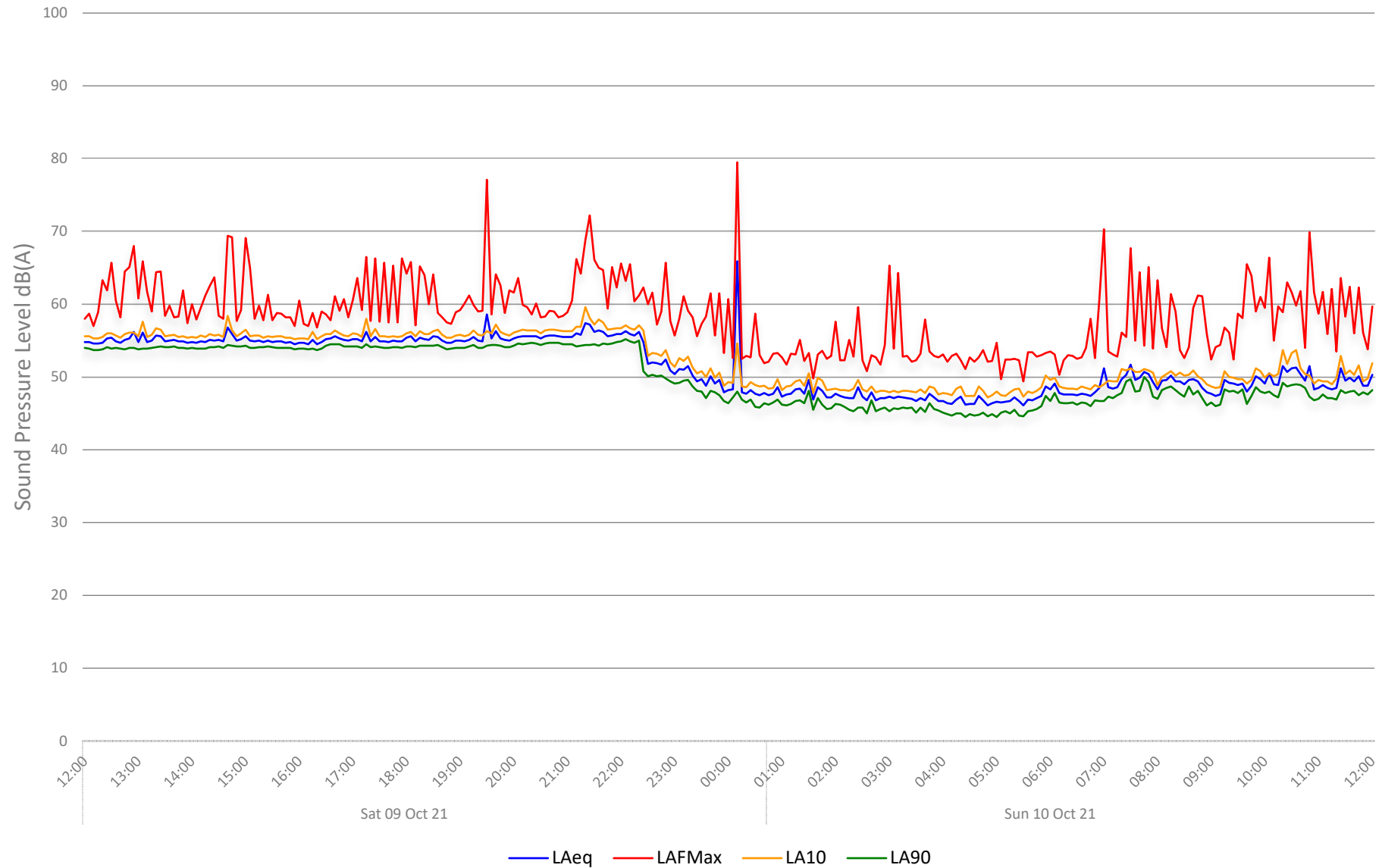
Soane Point, 3-10 Market Place, Reading

Environmental Noise Time History: 9

Position 3



Figure VA4297/TH9



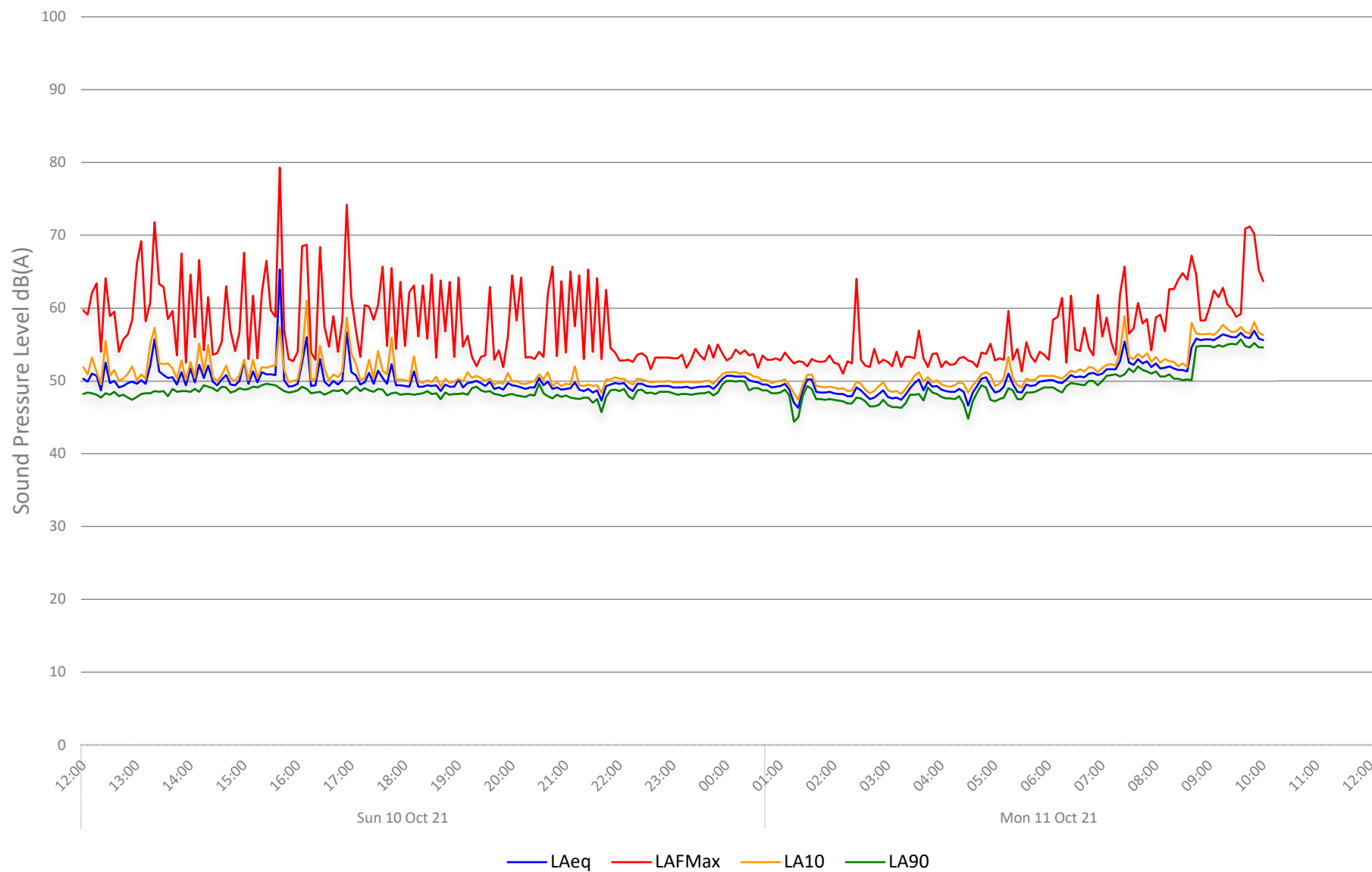
Soane Point, 3-10 Market Place, Reading

Environmental Noise Time History: 10

Position 3



Figure VA4297/TH10



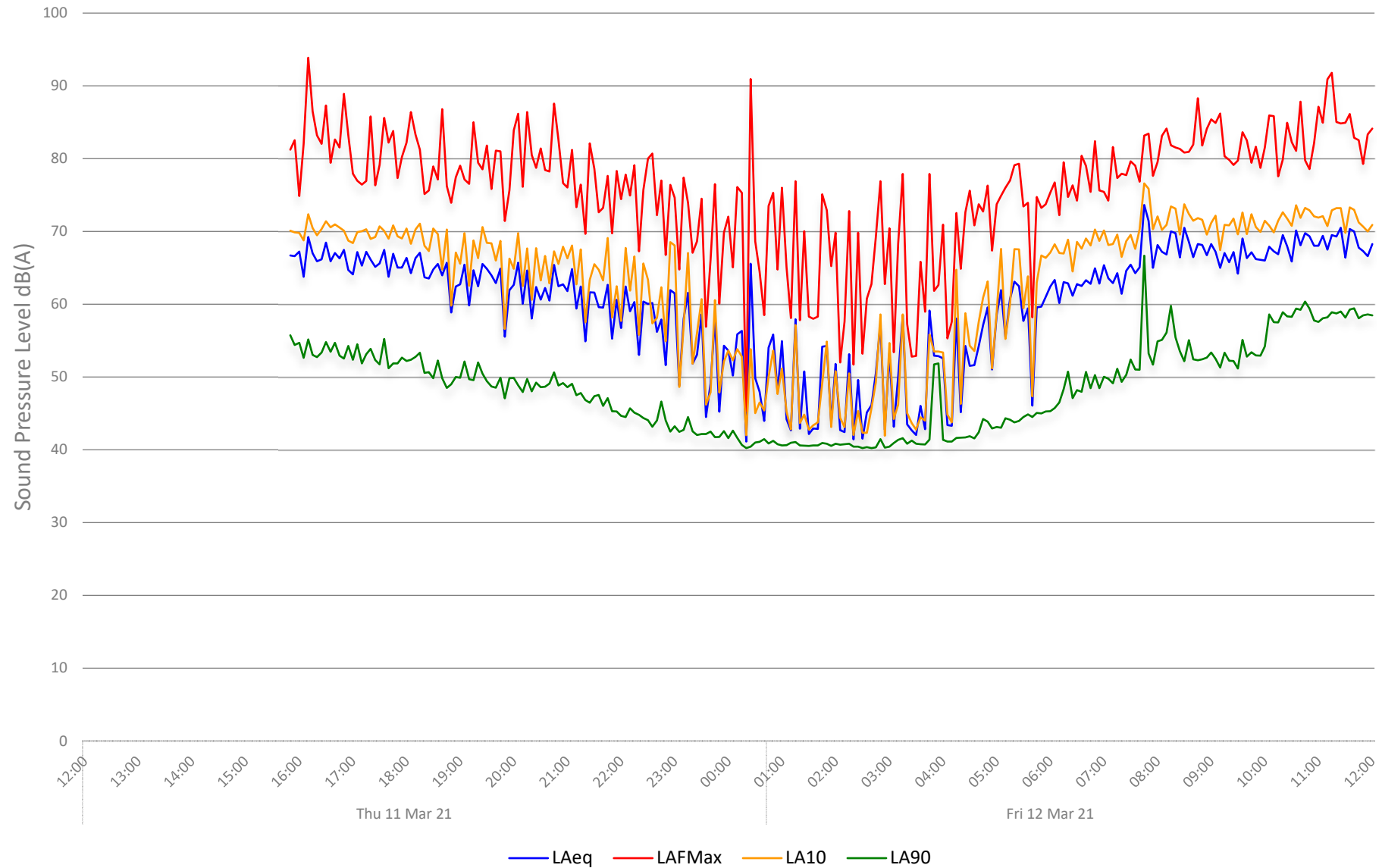
Soane Point, 3-10 Market Place, Reading

Environmental Noise Time History: 11

Position 4



Figure VA4297/TH11



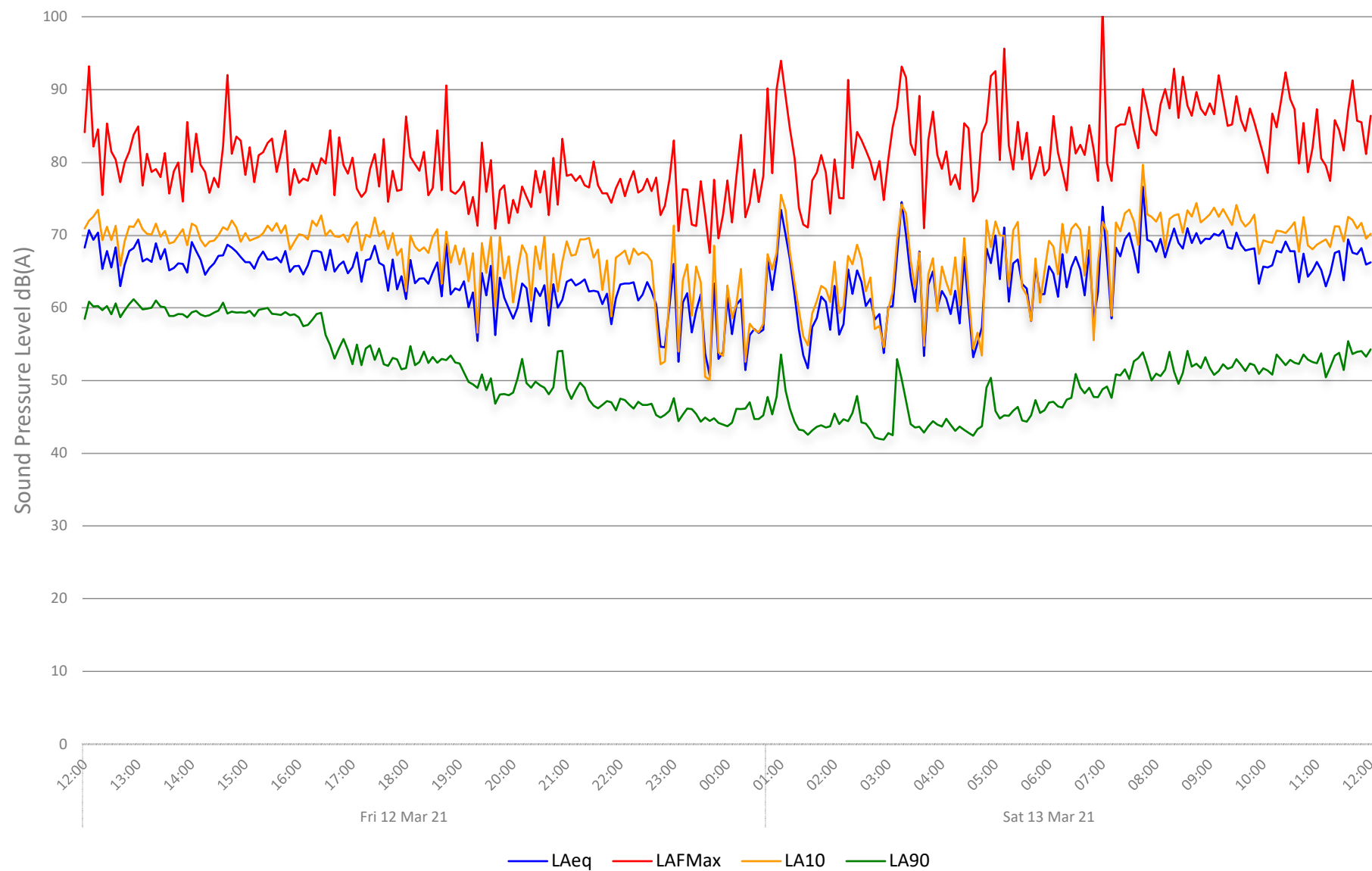
Soane Point, 3-10 Market Place, Reading

Environmental Noise Time History: 12

Position 4



Figure VA4297/TH12



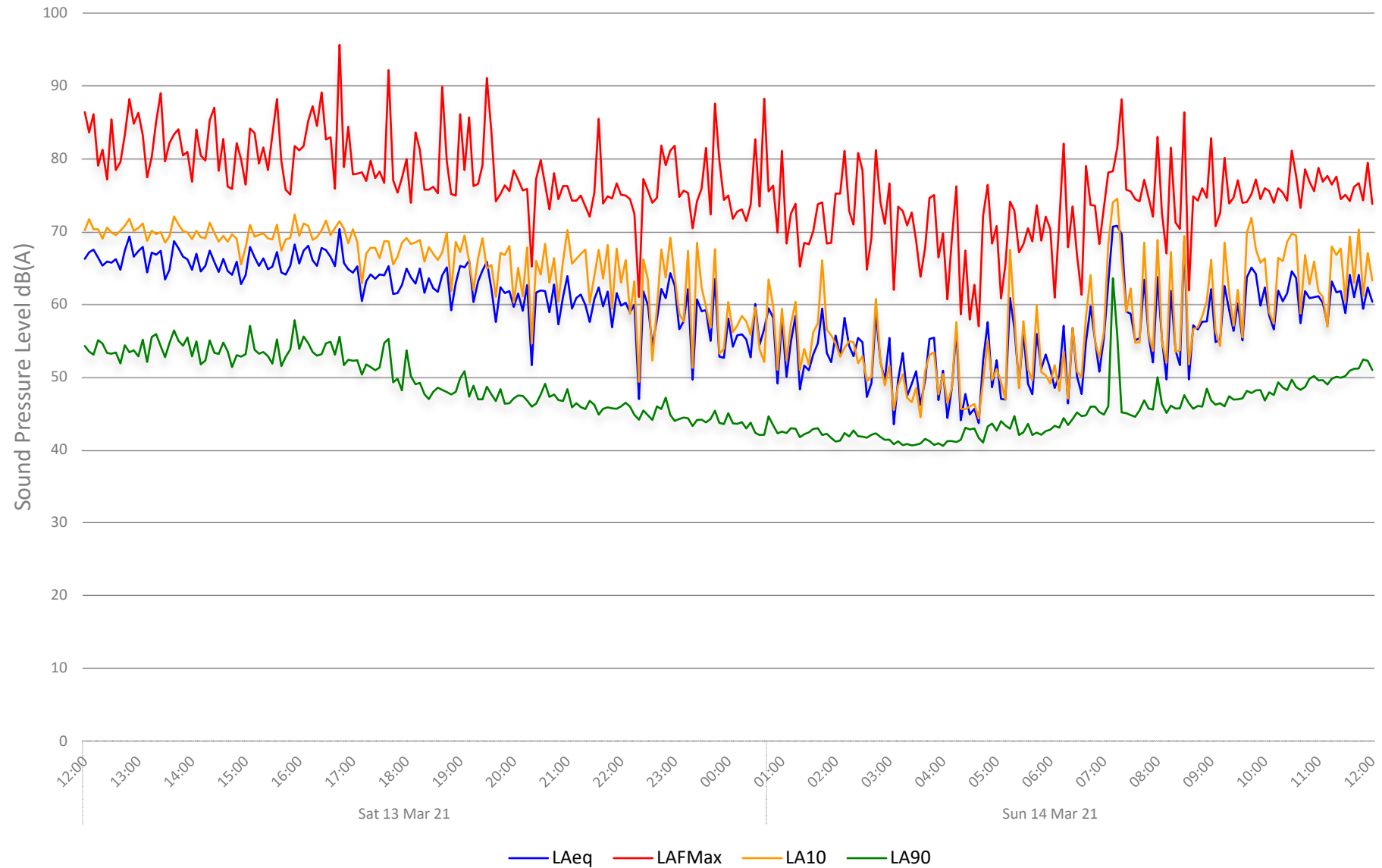
Soane Point, 3-10 Market Place, Reading

Environmental Noise Time History: 13

Position 4



Figure VA4297/TH13



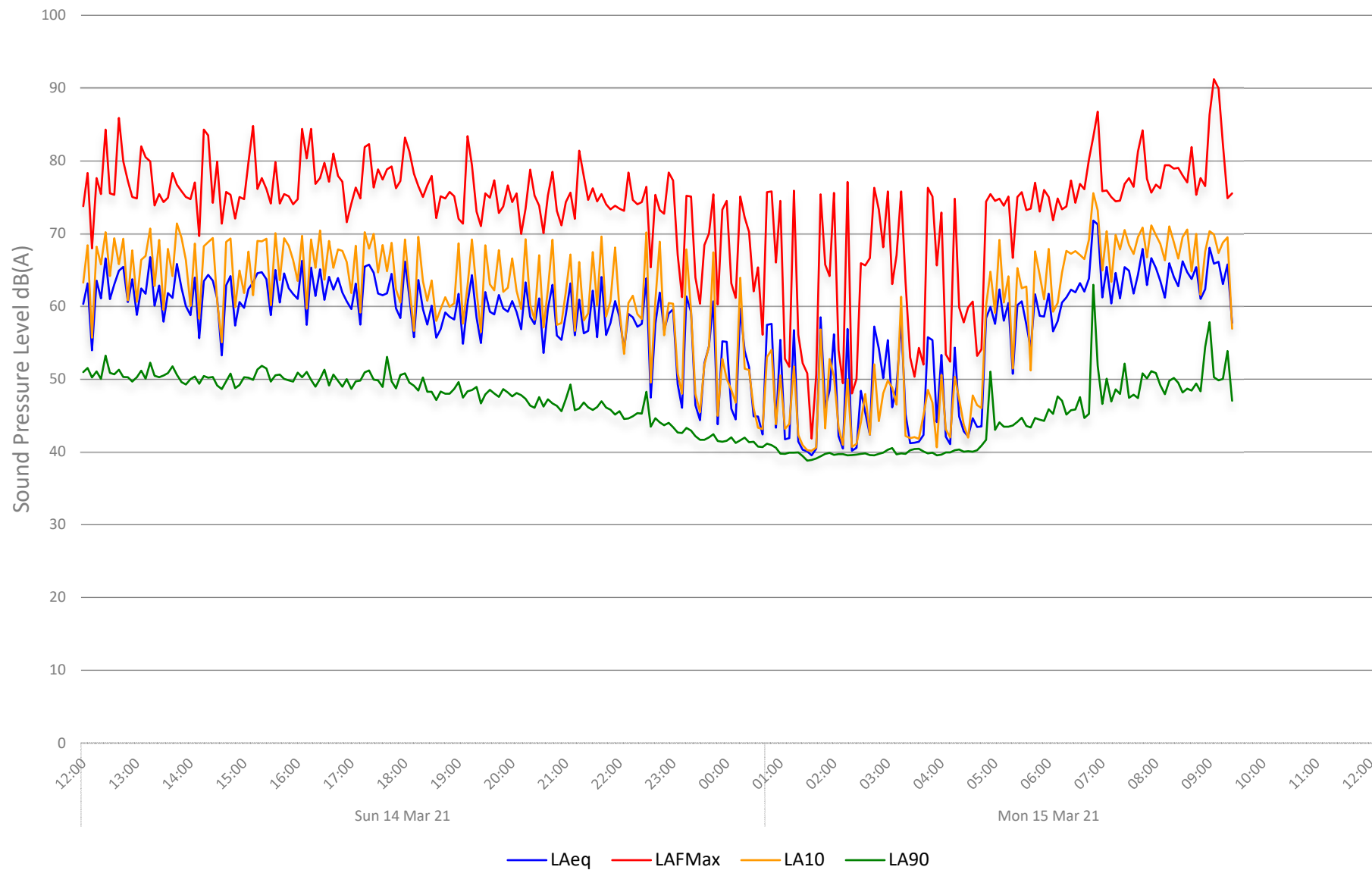
Soane Point, 3-10 Market Place, Reading

Environmental Noise Time History: 14

Position 4



Figure VA4297/TH14



# APPENDIX A

## Acoustic Terminology & Human Response to Broadband Sound

### 1.1 Acoustic Terminology

The human impact of sounds is dependent upon many complex interrelated factors such as 'loudness', its frequency (or pitch) and variation in level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

|                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sound</b>                                           | Vibrations propagating through a medium (air, water, etc.) that are detectable by the auditory system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Noise</b>                                           | Sound that is unwanted by or disturbing to the perceiver.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Frequency</b>                                       | The rate per second of vibration constituting a wave, measured in Hertz (Hz), where 1Hz = 1 vibration cycle per second. The human hearing can generally detect sound having frequencies in the range 20Hz to 20kHz. Frequency corresponds to the perception of 'pitch', with low frequencies producing low 'notes' and higher frequencies producing high 'notes'.                                                                                                                                                                                                                                           |
| <b>dB(A):</b>                                          | Human hearing is more susceptible to mid-frequency sounds than those at high and low frequencies. To take account of this in measurements and predictions, the 'A' weighting scale is used so that the level of sound corresponds roughly to the level as it is typically discerned by humans. The measured or calculated 'A' weighted sound level is designated as dB(A) or $L_A$ .<br>A notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 8 hour, 1 hour, etc).        |
| <b><math>L_{eq}</math> :</b>                           | The concept of $L_{eq}$ (equivalent continuous sound level) has primarily been used in assessing noise from industry, although its use is becoming more widespread in defining many other types of sounds, such as from amplified music and environmental sources such as aircraft and construction.<br><br>Because $L_{eq}$ is effectively a summation of a number of events, it does not in itself limit the magnitude of any individual event, and this is frequently used in conjunction with an absolute sound limit.                                                                                  |
| <b><math>L_{10}</math> &amp; <math>L_{90}</math> :</b> | Statistical $L_n$ indices are used to describe the level and the degree of fluctuation of non-steady sound. The term refers to the level exceeded for n% of the time. Hence, $L_{10}$ is the level exceeded for 10% of the time and as such can be regarded as a typical maximum level. Similarly, $L_{90}$ is the typical minimum level and is often used to describe background noise.<br>It is common practice to use the $L_{10}$ index to describe noise from traffic as, being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic flow. |
| <b><math>L_{max}</math> :</b>                          | The maximum sound pressure level recorded over a given period. $L_{max}$ is sometimes used in assessing environmental noise, where occasional loud events occur which might not be adequately represented by a time-averaged $L_{eq}$ value.                                                                                                                                                                                                                                                                                                                                                                |

### 1.2 Octave Band Frequencies

In order to determine the way in which the energy of sound is distributed across the frequency range, the International Standards Organisation has agreed on "preferred" bands of frequency for sound measurement and analysis. The widest and most commonly used band for frequency measurement and analysis is the Octave Band. In these bands, the upper frequency limit is twice the lower frequency limit, with the band being described by its "centre frequency" which is the average (geometric mean) of the upper and lower limits, e.g. 250 Hz octave band extends from 176 Hz to 353 Hz. The most commonly used octave bands are:

|                                 |  |    |  |     |  |     |  |     |  |      |  |      |  |      |  |      |
|---------------------------------|--|----|--|-----|--|-----|--|-----|--|------|--|------|--|------|--|------|
| Octave Band Centre Frequency Hz |  | 63 |  | 125 |  | 250 |  | 500 |  | 1000 |  | 2000 |  | 4000 |  | 8000 |
|---------------------------------|--|----|--|-----|--|-----|--|-----|--|------|--|------|--|------|--|------|

# APPENDIX A

## Acoustic Terminology & Human Response to Broadband Sound

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### 1.3 Human Perception of Broadband Noise

Because of the logarithmic nature of the decibel scale, it should be borne in mind that sound levels in dB(A) do not have a simple linear relationship. For example, 100dB(A) sound level is not twice as loud as 50dB(A). It has been found experimentally that changes in the average level of fluctuating sound, such as from traffic, need to be of the order of 3dB before becoming definitely perceptible to the human ear. Data from other experiments have indicated that a change in sound level of 10dB is perceived by the average listener as a doubling or halving of loudness. Using this information, a guide to the subjective interpretation of changes in environmental sound level can be given.

| Change in Sound Level<br>dB | Subjective Impression                             | Human Response   |
|-----------------------------|---------------------------------------------------|------------------|
| 0 to 2                      | Imperceptible change in loudness                  | Marginal         |
| 3 to 5                      | Perceptible change in loudness                    | Noticeable       |
| 6 to 10                     | Up to a doubling or halving of loudness           | Significant      |
| 11 to 15                    | More than a doubling or halving of loudness       | Substantial      |
| 16 to 20                    | Up to a quadrupling or quartering of loudness     | Substantial      |
| 21 or more                  | More than a quadrupling or quartering of loudness | Very Substantial |