NOISE EXPOSURE ASSESSMENT

PROJECT:

19 BETWEEN TOWNS ROAD OXFORD

TEST REPORT REF: 15142-NEA-01

DATE: **10/09/2019**

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List of Attachments

1.0 INTRODUCTION

Clement Acoustics has been commissioned by ERS Consultants Ltd to assess the suitability of the site at 19 Between Towns Road, Oxford OX4 3LX for residential development in accordance with the National Planning Policy Framework (NPPF): 2019.

Proposals are to demolish Cowley Conservative Club to comprise 223 residential units for students over four storeys.

This report presents the results of environmental noise surveys undertaken in order to measure prevailing background levels and outlines any necessary mitigation measures.

2.0 SITE DESCRIPTION

The proposed development site is currently vacant, with plans to comprise 223 residential units. The site is in a mixed residential and commercial facing on to Between Towns Road, an urban dual carriageway largely populated by residential flats, commercial retail units and offices. The site is bound by Between Towns Road to the north-west, St Luke's Road to the south-west, houses to the south-east and car parks to the north-east.

At the time of the survey, the background noise climate was dominated by road traffic and pedestrian noise from Between Towns Road.

3.0 ENVIRONMENTAL NOISE SURVEY

3.1 Procedure

A noise survey was undertaken at two positions on the proposed site as shown in Figure 15142-SP1. The locations were chosen based on accessibility and in order to obtain representative noise levels due to the main observed noise sources around the site.

The surroundings and position used for each monitoring location was as follows:

- Position 1: The microphone was mounted on a 1st storey window at the front of the building. The microphone was positioned 1 m in front of the window and as such the monitoring position is not considered free-field according to the guidance of BS 8233: 2014. Based on the presence of the reflective surface and the nature of surrounding noise sources, a correction for reflections of 2 dB has been applied, in line with the recommendations of the standard. Noise levels at Position 1 were dominated by road traffic noise during collection and installation of equipment. There is a social club/venue and snooker club opposite the premises, and an adjacent block of student residence due to open September 2019.
- Position 2: The microphone was mounted on a 1st storey window at the rear of the building. The microphone was positioned 1 m in front of the window and as such the monitoring position is not considered free-field according to the guidance of BS 8233: 2014. Based on the presence of the reflective surface and the nature of surrounding noise sources, a correction for reflections of 2 dB has been applied, in line with the recommendations of the standard. Noise levels at Position 2 were dominated by road traffic noise during collection and installation of equipment.

Continuous automated monitoring was undertaken for the duration of the survey between 10:30 on 23 August 2019 and 12:00 on 27 August 2019. Monitoring periods were chosen to ensure periods of rush hour traffic and noise due to nearby weekend activities was encapsulated.

Weather conditions were generally dry with light winds, therefore suitable for the measurement of environmental noise.

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

3.2 Equipment

The equipment calibration was verified before and after use and no abnormalities were observed.

The equipment used was as follows.

- 2 No. Svantek Type 957 Class 1 Sound Level Meter,
- 1 No. Norsonic Type 1251 Class 1 Calibrator.

4.0 CRITERIA

4.1 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)	Design range $L_{eq,T}$ 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: BS8233 recommended internal background noise levels

The latest revision of the document does not include a recommended maximum internal noise level. However, in order to provide a suitably robust assessment, the guidance of the previous document (1999 revision) will be used, which is based on WHO recommendations.

BS 8233: 1999 states that for reasonable standards in a bedroom at night, individual noise events should not normally exceed a maximum noise level L_{AFmax} of 45 dB(A).

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

5.0 RESULTS

5.1 Environmental Noise Survey

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 a time history in Figures 15142-TH1 and 15142-TH2.

	Ambient Noise Level $L_{eq,T}$	**Typical Maximum Noise Level** $L_{Fmax,\ 5min}$
	POSITION 1	
Daytime [07:00 - 23:00]	70 dB(A)	-
Night-time [23:00 - 07:00]	65 dB(A)	82 dB(A)
	POSITION 2	
Daytime [07:00 - 23:00]	53 dB(A)	-
Night-time [23:00 - 07:00]	47 dB(A)	60 dB(A)

Table 5.1: Site noise levels for daytime and night time

The levels presented in Table 5.1 are as expected considering the site location facing a busy main road (B4495). The significant difference between Position 1 and Position 2 is likely due to screening provided by the building itself. 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 6 of this report.

Maximum noise levels shown in Table 5.1 are deemed to be ‘not normally exceeded’ as required for maximum internal noise level specification purposes.

6.0 NOISE EXPOSURE ASSESSMENT

6.1 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. This would contribute towards a significant reduction of ambient noise levels in combination with a good quality window configuration, as shown in Section 6.2.

All non-glazed elements of the building facades have been assumed to provide a sound reduction performance of at least the figures shown in Table 6.1 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 6.1: Non-glazed elements assumed sound reduction performance

6.2 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 4.1.

Calculations were based on bedrooms, which have more onerous requirements particularly during night-time hours. Bedrooms with relatively high ratios of glazing to masonry were selected for the calculations to present a robust assessment.

This specification therefore presents the most robust assessment, for BS 8233: 2014 criteria for internal noise levels in a bedroom at all affected facades.

As a more robust assessment, L_{AFmax} spectrum values of night-time peaks have also been considered and incorporated into the glazing calculation in order to cater for the interior limit of 45 dB L_{AFmax} for individual events, as specified in BS 8233: 1999 and WHO guidance.

The minimum sound reduction index (SRI) value required for all glazed elements to be installed is shown in Table 6.2. The performance is specified for the whole window unit, including the frame and other design features. Suggested locations for Type A and Type B glazing are shown in site plan 15142-SP2. It is recommended that any habitable rooms with line-of-sight to Between Towns Road are treated with glazing Type A.

Glazing Type	Required Sound Insulation for Glazed Elements	Required Sound Insulation for Ventilation
Type A **[*Front Facade*]**	Required Sound Reduction: R_w 39 dB Typical Glazing Configuration[1]: *8.8 mm glass / 12 mm gap / 10 mm glass*	Required Sound Reduction: $D_{n,e,w}$ 42 dB Typical Ventilator[1]: *High Performance Acoustic Trickle Vent*
Type B **[*Rear Facade*]**	Required Sound Reduction: R_w 31 dB Typical Glazing Configuration[1]: *4 mm glass / 12 mm gap / 4 mm glass*	Required Sound Reduction: $D_{n,e,w}$ 23 dB Typical Ventilator[1]: *Generic Trickle Ventilator*

Table 6.2: Required glazing and ventilation performance

[1] The typical configurations shown are for indicative purposes only. Certificated performances should be sought from the manufacturer(s)

All major building elements should be tested in accordance with BS EN ISO 140-3: 1995. Sole glass performance data would not necessarily demonstrate compliance with this specification.

No further mitigation measures would be required to achieve recommended internal noise levels.

7.0 CONCLUSION

An environmental noise survey has been undertaken at 19 Between Towns Road, Oxford 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.

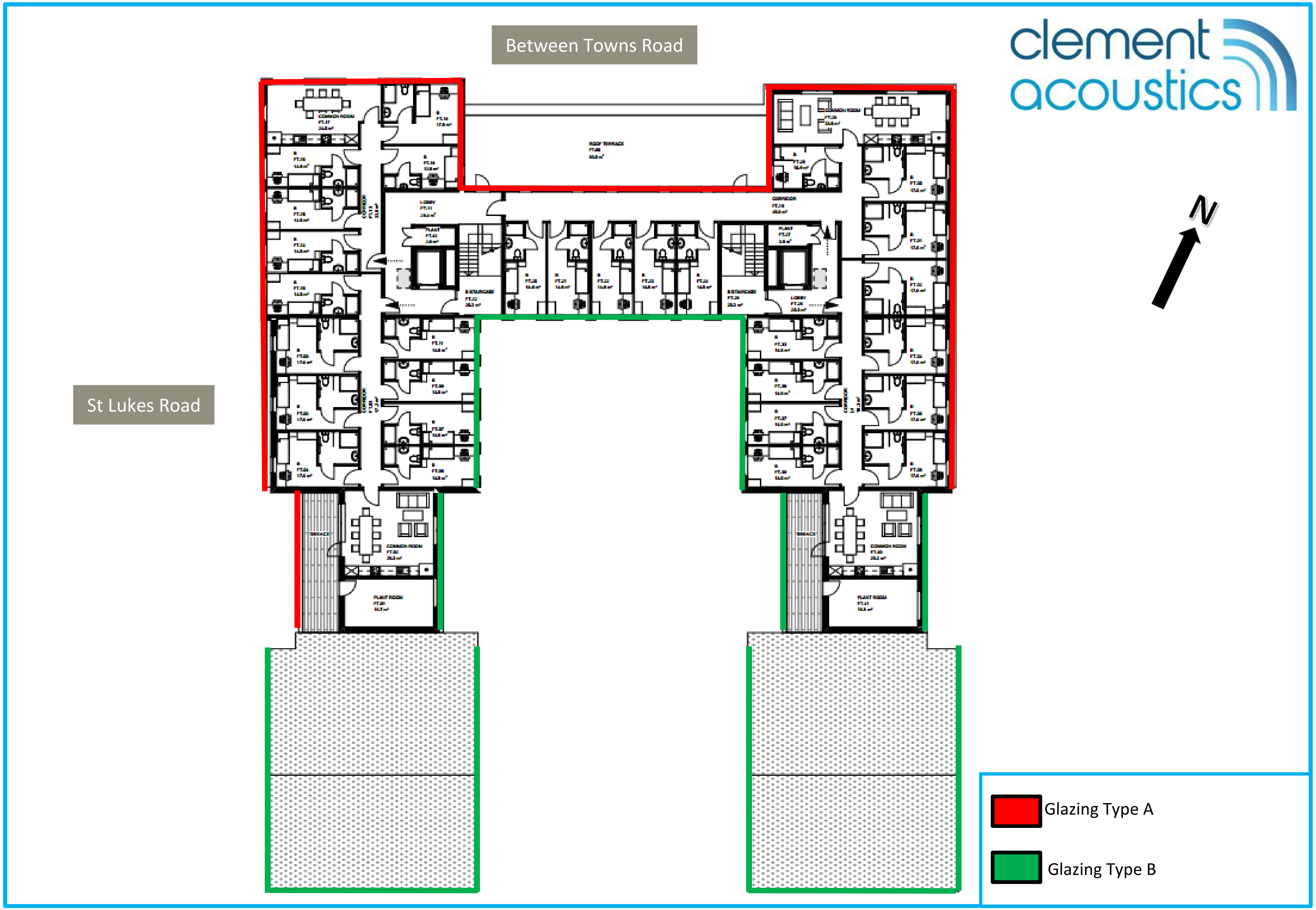
Outline mitigation measures, including a glazing specification and the use of appropriate ventilation have been recommended and should be sufficient to achieve recommended internal noise levels for the proposed development according to BS 8233: 2014.

Report by	Checked by
Peter Shakeshaft AMIOA	**Duncan Martin MIOA**

Noise Survey Positions

15142-SP1 Indicative site plan indicating noise monitoring positions

Date: 10 September 2019



15142-SP2 Indicative site plan indicating glazing configurations.

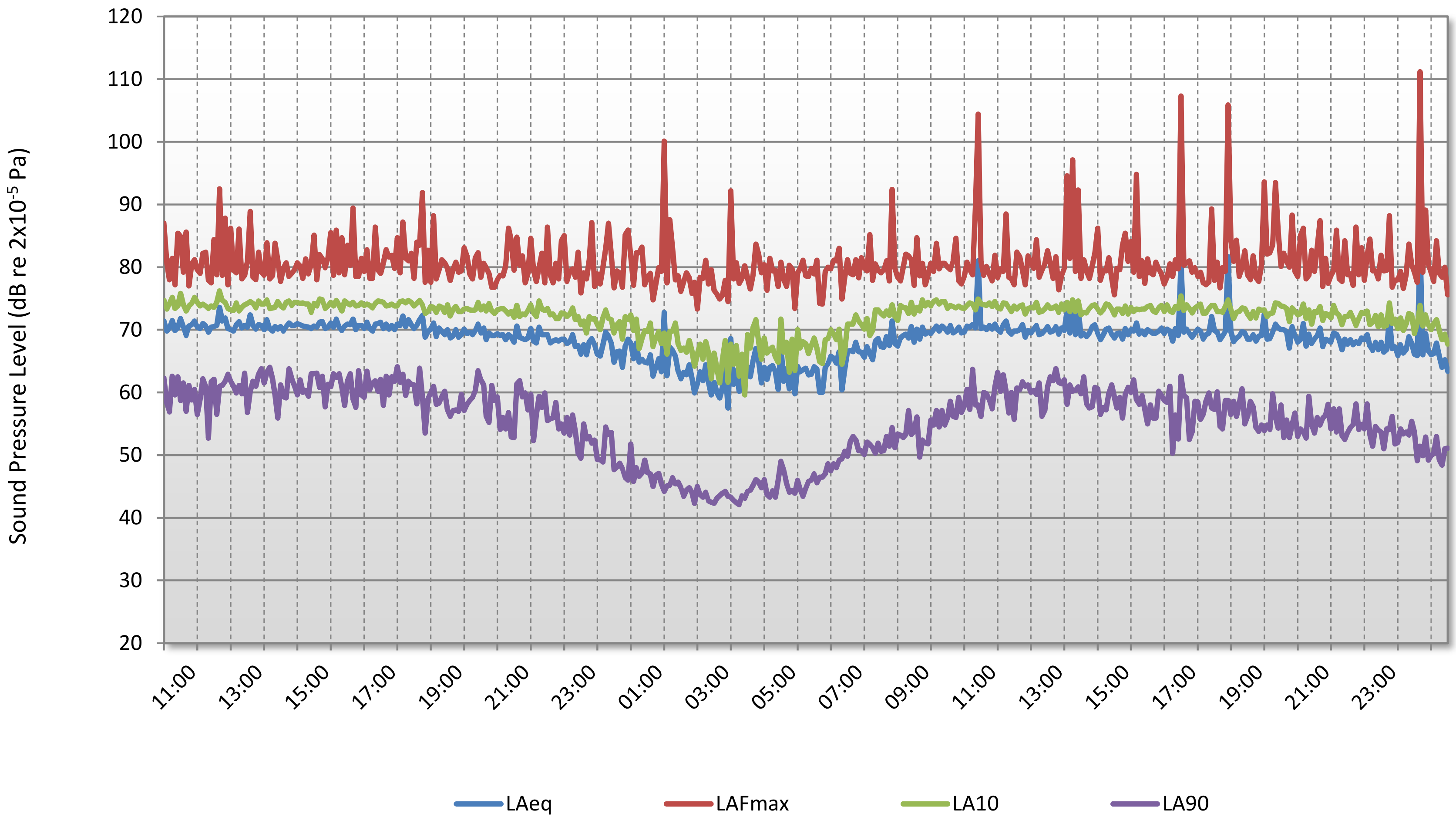
Date: 10 September 2019

19 Between Towns Road, Oxford

Position 1

Environmental Noise Time History

23 August 2019 to 24 August 2019



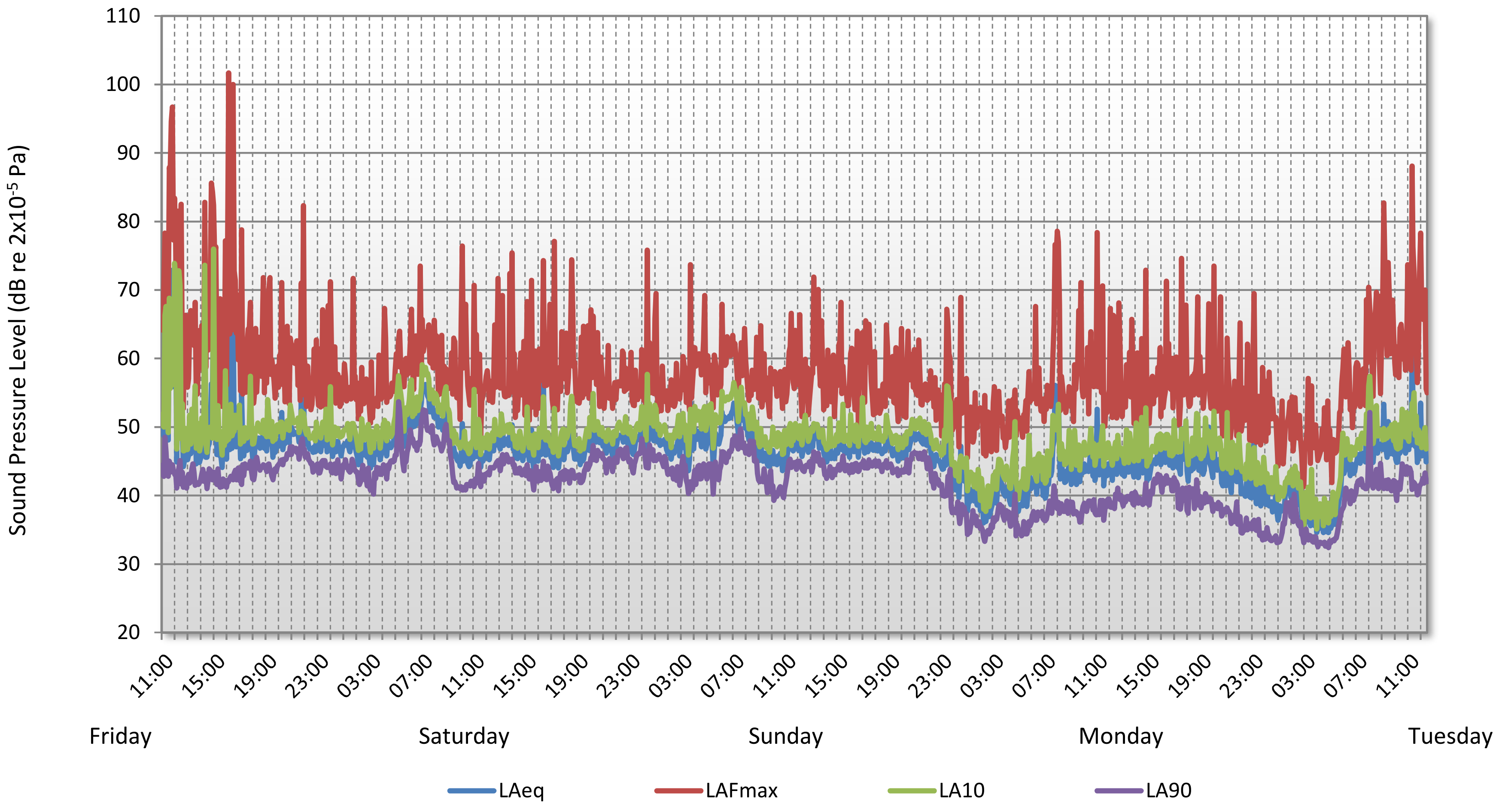
15142-TH1

19 Between Towns Road, Oxford

Position 2

Environmental Noise Time History

23 August 2019 to 27 August 2019



15142-TH2

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 10dB 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.