# HYDES BREWERY LTD

# RED LION STREET, MANCHESTER – PROPOSED HOTEL/PUB

# ACOUSTIC REPORT FOR PLANNING PURPOSES

**16 October 2013**

**AEC REPORT: P2834/R1a/BT**

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## 1.0 INTRODUCTION

1.1 Acoustic & Engineering Consultants Ltd (AEC) has been instructed by Fletcher McNeil and Partners Ltd, on behalf of Hydes Brewery Ltd, to undertake a noise assessment of a proposed hotel on Red Lion Street, which is required to accompany a planning application.

1.2 This report details the noise levels measured on site, and discusses the implications on the external building fabric to achieve acceptable internal noise levels to meet Manchester City Council's (MCC) requirements. Additionally, potential noise breakout affecting nearby noise sensitive locations has been considered.

1.3 Prior to the survey, contact was made with MCCs Environmental Health Department to confirm the requirements and survey periods required. Details of the noise surveys undertaken are detailed in Appendix A, and a brief overview of the acoustic terminology used in this report is provided in Appendix B.

## 2.0 BACKGROUND AND SITE DESCRIPTION

2.1 The site is located at the junction of four roads; Turner Street, Red Lion Street, Catlow Lane and Union Street, as identified on Figure 1.

2.2 The building on the site is currently a 3 storey clothes shop, and the proposal is to convert the shop into a pub and hotel, comprising 15 bedrooms over all three floors. There is also a basement, but this only comprises toilets and a beer cellar. The proposed floor layouts are shown as Figure 2. It is understood that the design brief is a 'traditional' pub, with occasional acoustic live music.

2.3 The building itself fronts directly onto the four surrounding roads. On the other side of these roads are residential developments to the north, west and south, generally above shops and cafes. To the east is a large NCP car park.

## 3.0 NOISE MEASUREMENTS

3.1 In order to understand the existing noise climate, noise surveys were required. As the proposal is for hotel accommodation, and the site is located in a reasonably busy part of Manchester City centre, long term monitoring was undertaken over the weekend of Friday 20 September to Monday 23 September. For the long term monitoring, the microphone was suspended out of a second floor window facing onto Red Lion Street, around 1m from the building envelope, shown as location A on Figure 1.

3.2 Ambient noise levels at location A were very consistent over the three days, and were dominated by road traffic on Red Lion Street, Union Street and Turner Street, with pedestrian noise also contributing.

3.3 In order to check the differences in noise level on the other elevations, spot measurements were also undertaken, both in the day and at night, at locations B-D, and A', which was a ground level beneath the long term measurement location. By comparison of the spot checks with the long term monitoring data, it was possible to ascertain any differences in noise levels at the other locations.

3.4 Full details of the measurements are provided in Appendix A, which are shown in terms of a facade level. Therefore, free-field noise levels incident upon the building would be around 3dB lower than those detailed in Appendix A.

3.5 By comparison with the data obtained on all four elevations with the long term measurements, it was found that there was no significant difference at any location in the day, but at night,

there was around a 2dB increase in noise levels on Union Street, which is used heavily by taxis.

3.6 Taking all of the above into account, the following 16 hour daytime (0700-2300h) and 8 hour night-time (2300-0700h) average ambient noise levels have been used.

**Table 1 – Typical Daytime and Night-time Free-Field Ambient Noise Levels**

| Elevation | Typical Daytime Average, $dBL_{Aeq,16hour}$ | Typical Night-time Average, $dBL_{Aeq,8hour}$ |
|---|---|---|
| Red Lion Street | 57 | 53 |
| Catlow Lane | 57 | 53 |
| Union Street | 57 | 55 |
| Turner Street | 57 | 53 |

3.7 In terms of maximum noise levels at night, these were typically 75-85$dBL_{Amax}$. Discounting the loudest 10 maximum noise levels of each evening, in line with WHO guidance, results in the highest facade maximum noise level of 80$dBL_{Amax.}$

3.8 This figure, when unusual maximum noise levels are discounted, were consistent on all four facades, and hence an overall, typical, free-field, worst-case maximum noise level of 77$dBL_{Amax}$ has been considered representative of maximum noise levels incident upon all four facades.

## 4.0 BASIS OF ASSESSMENT

4.1 In terms of the acoustic criteria, AEC was advised by Manchester City Council that the advice in their document *GD 03 Environmental and Public Protection Information for Developers* is appropriate.

4.2 This states that, inside dwellings, the noise level should not exceed 30$dBL_{Aeq,8\ hour}$ and 45$dBL_{Amax}$ in bedrooms at night and 40$dBL_{Aeq,\ 16\ hour}$ in other habitable spaces during the day. These limits are also in accordance with guidance provided in BS 8233:1999 '*Sound insulation and noise reduction for buildings – Code of practic*e', and the WHO document "*Guidelines for Community Noise*".

4.3 The WHO document also states that attenuation of external to internal noise levels provided by a window partially open for ventilation is up to 15dB, which relates to allowable external levels of 50$dBL_{Aeq}$ outside habitable rooms during the daytime, as well as 45$dBL_{Aeq}$ and 60$dBL_{Amax}$ during the night-time.

4.4 With regards to the maximum noise level limit of 45$dBL_{Amax}$ during the night-time, WHO guidelines states that *'for a good night's sleep, it is believed that indoor sound pressure levels should not exceed approximately 45$dBL_{Amax}$ more than 10 to 15 times per night".*

4.5 Based on this, AEC would propose to design the façade in order that 45$dBL_{Amax}$ is not typically exceeded during the night-time period 2300h to 0700h. As such, there is currently no intention to control maximum noise levels from non-typical events such as occasional noisy aircraft or motorcycle pass-bys.

4.6 In terms of noise break-out, MCC ideally like to see noise controlled to a noise level 10dB lower than the background noise level during the periods of operation. In terms of music noise, this also needs to be controlled to 10dB below the lowest measured background noise level in the 63Hz and 125Hz octave bands.

## 5.0 ASSESSMENT

5.1 By comparing the external noise levels with the required internal noise levels, the overall sound insulation performance of the external envelope can be deduced. As a hotel bedroom could be considered both a living room in the day, and a bedroom at night, both criteria should be met.

5.2 It can be seen that the external noise levels on all elevations, and at all times, exceed the criteria detailed above for allowing ventilation via partially opened windows. Therefore, ventilation music be provided by alternative means.

5.3 Based on external ambient noise levels of around 57dB$L_{Aeq}$, the hotel bedrooms in the day would need to achieve a minimum overall sound insulation of 17dB, to meet the requirement of 40dB$L_{Aeq}$ internally.

5.4 At night, with ambient noise levels of around 53dB$L_{Aeq}$, an overall sound reduction of 23dB would be required, to achieve 30dB$L_{Aeq}$ internally. However, at night, maximum noise levels also need to be considered.

5.5 At night, as described above, the typical, worst case maximum noise level expected would be around 77dB$L_{Amax}$. On this basis, a sound insulation performance of 32dB is required to achieve 45dB$L_{Amax}$ internally. Therefore, it is the maximum noise levels at night which will dominate the requirements for the hotel bedrooms.

5.6 The overall reduction required for the external envelope on each elevation therefore is 32dB.

## 6.0 MITIGATION MEASURES

6.1 Based on achieving a sound reduction of 32dB via the glazing and the ventilation, two options could be considered. Glazing having a sound insulation performance of 40dB$R_w$ AND 34dB$R_{TRA}$ (e.g. 10mm-thermal cavity-6.4mm pvb), in conjunction with a ventilator having a sound insulation performance of 38dB$D_{n,e,w}$ could be provided.

6.2 Alternatively, glazing having a sound insulation performance of 38dB$R_w$ AND 32dB$R_{TRA}$ (e.g. 10mm-thermal cavity-6mm), in conjunction with a ventilator having a sound insulation performance of 42dB$D_{n,e,w}$ would achieve the required internal noise levels.

6.3 These calculations are based on windows forming around 33% of each room's external facade.

6.4 Windows would need to remain closed in order to achieve the required internal noise levels. Windows could be openable, but would need to be well sealed when closed. All frames and seals must not downgrade the acoustic performance of the glazing.

6.5 It should be noted that the glazing examples provided are indicative only, as different manufacturers may have slightly different test data. However, the d$BR_w$ and d$BR_{TRA}$ values are those which should be achieved.

6.6 Alternatively, secondary glazing could be used, formed from the existing glazing, assuming well sealed and installed. Ideally, the reveals would be acoustically lined, and the panes of glass would be different thicknesses, with either a minimum cavity of 100mm, or a minimum pane thickness for the inner lining of 10mm, if the 100mm cavity cannot be accommodated.

6.7 Other building elements, such as the walls and roof, would need to achieve a sound insulation performance of 50dB$R_w$ or higher. This is not an onerous specification.

**Noise Breakout to Nearby Noise Sensitive Locations**

Music

6.8 In addition to noise affecting the proposed hotel, nearby noise sensitive locations should also not be unduly affected by noise from the hotel. There appear to be residential apartments on Union Street, Turner Street and Catlow Lane.

6.9 When music would be played, it is assumed that it would be in either of the bar areas, which is to the south of the building, facing onto the car park. A lobbied door is proposed to the exterior, and a number of rooms are located between the bar and the other external elevations. Therefore the inside to outside sound insulation would be at least 40-50dB, and probably significantly higher on all other elevations.

6.10 The lowest measured background noise levels in the evenings up until around 2330h was around 55dB$L_{A90}$. Therefore, the criteria would be 45dB$L_{A90}$ at the nearest affected location. This would, simplistically, result in a noise limit in the pub of around 85-95dB$L_{Aeq}$. This is not an onerous specification, given that acoustic music, even partially amplified, rarely exceed 80-85dB$L_{Aeq}$. This could, if necessary, and if amplified, be controlled using a noise limiter.

6.11 However, noise transfer to other bedrooms within the hotel itself is likely to be a greater concern, and this of course can be managed. The design of the floor will dictate the loudest noise levels allowable, which are likely to be significantly lower than 85dB$L_{Aeq}$.

Plant Noise

6.12 Any plant should also be controlled to 10dB below the lowest measured noise levels during the periods of operation. It is understood that the plant could potentially operate 24 hours a day, and hence the criteria would be 36dB$L_{Aeq}$ at the nearest affected location, based on the lowest measured background noise level.

6.13 There are three condenser units proposed, which are located on the roof, around 9m from the building opposite, which is understood to be residential, and are shielded visually from the building opposite using weather louvres. Calculations show that a noise level of around 40dB$L_{Aeq}$ would be incident upon the nearest affected window, when all units are operating at the same time. Therefore, mitigation measures would be required.

6.14 Calculations show that acoustically screening the plant by removing the line of sight from the plant to the windows would reduce the plant noise by at least 5dB. It is understood that it is proposed to back the weather louvre with a 1.2mm steel blanking plate, having a minimum mass of 10kg/$m^2$. This would reduce the noise to below 35dB$L_{Aeq}$ and hence meet the criteria at all times.

## 7.0 CONCLUSIONS

7.1 AEC has been instructed to undertake an acoustic assessment for planning purposes of a proposed hotel and pub on Red Lion Street, Manchester. As part of the assessment, noise surveys, including long term monitoring, were undertaken. Noise levels in the area were found to be dominated by traffic on the surrounding roads, and pedestrian noise.

7.2 Noise levels on all four roads were found to be very similar, with typical daytime free-field ambient noise levels of around 57dB$L_{Aeq}$, and typical night-time free-field ambient noise levels of around 53dB$L_{Aeq}$ on all elevations except Union Street, which was around 2dB higher, due to taxi activity. Free-field maximum noise levels at night were typically around 77dB$L_{Amax}$ on elevations, and it is these maximum noise levels which dominate the requirements for the external envelope, acoustically.

7.3 Based on these noise levels, calculations have been undertaken and a glazing and ventilation strategy has been devised, based on achieving the Local Authority requirements of 40dB$L_{Aeq}$ in the day and 30dB$L_{Aeq}$ and 45dB$L_{Amax}$ at night in the hotel bedrooms.

7.4 Additionally, an assessment of potential noise breaking out of the premises, affecting nearby noise sensitive locations has been made, and was found to be unlikely to be an issue. Mitigation measures for the plant have been proposed.

7.5 Overall, therefore, noise should not be a limiting factor with regards to the planning application for the development.



Ben Tomlin

## FIGURE 1 – Site Plan Showing Monitoring Locations

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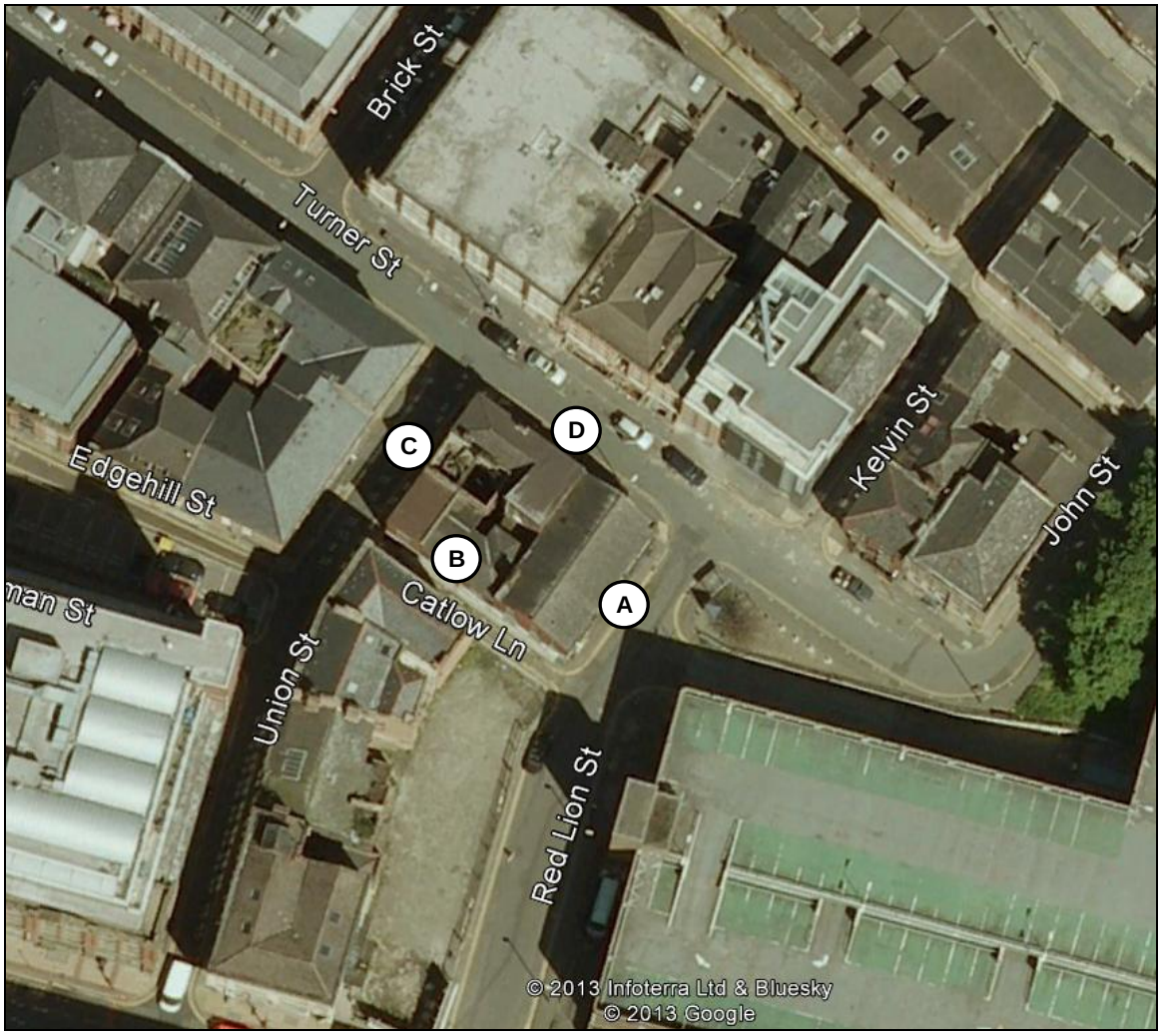
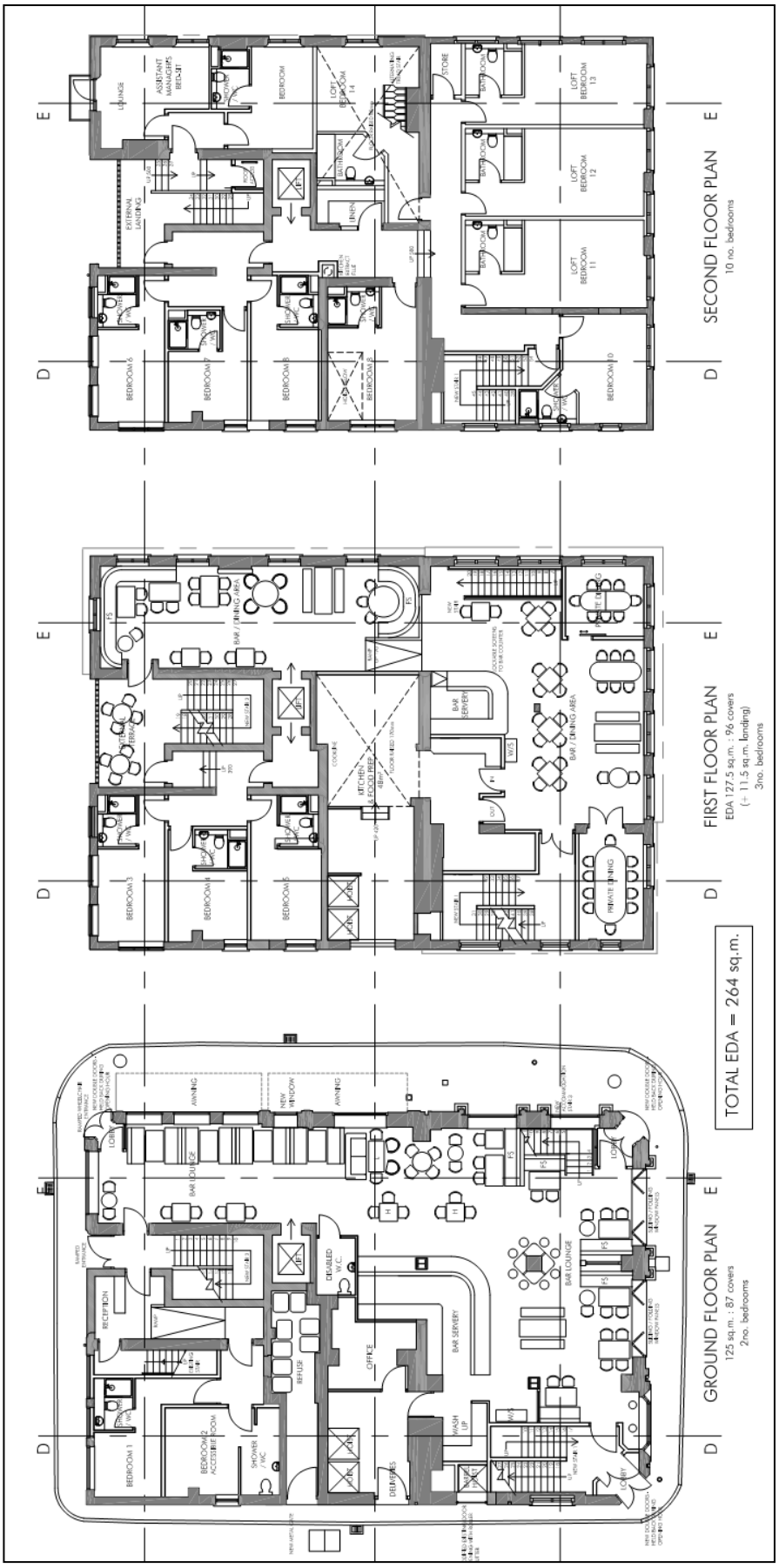


## FIGURE 2 – Proposed Internal Layout



## APPENDIX A – Measurement Procedure

| | |
|---|---|
| Dates & Times of Survey | Friday 20 August 1500h – Monday 23 September 1300h, Long term monitoring.<br>Friday 20 August 2013, 1530-1700h, Daytime spot checks<br>Saturday 21 – Sunday 22 September 2013, 2330-0030h, Night time spot checks. |
| Personnel Present | Ben Tomlin (AEC) (day)<br>Paul Knowles (AEC) (night) |
| Equipment Used | B&K 2260 Real Time Analyser (AEC Kit 1) (Long term monitoring)<br>B&K 2250 Real Time Analyser (AEC Kit 3) (Daytime spot checks)<br>B&K 2260 Real Time Analyser (AEC Kit 2) (Night-time spot checks) |
| Weather Conditions | Day: 20°C, cloudy and clear skies, winds around 0-2ms$^{-1}$.<br>Night: 15°C, clear skies, winds around 0-2ms$^{-1}$. |
| Measurement Procedure | Ambient, maximum and background noise levels were measured at 4 locations, identified as A to D on Figure 1, and described below. |

A – Suspended at second floor level, facing Red Lion Street, about 1m from the building.

A' – On Red Lion Street, at ground level, about 1m from edge of carriageway.

B – On Catlow Lane, about 0.5m from edge of carriageway.

C – On Union Street, about 1m from edge of carriageway.

D – On Turner Street, about 1m from edge of carriageway.

Locations A-D were selected to measure general ambient and background noise levels, which were measured in terms of $L_{Aeq}$, $L_{A90,}$ $L_{A10}$ and $L_{Amax}$ (fast and slow response), typically over 5 to 15 minute periods.

At night, the measurements were undertaken over 10 minute periods, but logged every minute, to establish the distribution of maximum noise levels.

All the measurements were taken at a height of 1.5m above ground unless stated, and all were facade measurements.

The sound level analyser, which conforms to BS EN 61672-12003 *'Electro acoustics – sound level meters - Part1: Specifications'* for Class 1 Type Z meters, was in calibration and check calibrated before and after the measurement periods using a Brüel & Kjær type 4231 (94dB) calibrator. There was no significant drift of calibration.

| | |
|---|---|
| Measured Data | A summary of the results are presented in Tables A1 and A2, and Figure A1. |

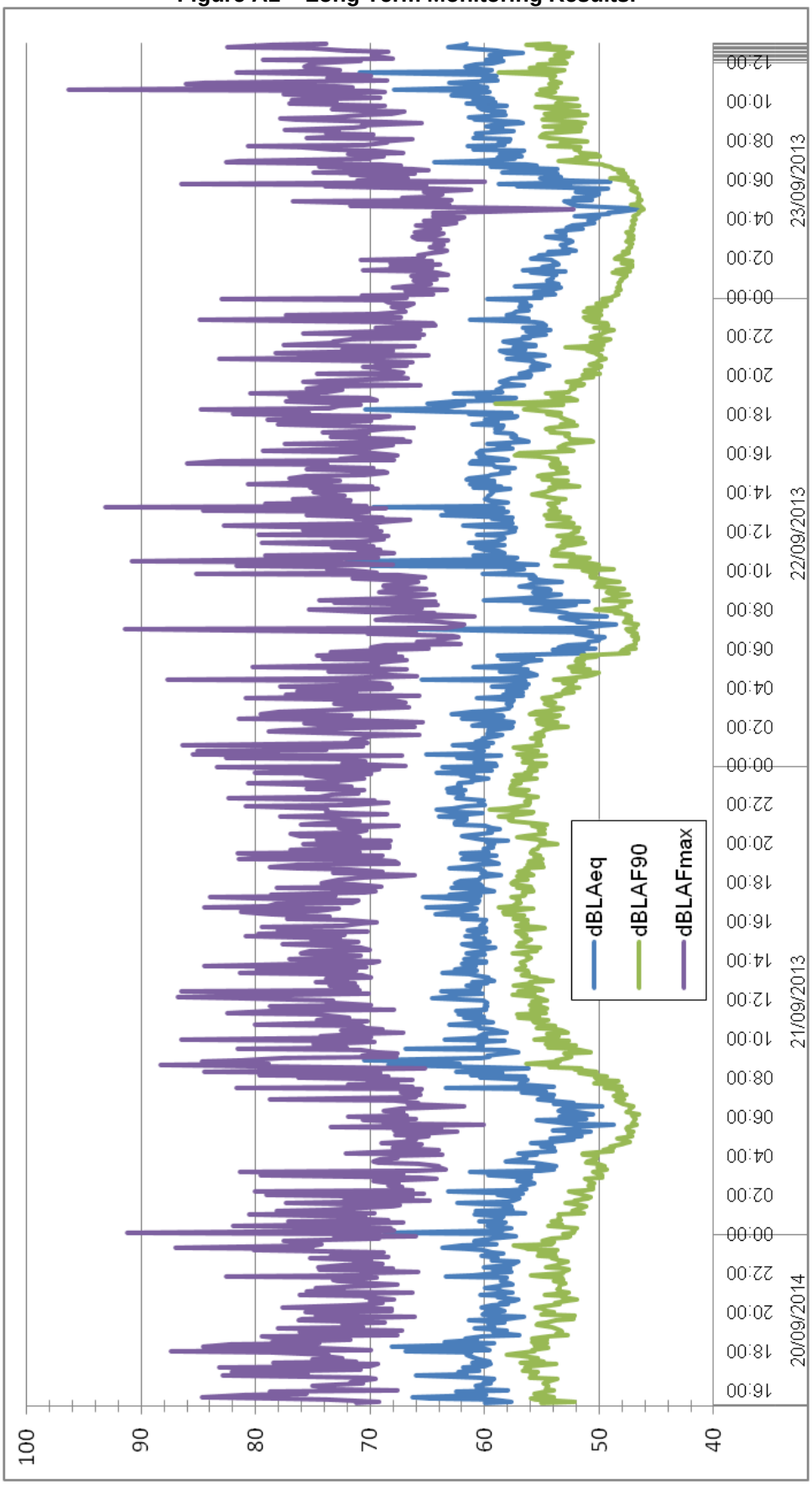
**TABLE A1 –Measured Noise Levels, Daytime**

| Location | Period, h | Noise Level, dB | | | | Comments |
|---|---|---|---|---|---|---|
| | | $L_{Aeq}$ | $L_{A90}$ | $L_{A10}$ | $L_{Amax}$ | |
| A’ | 1615-1620 | 60.9 | 53.5 | 64.6 | 74.5 | Ambient noise levels due to road traffic, maximum noise levels due to car on Red Lion Street. |
| B | 1545-1550 | 55.9 | 51.7 | 57.6 | 76.3 | Ambient noise levels due to road traffic, maximum noise levels due to car on Red Lion Street. |
| | 1620-1625 | 58.3 | 51.9 | 60.8 | 73.6 | Ambient noise levels due to road traffic, maximum noise levels due to car on Red Lion Street. |
| C | 1555-1600 | 59.6 | 51.6 | 62.5 | 73.9 | Ambient noise levels due to road traffic, maximum noise levels due to car pass-bys on Union St. |
| | 1635-1640 | 60.5 | 50.7 | 62.7 | 76.7 | Ambient noise levels due to road traffic, maximum noise levels due to car pass-bys on Union St. |
| D | 1605-1610 | 59.0 | 53.4 | 61.5 | 75.2 | Ambient noise levels due to road traffic, maximum noise levels due to car pass-bys on Turner Street. |
| | 1645-1650 | 61.2 | 53.9 | 64.7 | 77.9 | Ambient noise levels due to road traffic, maximum noise levels due to car pass-bys on Turner Street. |

**TABLE A2 –Measured Noise Levels, Night-time**

| Location | Period, h | Noise Level, dB | | | Comments |
|---|---|---|---|---|---|
| | | $L_{Aeq}$ | $L_{A90}$ | $L_{Amax}$ | |
| A | 0021-0025 | 60.5 | 55.2 | 76.9 | Ambient noise levels due to road traffic, maximum noise levels due to Taxi on Red Lion Street. |
| | 0025-0030 | 62.4 | 55.7 | 81.6 | Ambient noise levels due to road traffic, maximum noise levels due to Taxi on Red Lion Street. |
| | 0030-0035 | 58.8 | 53.7 | 71.5 | Ambient noise levels due to road traffic, maximum noise levels due to Taxi on Turner Street. |
| B | 2340-2345 | 64.6 | 55.2 | 71.7 | Ambient noise levels due to road traffic, maximum noise levels due to Taxi on Union Street. |
| | 2345-2350 | 58.5 | 54.2 | 69.4 | Ambient noise levels due to road traffic, maximum noise levels due to Taxi on Red Lion Street. |
| C | 2352-2355 | 70.7 | 52.6 | (89.1) 80 | Ambient noise levels due to road traffic, maximum noise level due to Moped on Union Street, although typical maximums were around 80dB$L_{Amax}$. |
| | 2355-0000 | 67.5 | 54.9 | 82.9 | Ambient noise levels due to road traffic, maximum noise levels due to Taxi on Union Street. |
| | 0000-0005 | 57.5 | 58.8 | 73.3 | Ambient noise levels due to road traffic, maximum noise levels due to Taxi on Union Street. |
| D | 0006-0010 | 56.5 | 52.9 | 75.5 | Ambient noise levels due to road traffic, maximum noise levels due to Taxi on Union Street. |
| | 0010-0015 | 58.2 | 53.2 | 72.1 | Ambient noise levels due to road traffic, maximum noise levels due to Taxi on Union Street. |
| | 0015-0020 | 60.0 | 54.0 | 74.6 | Ambient noise levels due to road traffic, maximum noise levels due to Taxi on Turner Street. |

**Figure A1 – Long Term Monitoring Results.**



## APPENDIX B - Acoustic Terminology in Brief

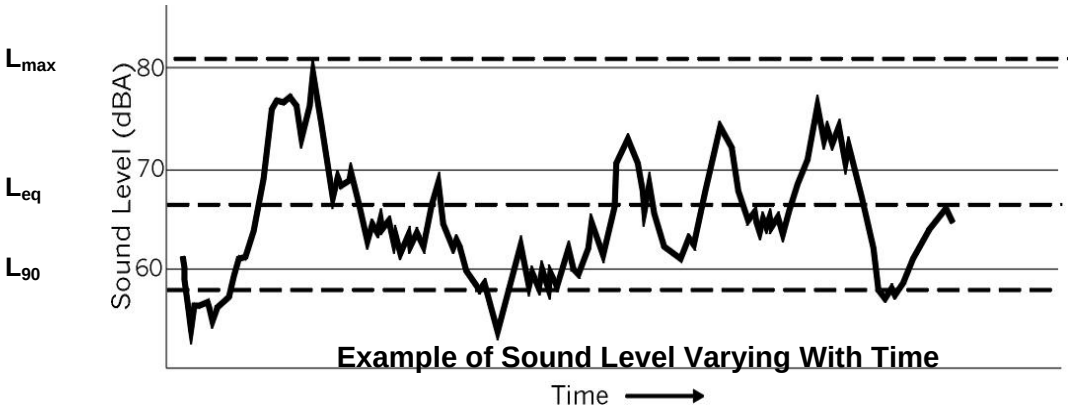
Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air. The rate at which the pressure fluctuations occur determines the pitch or *frequency* of the sound. The frequency is expressed in Hertz *(Hz)*, that is, cycles per second. The human ear is sensitive to sounds from about 20 Hertz to 20,000 Hertz. Although sound can be of one discreet frequency - a 'pure tone' - most noise is made up of many different frequencies.

The human ear is more sensitive to some frequencies than others, and modern instruments can measure sound in the same subjective way. This is the basis of the A-weighted sound pressure level *dBA,* normally used to assess the effect of noise on people. The dBA weighting emphasises or reduces the importance of certain frequencies within the audible range.

### Noise Units

In order to assess environmental noise, measurements are carried out by sampling over specific periods of time, such as fifteen minutes or one hour, the statistically determined results being used to quantify various aspects of the noise.

The figure below shows an example of sound level varying with time. Because of this time variation the same period of noise can be described by several different levels. The most common of these are described below.




**Example of Sound Level Varying With Time**

**$L_{Aeq,T}$** The equivalent continuous (A-weighted) sound level may be considered as the "average" sound level over a given time, T. It is used for assessing noise from various sources including transportation, industrial and construction sources and can be considered as the "ambient" noise level.

**$L_{A90}$** The (A-weighted) sound level exceeded for 90% of a measurement period. It is the value used to describe the "background" noise.

**$L_{Amax}$** The maximum (A-weighted) sound level during a measurement period.

**$L_{AE}$** The sound exposure level is a notional noise level and describes the average $L_{Aeq}$ noise level of an event over a given time period as if it occurred during a one second period. This allows the $L_{Aeq}$ to be determined over a time period with a number of distinct events.

**Free-field Level** This refers to the sound level measured outside, away from reflecting surfaces.