# NR SCORPIO LLP

## NOISE ASSESSMENT

## LAND BETWEEN BEVINGTON BUSH & GARDENERS ROW, LIVERPOOL

**18 August 2015**

**AEC REPORT: P3191/R1A/PJK**

**Prepared by:**
**P J Knowles BSc (Hons) MIOA (D)**

**Acoustic & Engineering Consultants Limited**
**Lockside 1 Stockport Road Marple Stockport Cheshire SK6 6BD**
**Telephone 0161 449 5900 Fax 0161 449 5901**

# CONTENTS



**DOCUMENT STATUS**

| Revision | Date | Document Details | Author | Checked By |
|---|---|---|---|---|
| Original | 11 August 2015 | Original | PJK | DMT |
| A | 18 August 2015 | Updated following client feedback | PJK | DMT |

## 1.0 INTRODUCTION

1.1 Acoustic & Engineering Consultants Limited (AEC) has been appointed by NR Scorpio LLP, to assess the noise levels affecting the proposed new accommodation blocks on land between Bevington Bush and Gardeners Row, Liverpool

1.2 This report presents the results of the daytime and night-time noise level measurements undertaken on the site and an assessment of the potential impact on the acoustic design of the site taking into account available guidance and Local Authority's requirements.

1.3 Acoustic terminology used throughout the report is described in brief in Appendix A.

## 2.0 BACKGROUND AND SITE DESCRIPTION

2.1 A scheme to build three new accommodation blocks on vacant land between Bevington Bush and Gardeners Row, Liverpool has been prepared by Falconer Chester Hall, as identified on Figure 1. The scheme layout is presented on Figure 2.

2.2 The Scotland Road (A59), which runs along the eastern boundary of the site, is a busy four carriageway road.

2.3 To the south of the site, beyond Edgar Street, is the main St Johns Ambulance depot in Liverpool. Edgar Street is a dead end and is used as a car park in the day. Further south is Leeds Road, which is also a four carriageway road, however, it is mainly screened from the proposed site by the St Johns Ambulance Depot and other buildings which line Leeds Road.

2.4 Gardeners Row makes up the western site boundary. This road is relativity quiet in terms of traffic flow during both the day and night-time periods. Beyond Gardeners Row are existing residential blocks.

2.5 To the north of the site is Bevington Bush, which is also a dead end, and an electric substation. Past Bevington Bush is a derelict factory site, which is currently unused.

## 3.0 NOISE MEASUREMENTS

3.1 Daytime noise levels were measured by AEC on Friday 7 August 2015 between 1000 and 1400h and night-time noise levels were measured on Thursday 6 and Friday 7 August 2015 between 2300 and 0110h.

3.2 Measurements were undertaken at four locations identified as A to D on Figure 1. Full details of the noise surveys are presented in Appendix B with measured noise data presented in Tables B1 and B2, with a brief description provided below.

3.3 Location A was selected to represent the eastern elevation of Building B which would overlook the main noise source in the area Scotland Road. During the daytime period the road traffic was relatively consistent, a with the measured noise levels of 66dB$L_{Aeq,\ 15minute}$ and 69dB$L_{A10,\ 15minute}$. Similarly, at night the measured ambient noise level was relatively consistent at 63dB$L_{Aeq,\ 10minute}$ until 0100h when it reduced to 60dB$L_{Aeq,\ 10\ minute}$. Night-time maximum noise levels at this location did not exceed 74dB$L_{Amax}$.

3.4 Location B was chosen to represent the southern elevation of Building A, the measured noise levels at this location were due to road traffic on Scotland Road during both the day and night-time periods. The noise levels were not affected by the St Johns Ambulance Depot during either period.

3.5 The daytime noise levels at this location were 54dB$L_{Aeq,\ 15minute}$. At night the amount of traffic on Scotland Road reduced and the night-time ambient noise level was around 52dB$L_{Aeq,\ 10minutes}$ with maximum noise levels no greater than 64dB$L_{Amax}$.

3.6 Location C was chosen to represent the western elevation of Block C which overlooks Gardeners Row. The road traffic on Gardeners Row was relatively intermittent during the daytime, with ambient noise levels ranging from 54 to 57dB$L_{Aeq,\ 15minutes}$, depending on the number of vehicle pass-bys. At night, very few cars used Gardeners Row and the ambient noise level ranged from 47 to 53dB$L_{Aeq,\ 10\ minutes.}$ The highest measured maximum noise level of75dB$L_{Amax}$ was due to a car pass-by, however, this was a one off event and no other maximum noise level exceeded 60dB$L_{Amax}$.

3.7 At location D, on Bevington Bush, the noise climate during the daytime was dominated by road traffic on Scotland Road, and the ambient noise level was around 57dB$L_{Aeq,\ 15\ minute}$. At night the noise climate was a combination of road traffic on Scotland Road and noise from the electric substation. The ambient noise level was around 54dB$L_{Aeq,\ 10minutes}$ with maximum noise levels no greater than 66dB$L_{Amax}$.

3.8 A measurement of the electric substation was also undertaken, between vehicle movements on Scotland Road, and this source was measured as 52dB$L_{Aeq}$ at 7m.

## 4.0 BASIS OF ASSESSMENT

4.1 Liverpool City Council has generally adopted a requirement for the external envelopes of residential accommodation in the city centre to incorporate windows with 10mm glass/thermal cavity/6mm glass and for habitable rooms to be provided with acoustically attenuated mechanical ventilation to remove the need to open windows.

4.2 These proposals are understood to be required to control internal noise levels in habitable rooms to typically no greater than those identified in the World Health Organisation (WHO) document '*Guidelines for Community Noise*'. WHO states that to avoid annoyance and sleep disturbance. Inside dwellings, the noise level should not exceed 30dB$L_{Aeq,\ 8\ hour}$ and 45dB$L_{Amax}$ at night and between 35dB$L_{Aeq,\ 16\ hour}$ during the day.

4.3 These levels are similar to those presented in the updated BS 8233:2014 '*Guidance on sound insulation and noise reduction for buildings'*, therefore, the internal levels identified by WHO would appear to be appropriate for this type of development.

4.4 Where these internal levels can be achieved with a less onerous glazing and ventilation strategy than the one provided above, the suggested alternative scheme needs to be agreed with LCC.

## 5.0 ASSESSMENT OF PROPOSED DEVELOPMENT

5.1 In relation to assessing the daytime ambient and night-time ambient and maximum noise levels on the proposed development, this assessment has looked at 5 different elevations, as identified on Figure 2. Elevations A to D correspond to the measurement locations A to D, elevation E represents the elevations of the three buildings, over the courtyard.

5.2 Due to the constant nature of the road traffic on Scotland Road it is possible to calculate the daytime ambient noise level (dB$L_{Aeq,\ 16h}$) on Elevation A, using the shortened measurement procedure in CRTN which is based on the measured $L_{A10,\ 3h}$ of 69dB. To convert $L_{A10,\ 3h}$ to a daytime average, $L_{A10,18h}$, 1dB is subtracted. To convert this to an ambient noise level, a further 2dB is subtracted, giving an overall level of 66dB$L_{Aeq,16h}$, which is the same as the measured short term ambient noise level at this location.

5.3 Due to the nature of the noise sources at locations B to D, the daytime ambient noise level has been based on the typical measured noise level during the measurement period and the determined noise level based on the measured noise level at Location A. These levels are presented in Table 1 below.

5.4 At night, although ambient noise levels may reduce after 0100h until about 0500h, the average noise level measured over the two hour period between 2300 and 0100h at each location has been considered representative of the noise climate at each of the elevations A to D and these levels are presented in Table 1. Also provided in Table 1 is the highest measured maximum noise level at night, for all locations with the exception of Location C. As there was a single event which was significantly above the other measured maximum noise levels at this location, the second highest maximum level of 60dB$L_{Amax}$, has been assessed instead.

5.5 In relation, to elevation E which overlooks the courtyard, it is assumed that the rest of the development will provide at least 25dB in screening from each of the noise sources surrounding the site.

**Table 1 – Typical Noise Levels due to Road Traffic**

| Elevation | Noise Level, dB | | |
|---|---|---|---|
| | Day 0700-2300, $L_{Aeq, 16h}$ | Night 2300-0700 | |
| | | $L_{Aeq, 8h}$ | $L_{Amax}$ |
| A | 66 | 63 | 74 |
| B | 61 | 58 | 64 |
| C | 56 | 53 | 60 |
| D | 61 | 58 | 66 |
| E | <50 | <45 | <60 |

5.6 As identified above it is understood that LCC generally require that any habitable rooms in new residential developments within Liverpool city centre should be provided with 10/TC/6 glazing and mechanical ventilation. This specification would more than adequately control internal noise levels to those suggested in Section 4, however, calculations taking account of the measured external noise levels, the area of the windows (assumed to be around 50%) and assumed room dimensions, indicate that the required ventilation strategy could be reduced on all locations to acoustic ventilators. In relation to the glazing, calculations indicate that 10/TC/6 would only be required on the elevations A and D facing Scotland Road and Bevington Row respectively.

5.7 The suggested revised glazing and ventilation strategy for all facades during daytime and night-time periods are presented in Table 2 below.

**Table 2 – Outline Requirements to Achieve Internal Noise Levels in Habitable Rooms**

| Elevation | Period | Glazing (Sound Insulation Performance) | Ventilation (Sound Insulation Performance) |
|---|---|---|---|
| A | Day and Night | 10mm Glazing/thermal cavity/6mm Glazing ($38dBR_w$, $32dBR_{Tra}$) | $41dBD_{n,e,w}$ |
| B | Day and Night | 4/TC/4 ($31dBR_w$, $25dBR_{Tra}$) | $38dBD_{n,e,w}$ |
| C | Day | 4/TC/4 ($31dBR_w$, $25dBR_{Tra}$) | $33dBD_{n,e,w}$ |
| | Night | 4/TC/4 ($31dBR_w$, $25dBR_{Tra}$) | $38dBD_{n,e,w}$ |
| D | Day and Night | 10/TC/6 ($38dBR_w$, $32dBR_{Tra}$) | $41dBD_{n,e,w}$ |
| E | | See below | |

5.8 It should be noted that these performance specifications, would control external to internal noise levels to meet the daytime and night-time criterion as stated in BS8233 and WHO guidelines. However, where the glazing and ventilation strategies are different from LCC's standard requirement and would, therefore, need to be agreed with the Local Authority in advance.

5.9 Windows can be openable providing that they are effectively acoustically sealed when closed and it is important that any frames and seals do not downgrade the sound insulation performance of the glazing.

5.10 In relation to the rooms which overlook the courtyard, the external noise levels are expected to be such that ventilation to these spaces could be provided via partially opened windows. However, again this will need to be confirmed with LCC.

5.11 In addition to the above, the suggested glazing and ventilation strategy for Elevation D would also control noise from the electric substation only, to around 25dB$L_{Aeq,\ 24h}$ inside habitable rooms. This should be acceptable to the Local Authority.

## 6.0 CONCLUSION

6.1 Acoustic and Engineering Consultants Limited has been appointed to undertake a noise assessment for the three proposed accommodation blocks on land between Bevington Bush and Gardeners Row, Liverpool.

6.2 Based on the noise levels at the proposed development site, the sound insulation requirements to achieve appropriate internal noise levels based on WHO guidance has been determined and is presented in Section 5. The proposed glazing and ventilation specification is less onerous than the usual requirement of LCC for all habitable rooms and, would therefore, need to be agreed with LCC.

6.3 Noise levels at the proposed development have been assessed, and may be controlled through the use of an appropriate sound insulation scheme. Therefore, appropriate planning conditions can be applied to the proposed development to ensure reasonable internal noise levels in the proposed accommodation. Based on this, noise should not be considered a determining factor in relation to any planning permission being sought.

Paul Knowles

## FIGURE 1 – Proposed Site Location Identifying Monitoring Locations

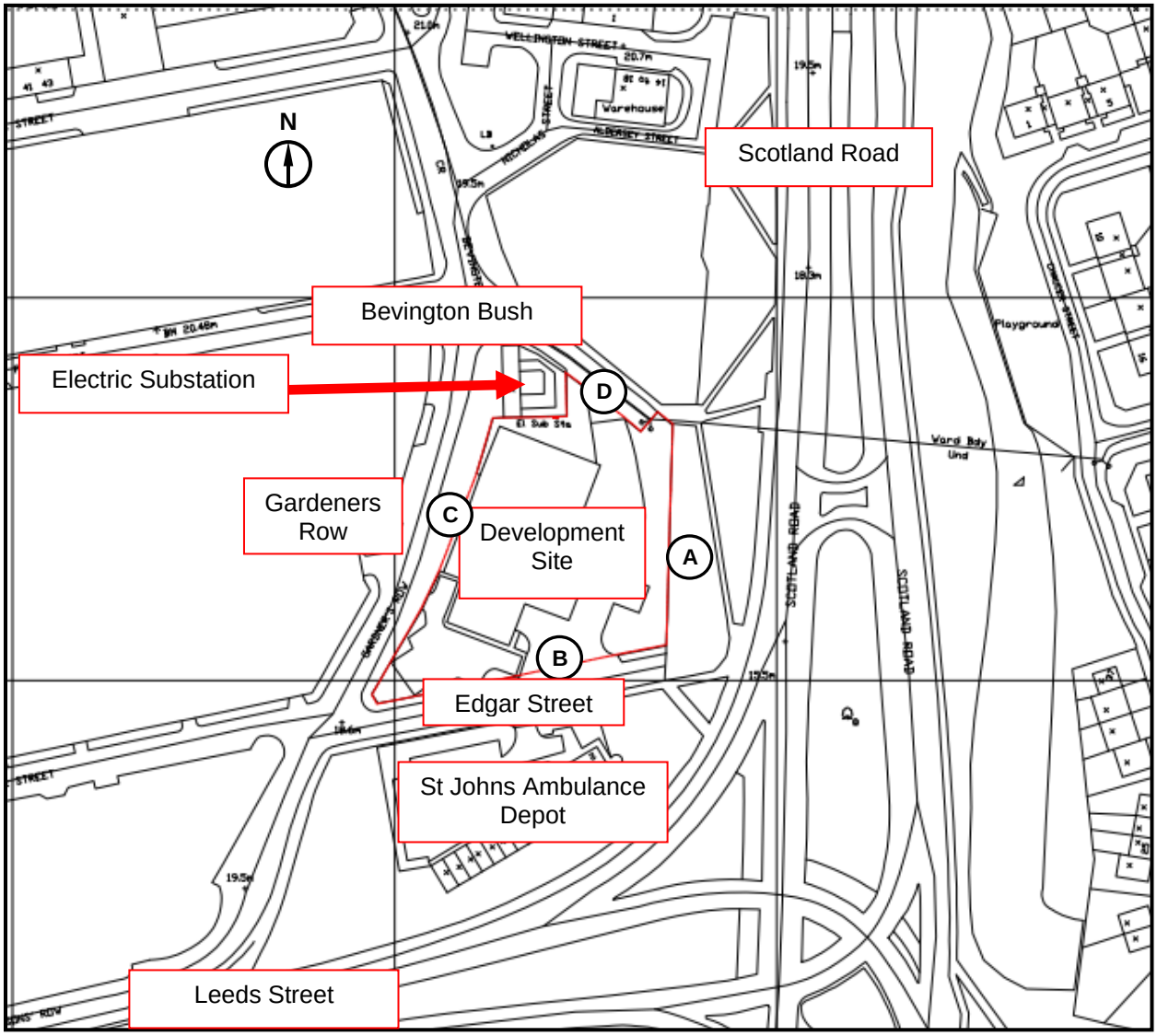
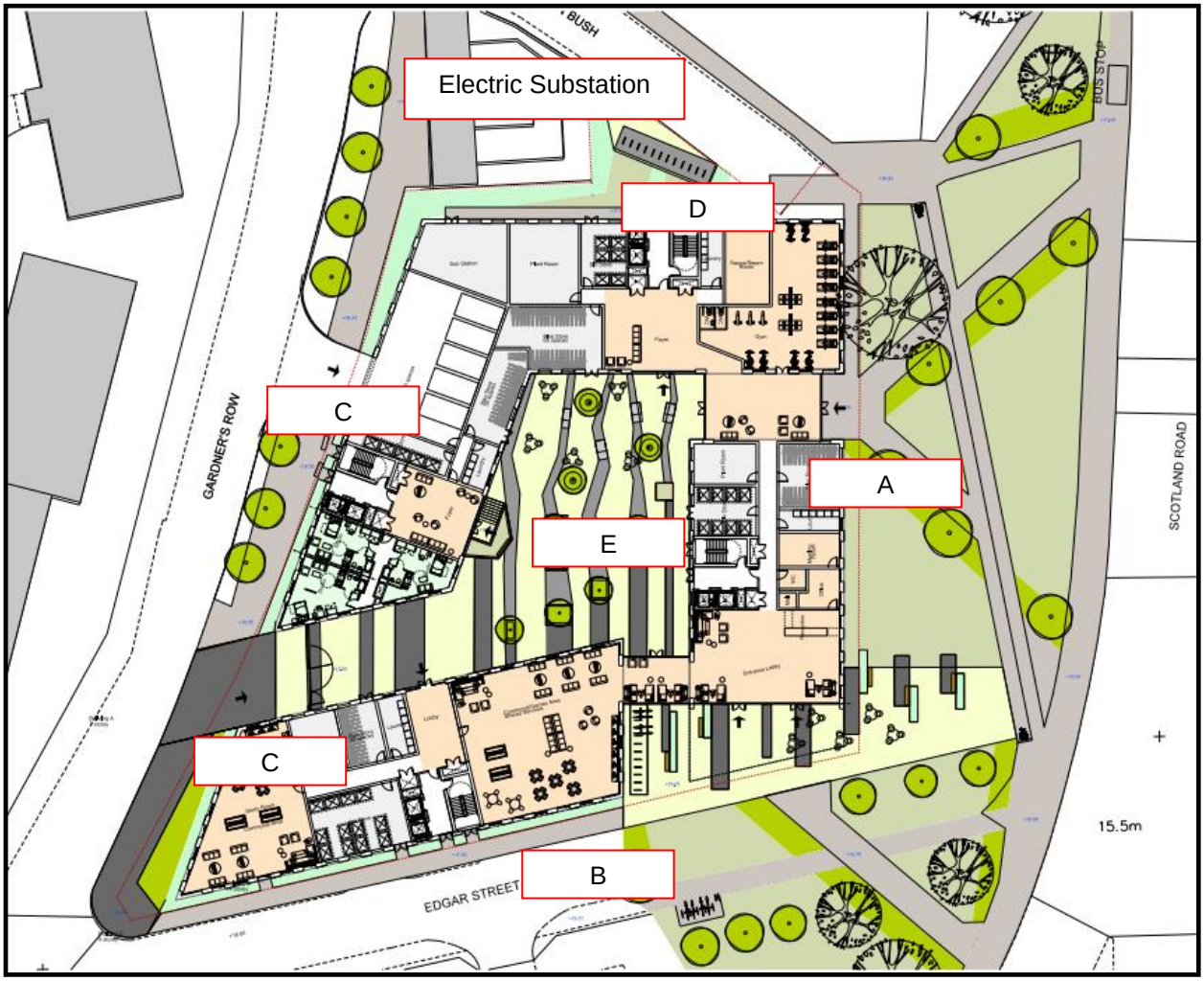


**FIGURE 2 – Proposed Site Layout Identifying the Different Elevations**



## APPENDIX A – Acoustic Terminology in Brief

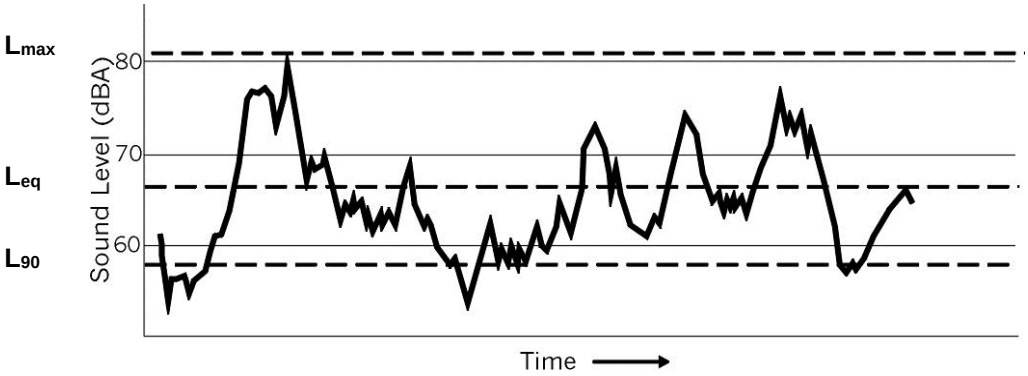
Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air. The rate at which the pressure fluctuations occur determines the pitch or *frequency* of the sound. The frequency is expressed in Hertz *(Hz)*, that is, cycles per second. The human 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. |
| **Free-field Level** | This refers to the sound level measured outside, away from reflecting surfaces. |
| **$R_w$** | Single number rating used to describe the airborne sound insulation properties of a material or building element over the frequency range of typically 100-3150Hz. |
| **$R_{tra}$** | Single number rating used to describe the airborne sound insulation properties of a material or building element over the frequency range of typically 100-3150Hz, using a traffic noise spectrum as the source. |
| **$D_{n,e,w}$** | Weighted element-normalised level difference. Single number rating used to describe the performance of a ventilation unit. |

## APPENDIX B – Measurement Procedure

| | |
|---|---|
| Dates & Times of Survey | Daytime: Friday 7 August 2015, 1000 to 1400h<br>Night-Time: Thursday/Friday 7/8 August 2015, 2300 to 0130h |
| Personnel Present | Paul Knowles (AEC) |
| Equipment Used | B&K 2260 Real Time Analyser (AEC Kit 1) |
| Weather Conditions | Daytime: Dry, 22°C, clear skies, calm<br>Night-Time: Dry, 15°C, clear skies, calm.. |
| Measurement Procedure | Ambient, background and maximum noise levels were measured at four locations, identified as Locations A to D on Figure 1 and described below.<br><br>A - On the grass, 20m from the edge of the carriageway of Scotland Road.<br><br>B - 2m from the edge of the carriageway of Edgar Street.<br><br>C - On the site, 5m from the edge of the carriageway of Gardeners Row.<br><br>D - 1m from the edge of the carriageway of Bevington Bush.<br><br>All locations were selected to measure baseline noise levels, which were measured in terms of $L_{Aeq}$, $L_{A10}$, $L_{A90}$ and $L_{Amax}$ (fast response) typically over 5 to 15 minute periods.<br><br>All the measurements were taken at a height of 1.5m above ground and all were free field measurements.<br><br>The sound level analyser, which conforms to BS EN 61672-12003 *'Electro acoustics – sound level meters - Part1Specifications'* 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. Calibration certificates are available on request. |
| Measured Data | A summary of the results are presented in Tables B1 and B2. |

**TABLE B1 – Measured Daytime Noise Levels**

| Location | Period, h | Noise Level, dB | | | | Comments |
|---|---|---|---|---|---|---|
| | | $L_{Aeq}$ | $L_{A10}$ | $L_{A90}$ | $L_{Amax, F}$ | |
| A | 1021-1036 | 65.5 | 69.2 | 57.1 | 75.1 | Road traffic on Scotland Road. |
| | 1133-1148 | 65.5 | 69.0 | 56.9 | 78.0 | |
| | 1240-1255 | 65.2 | 68.1 | 56.8 | 81.5 | |
| B | 1039-1054 | 53.8 | 56.4 | 49.6 | 64.5 | Road traffic on Scotland Road and Leeds Street |
| | 1150-1205 | 54.4 | 57.3 | 49.3 | 66.7 | |
| | 1257-1312 | 54.9 | 57.0 | 49.0 | 73.2 | |
| C | 1059-1114 | 56.2 | 56.2 | 49.3 | 76.9 | Road traffic on Gardeners Row and distant road traffic. |
| | 1206-1221 | 57.4 | 54.8 | 47.9 | 77.2 | |
| | 1314-1349 | 53.7 | 54.8 | 49.7 | 71.2 | |
| D | 1116-1131 | 56.7 | 59.2 | 53.0 | 70.9 | Road traffic on Scotland Road, and plant noise from the electric substation. |
| | 1224-1239 | 55.5 | 58.0 | 51.3 | 65.4 | |
| | 1332-1347 | 58.4 | 60.4 | 55.3 | 69.3 | |

**TABLE B2 – Measured Night-Time Noise Levels**

| Location | Period, h | Noise Level, dB | | | Comments |
|---|---|---|---|---|---|
| | | $L_{Aeq}$ | $L_{A90}$ | $L_{Amax, F}$ | |
| A | 2317-2327 | 62.6 | 51.2 | 73.2 | Road traffic on Scotland Road. |
| | 0005-0015 | 63.1 | 49.5 | 74.0 | |
| | 0056-0106 | 59.5 | 47.7 | 73.0 | |
| B | 2329-2339 | 50.4 | 45.1 | 61.3 | Road traffic on Scotland Road and Leeds Street |
| | 0017-0027 | 51.6 | 43.9 | 63.5 | |
| C | 2341-2351 | 52.7 | 44.7 | 75.1 | A car pass-by on Gardeners Row and distant road traffic. Maximum noise levels no greater than 60dB$L_{Amax}$. |
| | 0029-0039 | 46.8 | 43.5 | 55.2 | Distant road traffic. |
| D | 2354-0004 | 54.0 | 49.1 | 64.1 | Road traffic on Scotland Road, and plant noise from the electric substation. |
| | 0044-0054 | 53.4 | 48.9 | 65.5 | |
| | | 52.9 | | | |