MUGA noise impact assessment

Hebburn Community Hub

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1. Revision register

Version	Changes from previous version	Issued by	Date
A	First Issue	RAH	11/6/14
B	Figures 1 and 2 revised	RAH	14/07/14
C	Para.s 5.5, 10.5, 10.5, 10.7 , Fig. 2, Table 5 revised Para. 8.5 added	RAH	14/08/14
D	Fig.s 2, 3,4 &5 revised	RAH	19/08/14
E	Para. 8.9 revised, Para.s 8.11, 8.12 added	RAH	6/7/15

2. Contents

3. Summary

3.1 This report has been prepared in support of a Planning Application for a MUGA at Hebburn Community Hub, Rose Street, Hebburn, Newcastle.

3.2 Background and residual noise levels at the nearest noise sensitive location have been measured.

3.3 Noise transmission from the proposed MUGA has been calculated, and noise propagation modelled with proprietary software.

3.4 A 3m high barrier located along the south-west boundary of the MUGA, as shown in Figure 2, has been included in all calculations.

3.5 The MUGA L_{Aeq} worst case noise impact is calculated to be 2 dB above the existing background noise level, and 9 dB below the 50 dB L_{Aeq} required to "protect the majority of people from being moderately annoyed during the daytime" according to the WHO.

3.6 The worst case calculated internal L_{Aeq} noise levels through a partially open window are 4 dB below the guideline internal daytime noise levels given in BS 8233.

3.7 Both the calculated worst case L_{Aeq} and L_{Amax} levels due to activities associated with the proposed MUGA meet the criteria determined in recent research which indicates that the MUGA is unlikely to be the cause of complaints

4. Introduction

4.1 A development consisting of a Multi-Use Games Area (MUGA) has been proposed at Hebburn Community Hub, Rose Street, Hebburn, Newcastle upon Tyne.

4.2 The site location is shown in Figure 1.

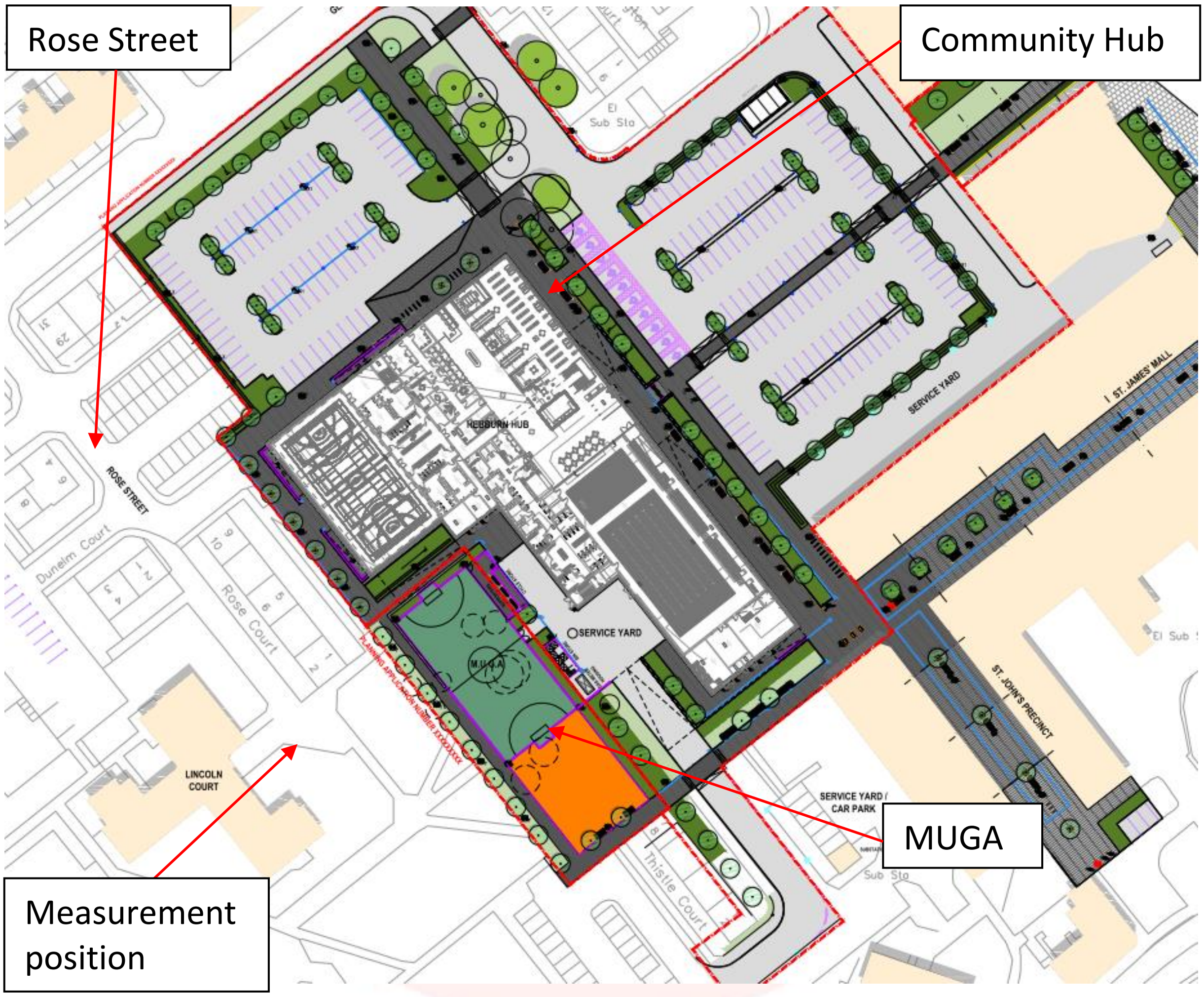

Figure 1: Site location, proposed MUGA, and measurement position

4.3 Apex Acoustics has been commissioned to undertake a noise survey and assessment of the MUGA noise in support of a planning application.

4.4 It is understood that the MUGA will operate between 09:00 and 21:00 hours on Monday to Sundays.

4.5 This report presents the evaluation of the potential noise impact from the proposed MUGA on the Nearby Noise Sensitive Locations (NNSL).

4.6 This assessment is based on previous measurements of sports activities equivalent to those proposed, the layout proposed by the architects, acoustic modelling described in this report, and measurements of site existing noise levels.

5. Assessment criterion

5.1 It is understood that BS 4142, Reference 1, has been used to assess the impact for similar developments by others. However, the scope of BS 4142 clearly indicates that the purpose of the defined assessment method is not intended for a noise source of this nature. Further research may conclude that an assessment following the methodology of BS 4142 for this type of noise source is valid, but this is not considered a suitable assessment at this time.

5.2 The World Health Organisation (WHO), Reference 2, defines noise level limits in outdoor living areas (e.g. gardens) of 55 dB L_{Aeq} to “protect the majority of people from being seriously annoyed during the daytime” and 50 dB L_{Aeq} to “protect the majority of people from being moderately annoyed during the daytime”.

5.3 Guideline internal ambient noise levels are defined in Table 4 of BS 8233, Reference 3, as shown in Table 1.

Activity	Location	Time period, $L_{Aeq, T}$ / dB	
		07:00 – 23:00	23:00 – 07:00
Resting	Living rooms	35	-
Dining	Dining room/area	40	-
Sleeping (daytime resting)	Bedroom	35	30

Table 1: Guideline internal levels as defined in BS 8233

5.4 Research into assessment of noise impact from MUGAs has been carried out by Fallon, R, Reference 4, and determined that should the all of the criteria below be met at a noise sensitive receptor, then this is an indication that the MUGA is unlikely to be the cause of complaints:

1. The $L_{Aeq, 15\,min}$ should not exceed the $L_{A90, 5min}$ by more than 5dB
2. The $L_{Aeq, 15\,min}$ should not exceed 55 dB
3. The average L_{Amax} should not exceed 60 dB where the average L_{Amax} is defined as the logarithmic mean of the 10 loudest events from at least 3 no. separate 15 minute measurement periods.

5.5 The NNSL is identified as the Care Home on Lincoln Court to the west of the MUGA, and the dwellings at Durham Court to the south of the site.

6. Existing noise environment

6.1 The existing noise environment was measured between 20:41 and 21:11 hrs on Thursday the 5th June 2014.

6.2 The microphone was located 1.5 metres above ground level and away from other reflecting surfaces, such that the measurements are considered free-field.

6.3 Data was recorded in octave bands at 1 second intervals throughout the thirty minute measurement period. The average wind speed was 4 m/s; the temperature was around 12 °C.

6.4 The measurement position was to the east of the Care Home at Lincoln Court and is indicated in Figure 1.

6.5 The most significant noise source was distant road traffic.

6.6 The equipment used is listed in Appendix 3.

6.7 The measured noise levels are shown in Table 2.

Location	Start time	Measured noise levels / dB	
		$L_{Aeq,\ 30\ mins}$	$L_{A90,\ 30\ mins}$
1 – East of Lincoln Court	20:41	49	44

Table 2: Measured noise levels

6.8 Noise measurements were taken at around the latest time the MUGA is intended to operate.

7. Source noise levels

7.1 **Sports pitch**

7.2 Noise from users of the MUGA is assessed on the basis of previous measurements of sports pitch activities undertaken by Apex Acoustics, details of which are given in Appendix 1.

7.3 The calculated sound power levels are shown in Table 3.

7.4 Noise from such activities is due to users of the pitch shouting. To provide a worst case assessment, the MUGA has been assigned the higher sound power level calculated for a sports pitch.

A-Weighted Source Sound Power Level / dB	dB	Octave Band Centre Frequency / Hz						
		63	125	250	500	1000	2000	4000
Sports Pitch (worst case)	91	64	73	80	84	86	87	79
Sports Pitch (average)	82	55	64	71	75	77	78	70

Table 3: Sound power level of sports pitch activities

7.5 **Ball impact**

7.6 Noise from ball impacts on a MUGA steel mesh fence have been measured previously by Apex Acoustics. Details of the measurements are given in Appendix 2.

Average measured noise level	dB(A)	Octave Band Centre Frequency / Hz						
		63	125	250	500	1000	2000	4000
Ball on fence L_{AFmax} at 10 m	76	53	67	67	74	68	65	60

Table 4: Average A-weighted sound pressure levels of ball impact on fence

8. Calculation of noise propagation

8.1 Noise transmission and propagation is modelled using proprietary software, Cadna/A, Reference 5. This models noise propagation outdoors according to ISO 9613, Reference 6.

8.2 The site is surrounded by roads, hence loss due to ground absorption is accounted for by the use of a ground factor, G, of 0.

8.3 The proposed site layout plan and dimensions are taken from the drawings, Reference 7.

8.4 Receivers have been positioned in the model at a height of 1.8 m, 4.3 m, 6.8 m and 9.3 m at Lincoln Court to represent likely noise levels at windows at ground floor, first floor, second floor and third floor respectively, and are shown in Figure 2 and Figure 3.

8.5 A receiver has been placed at a height of 9.3 m at Durham Court.

8.6 An area source at a height of 1.8 m over the area of the MUGA is used to represent the MUGA users.

8.7 A point source is positioned on the south-western boundary of the MUGA to represent ball impacts on the surrounding fence.

8.8 A 3m high barrier has been included in the model along the western boundary of the site to attenuate noise from the MUGA affecting the NNSL and is shown in Figure 2.

8.9 Typically, to be effective an acoustic barrier should have a surface density of ≥ 10 kg/m^2.

8.10 Such a barrier may take the form of a close boarded timber fence with no gaps constructed using 20 mm thick softwood.

8.11 It is understood that the proposed acoustic barrier is comprised of acrylic panels with a surface density of 6 10 kg/m^2 and a weighted sound reduction performance of ≈ 22 dB R_w.

8.12 Given the relatively small amount of attenuation (e.g. < 5dB) required by the acoustic barrier in order to achieve the proposed noise impact criteria, it is considered that the proposed acrylic barrier will achieve this required level of attenuation.

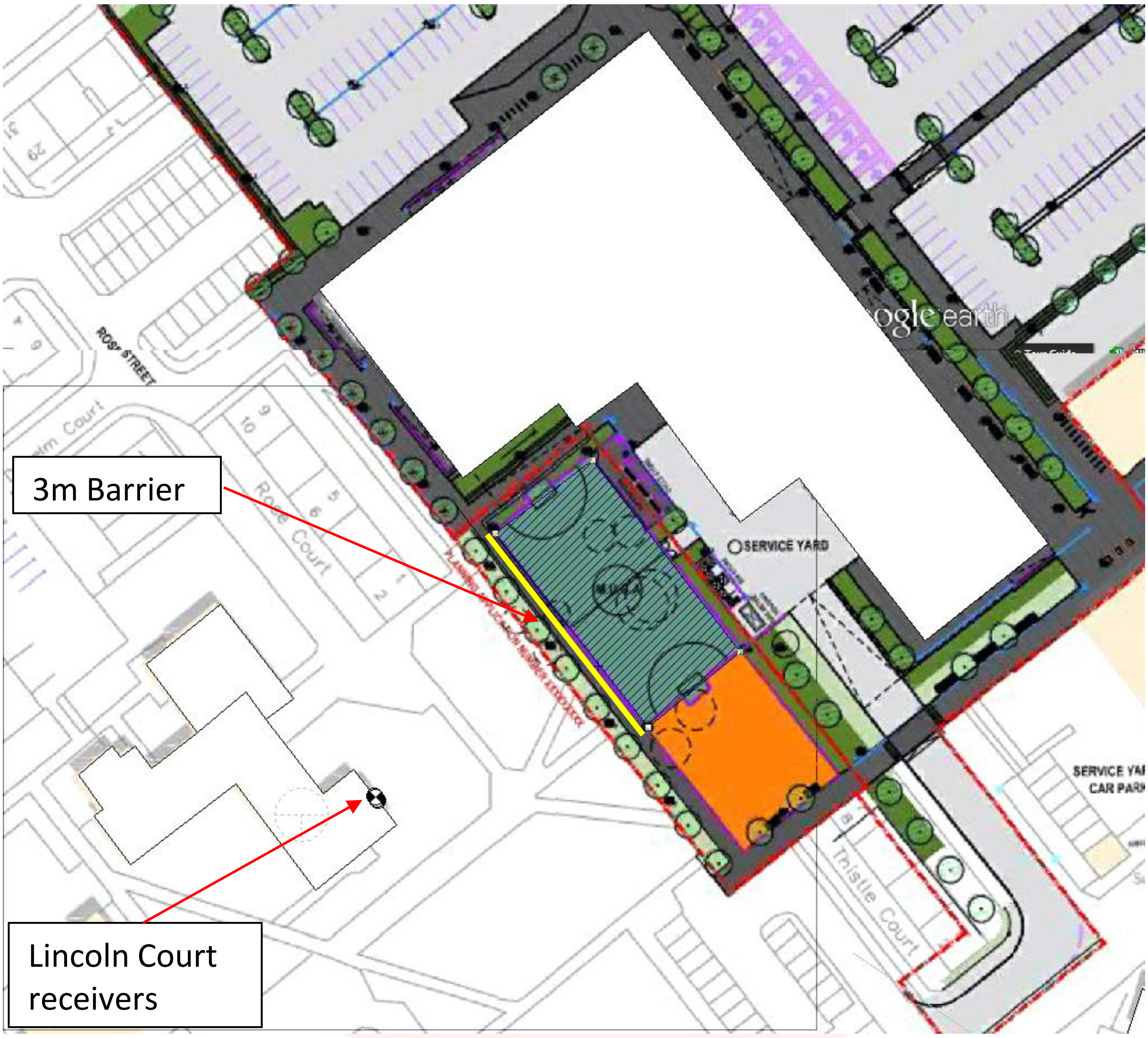

Figure 2: Plan view of CadnaA model illustrating receiver position, barrier shown as yellow line

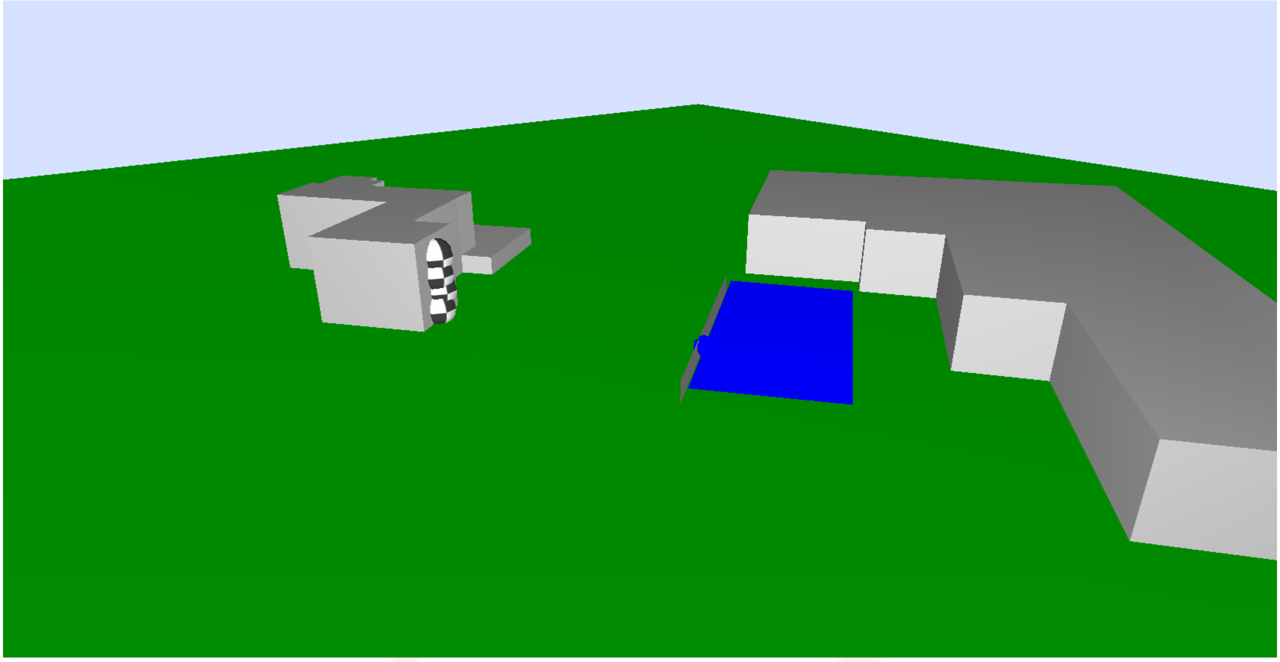

Figure 3: 3D view of model from the south-east

9. Results

9.1 The calculated noise levels at the NNSL due to activities associated with the MUGA are shown in Table 5.

Noise source	Level / dB(A)	
	Lincoln Court	Durham Court
MUGA – worst case / L_{Aeq}	45	44
Ball impact on boundary fence / L_{Amax}	55	58

Table 5: Calculation noise levels at NNSL

9.2 L_{Aeq} noise contours at a height of 9.3 m are shown in Figure 4 for the MUGA with worst case noise levels attributed.

9.3 Noise contours for the calculated L_{Amax} levels across the site for ball impacting on the fence to the boundary of the MUGA are shown in Figure 5.

Figure 4: Plan view showing L_{Aeq} noise contours at 9.3 m with worst case noise levels attributed to MUGA

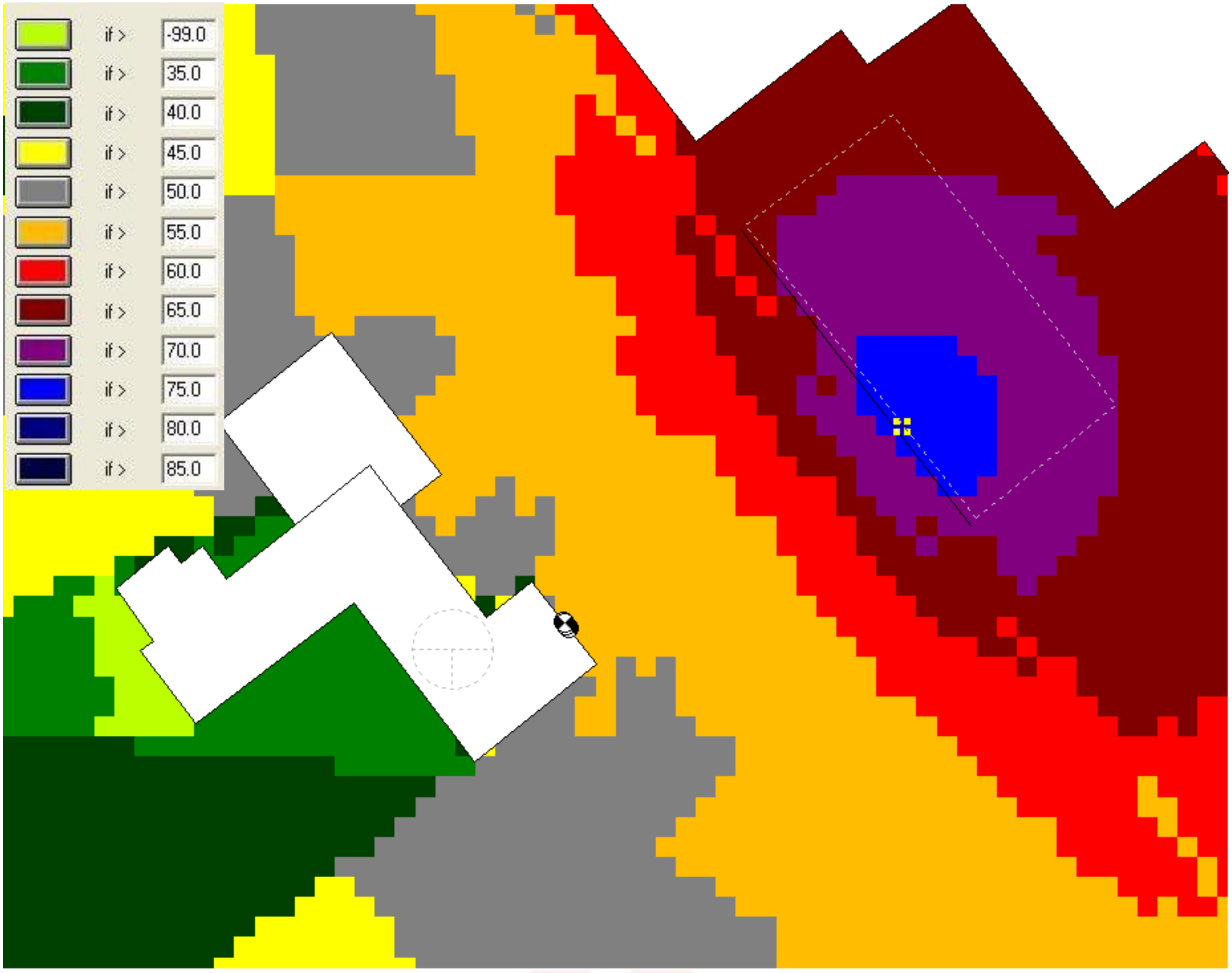

Figure 5: L_{Amax} noise contours at 9.3 m– ball impact on boundary fence

10. Assessment

10.1 **WHO**

10.2 The worst case ground floor calculated noise level at the NNSL is 41 dB L_{Aeq}; below the 50 dB L_{Aeq} required to "protect the majority of people from being moderately annoyed during the daytime".

10.3 **BS 8233**

10.4 Assuming a reduction of 15 dB through a dwelling's external façade into a room with a partially open window, the worst case calculated internal noise level is 30 dB L_{Aeq}.

10.5 This is 5 dB below the daytime noise levels for living rooms and bedrooms given in BS 8233.

10.6 **Research by Fallon, R.**

10.7 The calculated worst case L_{Aeq} noise level at an NNSL exceeds the measured background noise level by 1 dB and is less than 55 dB(A).

10.8 The worst case calculated average L_{Amax} at the NNSL is 58 dB(A), 2 dB below the 60 dB L_{Amax} criterion proposed.

10.9 Hence, all noise conditions proposed in this research are met, indicating that the MUGA is unlikely to be the cause of complaints.

11. Conclusion

11.1 On the basis of the measurements, details and prudent assumptions in this report, it is calculated that with a 3 m barrier to the south-west boundary of the MUGA, the potential noise impact of the MUGA complies with the all of the proposed assessment criteria.

11.2 No other attenuating features are calculated to be required.

12. References

1. BS 4142: 1997, Method for rating industrial noise affecting mixed residential and industrial areas.
2. Guidelines for Community Noise, Edited by Birgitta Bergland, Thomas Lindvall, Dietrich H Schwela, World Health Organisation, 1999.
3. BS 8233: 2014, Guidance on sound insulation and noise reduction for buildings.
4. The development and evaluation of an assessment methodology for the prediction and identification of noise impact from Multi Use Games Areas, Masters Derby: University of Derby, Fallon, R., 2012.
5. Cadna/A environmental noise modelling software, version 4.4.145, Datakustik GmbH.
6. ISO 9613: Acoustics - Attenuation of sound during propagation outdoors.
7. Architects Drawing, Hebburn Masterplan Planning – Development Masterplan M 5031 – 101 P00, Gillespies.

13. Glossary

13.1 The British Standards and other documents referenced should be consulted for definitions of terms and a more extensive glossary.

13.2 **Ambient noise**

13.3 The total sound at a given place, usually a composite of sounds from many sources near and far. Should not be confused with "background noise".

13.4 **Residual noise**

13.5 The ambient noise remaining at a given position in a given situation when the specific noise source is suppressed to a degree such that it does not contribute to the ambient noise.

13.6 **Background noise level, $L_{A90,T}$**

13.7 The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of a given time interval, T, measured using Fast time weighting, and quoted to the nearest whole number of decibels.

13.8 **Specific noise source**

13.9 The noise source under investigation for assessing the likelihood of complaints.

13.10 **Specific noise level, $L_{Aeq, T}$**

13.11 The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval.

13.12 **Rating level, $L_{Aeq, T}$**

13.13 The specific noise level plus any adjustment for the characteristic features of the noise.

14. Appendix 1: Measurements at Eastborne STP

14.1 It is assumed that the MUGA may be used for games of football or other sports in a manner similar to those at Eastbourne Sports Complex, Hundens Lane, The Fairway, Darlington, DL1 1ET. It is reported that the busiest evening at Eastbourne is a Monday night, when 6-a-side league games take place. Source noise levels associated with these activities have been measured.

14.2 Measurements were made at two positions around the flood-lit pitch. During all measurements, three 6-a-side games were taking place simultaneously on the pitch. The site layout and measurement positions are shown in Figure 6, and the measurements in progress in Figure 7. Measurement position 1 was 18 metres from the end of the pitch, over paved intervening ground.

14.3 The purpose of using measurement position 1 was to obtain clear source noise levels unaffected by background noise. The time history of the $L_{Aeq, 1 sec}$ recorded at position 1 is shown in Figure 8. The weather was calm, around 14°C, and clear. Background noise sources included distant road traffic and people passing by.

14.4 **Source levels measured**

14.5 Figure 8 shows one game, between 20:00 and 20:30 hrs, with consistently high noise levels, on the pitch immediately adjacent to the measurement position. Immediately following this, a second game commencing at 20:30 hrs is significantly quieter; the change in levels is apparent at 20:30 hrs. A summary of the source levels measured is included in Table 3 (fireworks have been excluded from the calculations).

14.6 The calculated source sound power levels of these two games is compared in Table 6.

Game	L_w / dB(A)
1	91
2	82

Table 6: Calculated sound power levels

14.7 It is generally considered that the sound power of a person shouting is around L_w = 90 dB(A). These measurements are therefore consistent with the observation that there were shouts continuously from at least one person throughout the first game, and it is the voice effort that is the most significant noise source.

14.8 By contrast, a sound power level 9 dB lower represents shouting for only around 12 % of the time of the second game. Of the six games observed, only one had the noise levels associated with sound power levels over 90 dB(A), and the other five were more consistent with Game 2 as above. Game 1 therefore represents a worst case for source noise levels.

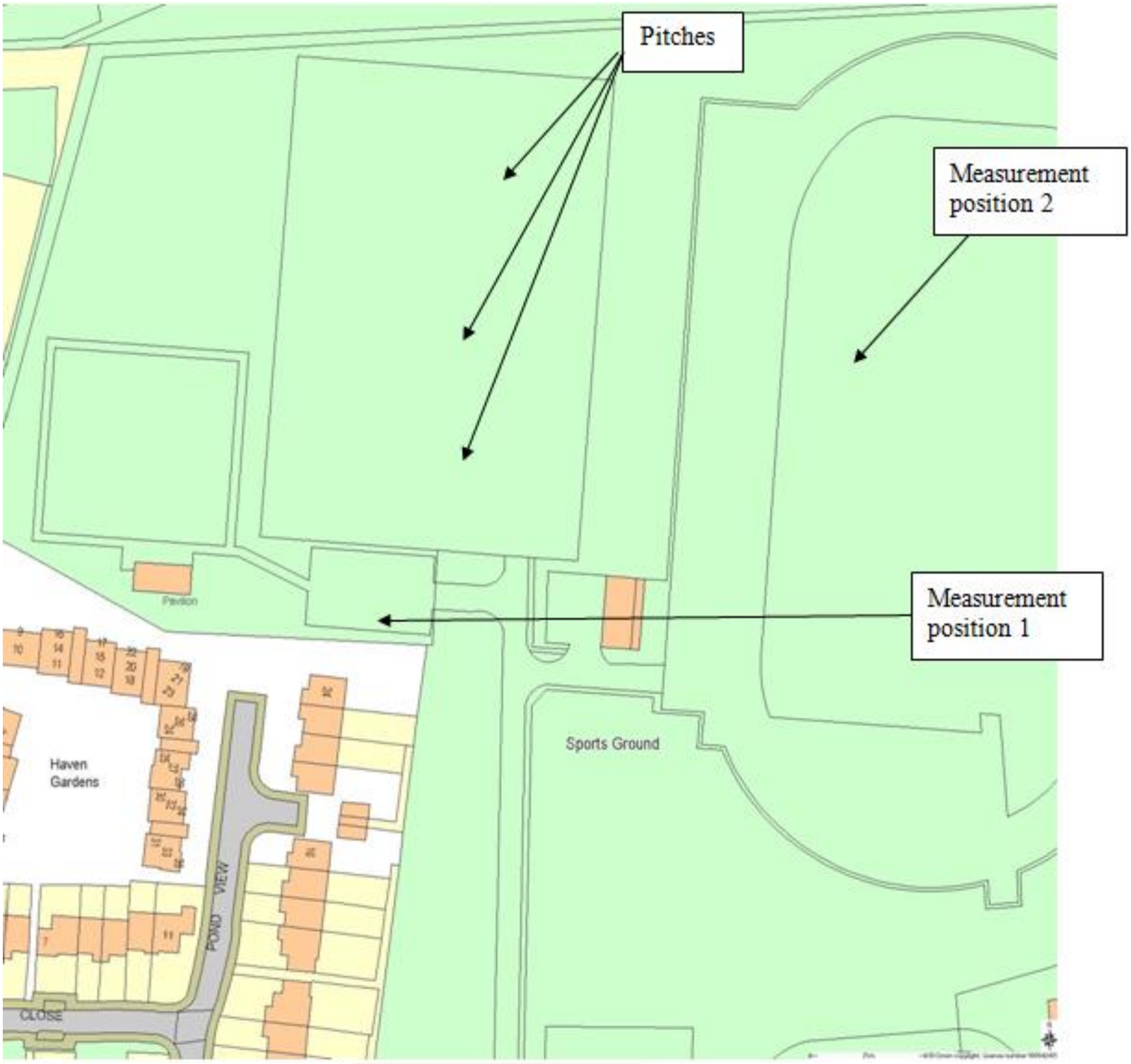

Figure 6: Measurement positions at Eastbourne STP

Figure 7: Measurements at position 1, Eastbourne STP

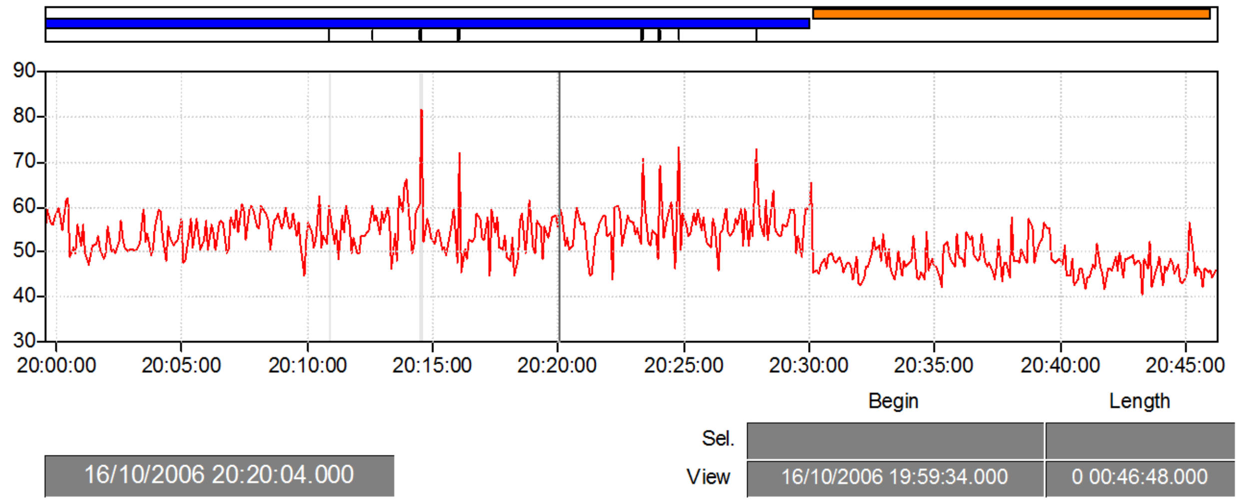

Figure 8: Time history of the $L_{Aeq, 1 sec}$ recorded at Eastbourne position 1. The high peaks are due to fireworks, and are excluded from the calculated levels.

15. Appendix 2: Measurement of ball impact noise

15.1 Measurements of ball impact noise were made at a similar installation opposite Heworth Dene Gardens, Felling, Gateshead. The weather was warm and calm.

15.2 The fence was in good repair, and no sections were found to rattle.

15.3 A size 5 football was used, and repetitive impacts of the ball the the fence were measured at a distance of 10 metres. Data was collected in octave bands at 1 second intervals, including spectral L_{eq}, L_{Fmax} and L_{Smax} parameters.

15.4 Measurements of the ball impact on the fence are shown in Figure 9. The time history of the ball impact on the fence is shown in Figure 10.

Figure 9: Measurement of ball impact on the fence.

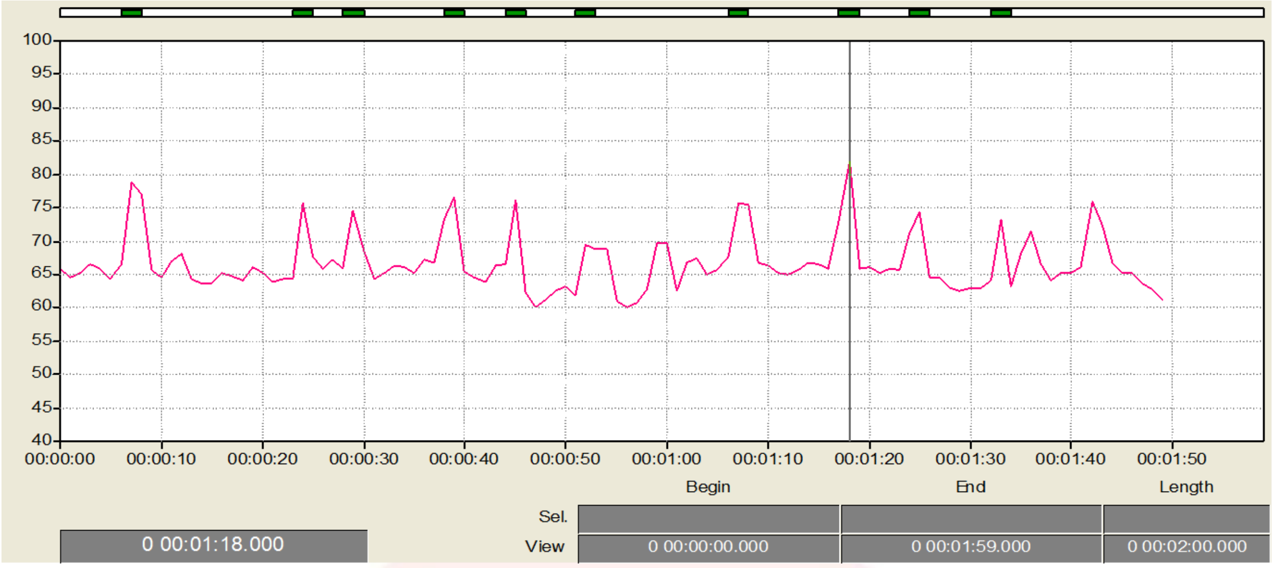

Figure 10: Time history of L_{AFmax} from ball impact on the fence. Each impact is marked with a green bar in the header.

16. Appendix 3: Equipment used

Equipment	Model	Serial no.
Sound Level Meter	Norsonics 140	1403423
Calibrator	Norsonics 1251	32198

Both meter and calibrator have current UKAS calibration certificates traceable to national standards.