Rev. 0 15/01/2019

Noise Impact Assessment

Project Reference Number: PA742

Report Reference Number: TH2111182NR

Client: Norman Patterson

Site: Luckley House School, Luckley Rd, Wokingham RG40 3EU

Project Consultant	**Proofing Consultant**
T. Hegan, BSc (Hons) AMIOA	L. Hatton, BSc (Hons) AMIOA
Acoustics Consultant	Acoustics Consultant
info@acousticsurveys.co.uk	info@acousticsurveys.co.uk

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Assessment Summary

A Noise Impact Assessment has been conducted for a proposed Multi-Use Game Area (MUGA) at Luckley House School, Luckley Rd, Wokingham RG40 3EU. This was to quantify the sound levels likely to generated by the facility, establish their associated impact on the neighbouring residential receptors and to propose mitigation measures to control noise.

Guidance for the assessment has been drawn from *'Artificial Grass Pitch (AGP) Acoustics – Planning Implications' – [Sport England 2015],* which specifies typical noise levels of sports pitches and their associated noise impacts.

A survey of the existing residual noise climate was taken at a location representative of nearby Noise-Sensitive Receptors (NSRs) from Friday 30th November – Monday 3rd December 2018.

When compared against Sport England criteria, the noise impact of the proposed MUGA is low, as noise levels generated are likely to be below 50 dB $L_{Aeq,1hr}$ at the NSRs. This assessment method does not take into the pre-existing noise climate and therefore jas been accompanied by a comparison against residual levels.

For most of the daytime hours, noise generated by the proposed MUGA would be below the existing ambient levels in terms of the level averaged over a sports game ($L_{Aeq,1hr}$). However, during the evening (beyond 21:00 on weekdays or 20:00 on weekends), residual levels are lower and noise from the MUGA would be more prominent at the NSR locations.

Impulsive noise events arising from sources such as a referee's whistle and hockey balls impacting on goal back boards would exceed the existing noise maxima by around 3 – 6 dB under the proposed scheme.

If the applicant wishes to make full use of their requested opening times, mitigation is recommended. The mitigation would include two sections of acoustic fencing, which would achieve the requisite noise attenuation toward NSR locations. When combined with the other proposed mitigation measures (e.g. use of resilient layers on goal backboards), this would allow use of the pitch up until 22:00 on any day.

Subject to the recommendations of the report being adhered to, it is considered that the development is unlikely to give rise to adverse noise impacts upon the neighbouring residential community.

1. Proposal

1.1 The development of a Multi-Use Game Area (MUGA) is proposed at Luckley House School, Luckley Rd, Wokingham RG40 3EU.

2. Standards & Criteria

2.1 Relevant guidance can be drawn from ***'Artificial Grass Pitch (AGP) Acoustics – Planning Implications' – [Sport England 2015]***. The document brings together relevant noise guidelines and UK planning policies for the assessment of noise from Artificial Grass Pitches. It identifies the noise implications of the associated sound sources and recommends mitigation measures to limit adverse impacts upon noise sensitive receptors.

2.2 No specific criteria have been set by the Local Authority for the assessment, therefore the following noise targets have been selected for the assessment:

- Noise generated by the proposed MUGA ($L_{Aeq,1hr}$), as calculated over a worst-case 1-hour period, should not exceed 50 dB at the nearest Noise-Sensitive Receptor (as recommended in Sport England guidance).

- Maximum individual noise events (L_{AFmax}) should not exceed the existing typical maximum noise levels at the nearest Noise Sensitive Receptor.

- Ambient noise levels ($L_{Aeq,1hr}$) should not exceed the current residual noise level ($L_{Aeq,1hr}$).

3. Noise Sensitive Receptors

3.1 The nearest Noise Sensitive Receptors are displayed in **Figure 1** and listed below:

- **NSR 1 (West)** – Residential dwellings on Denby Close, RG41 2AL
- **NSR 2 (East)** – Residential dwellings on Luckley Wood, RG41 2EW

4. Site & Measurement Locations

4.1 Figure 1 shows the site, NSR and measurement locations.

Figure 1: Site and Measurement Locations

Proposed MUGA Location (Approx.)

NSR Location

Measurement Position

5. Background Noise Survey

5.1 Ambient noise levels were measured from 10:25 on Friday 30th November to 15:20 on Monday 3rd December 2018. This period was chosen to obtain representative noise levels with and without the influence of existing sports activities within the school.

5.2 Noise levels were measured 1.6m from ground level at the locations shown in **Figure 1.**

5.3 Measurements were undertaken using a Svantek 971 Class 1 Sound Level Meter, SN: 40305. Full equipment details can be found in **Appendix B**.

5.4 The calibrator reference level was 114.0dB and the calibration drift during measurements was 0.1 dB. Full calibration details can be found in **Appendix D**.

5.5 Weather conditions were mild and dry with light South Westerly winds of 2 – 4 m/s. Full meteorological details are shown in **Appendix C**.

6. Residual Noise Levels

6.1 The residual noise climate representative of the NSR locations is comprised of birdsong, road traffic and aircraft.

6.2 Existing residual noise levels are displayed graphically in **Appendix E**. The most sensitive time periods during the proposed usage times of the MUGA are displayed below:

Table 1: Measured Ambient Noise Levels

Location	Time	Ambient Level dB $L_{Aeq,1hr}$	Typical Maxima dB L_{AFmax}
M1	Fri 21:00 – 22:00	44.5	40 - 55
	Sat 21:00 – 22:00	42.8	50 - 60
	Sun 21:00 – 22:00	43.8	50 - 60

7. Assumed Noise Sources

7.1 Sport England guidance states that noise generated by Multi-Use Game Areas is normally dominated by human voice. An exception is made for Hockey Games whereby the loudest sounds are reported to be the impact noises from balls hitting boards; these sources are therefore to be given special consideration in the assessment.

7.2 The research conducted by Sport England included monitoring of nine sports sessions of different types, with participation by men, women and children, with the objective being to determine the 'typical' noise level from an AGP sports session (58 dB $L_{Aeq,1hr}$). The research does not make a distinction between competitive and practice type sessions, implying that the typical level reported would account for both these applications. In sports facilities used for local league competitions, large crowds of vocal supporters are not anticipated and as such the figure reported in Sport England guidance is deemed suitable for use in the assessment.

7.3 Table 2 summarises the various noise data sources that have been used within the acoustic model.

Table 2: Noise Data for Sports Pitch Sources

Ref.	Description	Parameter	Given Source Distance	Level
A	Typical Level of an AGP (Artificial Grass Pitch)	dB $L_{Aeq,1hr}$	10m from the side-line halfway marking.	58.0
B	Noise data of a Hockey Game	dB $L_{Aeq,1hr}$	10m from pitch boundary	51.0
C	Male Vocal Shout	dB L_{Amax}	1m	82.0
D	Football impacting on a mesh fence	dB SEL	1m	76.8
E	Hockey ball impacting on a goal backboard (highest level given)	dB L_{Amax}	5m	96.0
F	Referee whistle	dB SEL	1m	110

References

A *'Artificial Grass Pitch (AGP) Acoustics – Planning Implications' – [Sport England 2015]*

B *Noise Assessment of an all-weather sports pitch available on Mole Valley Planning Portal, conducted by Sharps Redmore Partnership, May 2017. (www.molevalley.gov.uk/)*

C *'Speech Levels in Various Noise Environments' – [US Environmental Protection Agency, 1977]*

D *Measurement conducted by Peak Acoustics Ltd in May 2017*

E *'Measurements of hockey ball hitting backboard covered by different materials' – [Apex Acoustics, 2018] (apexacoustics.co.uk)*

F See below

7.4 There is wide ranging noise data available for referee's whistles, however the most reliable sources have tended to use L_{peak} levels intended for the assessment of hearing damage and this parameter would overestimate the perceived level at a given receiver distance. Noise levels of the loudest available whistles are reported to be as much as 120 dB(A) SPL at 2m whilst the lower end of the spectrum is 106 dB(A) at the operator's ear, which would correspond to around 90 dB at 1m with a basic point-source distance correction from 0.15m to 1m applied. Within the assessment, 110 dB(A) at 1m is assumed, which is selected as a mid-point between the wide-ranging noise data available. Noise levels at the NSR locations will depend on the position and orientation of the referee as well as how hard the whistle is blown. The reported levels of the referee's whistle can therefore only be seen as a guide.

7.5 The Hockey Game level is lower than the Sport England level which is given at the same distance. The more onerous of the two levels will be used in the actual prediction of noise levels, however both levels are shown in Table 2 for informative purposes.

8. Acoustic Model

8.1 To predict noise emitted from the MUGA, an acoustic model was generated using *SoundPLAN*.

8.2 The model considers the MUGA as an area-source of noise at a height of 1.5m, representative of an adult human voice height. Noise levels at the receiver locations were calculated externally 1m from the ground-floor window (this location is also representative of the noise level in gardens).

8.3 The noise level of the MUGA area-source was calibrated to return the noise levels detailed in Section 7 at the given source distances.

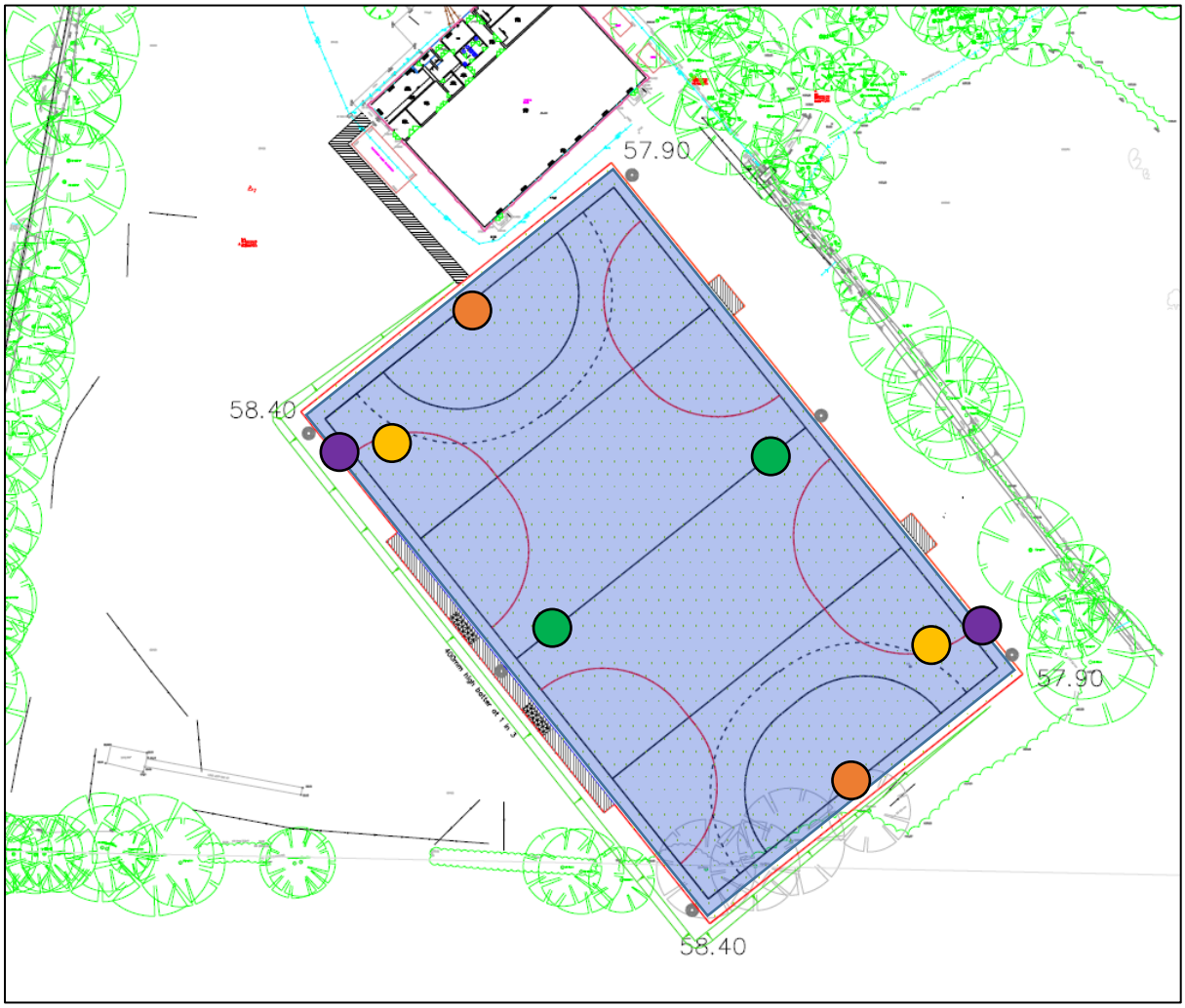
8.4 Point sources for the impulsive sounds (ball impacts, whistle, vocal shouts) were inputted and calibrated to match the levels detailed in Section 7 at the given distances.

8.5 The SoundPLAN software calculates the propagation of sound in accordance with '*ISO 9613-2:1996, Acoustics – Attenuation of sound during propagation outdoors'* and accounts for key factors such as:

- Composition of the intervening land between the noise source and receivers
- Atmospheric absorption of sound
- Ground absorption of sound
- Heights of the noise sources and receivers
- A light downwind correction toward the receiver

8.6 Figure 2 shows where noise sources were inputted into the acoustic model.

Figure 2: Visual Representation of Noise Source Test Positions in Acoustic Model



Area Source at 1.5m from ground – $L_{Aeq,1hr}$ Sports Activity Noise

Vocal Shout at 1.5m from ground – L_{AFmax} Point-Source

Football hitting metal fence at 1.0m from ground – L_{AFmax} Point-Source

Hockey ball hitting goal backboard at 10cm from ground– L_{AFmax} Point-Source

Referee's Whistle at 1.6m from ground – L_{AFmax} Point-Source

9. Predicted Sound Levels at NSR Locations

9.1 The noise level of the MUGA over a representative period of 1 hour has been calculated at the receiver locations and is displayed in **Table 3**. Maximum individual noise events have been calculated and are shown in **Table 4**.

Table 3: Predicted Noise Levels of Sports Sessions

Receiver Location	Noise Source	Average Noise Level at NSR Location dB L_{Aeq}
NSR 1	Sports Session (Sport England Referenced Level)	46.1
NSR 2	Sports Session (Sport England Referenced Level)	43.5

Table 4: Predicted Noise Levels of Impulsive Sources

Receiver Location	Noise Source	Maximum Noise Level at NSR Location dB L_{AFmax}
NSR 1	Football Impacting Wire Fence	39.4
	Human Voice (Shout)	44.2
	Hockey ball impacting goal board	66.9
	Referee's Whistle	66.8
NSR 2	Football Impacting Wire Fence	35.3
	Human Voice (Shout)	40.4
	Hockey ball impacting goal board	63.7
	Referee's Whistle	60.9

9.2 Sport England guidance indicates that "*Based on a 15 decibel sound reduction of a partially open window, the noise level outside a residential property during the daytime about 1 metre from façades of living spaces should not exceed 50 dB L_{Aeq}." (*p.6). As indicated in Table 1, this criterion would be achieved under the proposed scheme.

9.3 Graphs have been provided in **Appendix E** which show the predicted $L_{Aeq,T}$ level of a sports session plotted against the existing residual level for the two NSRs (Graphs B and C). During times where the sports noise (purple line) exceeds the existing ambient level (blue line), this indicates that the sports noise is likely to be the dominant source at the NSR and adverse noise impacts may arise.

9.4 The typical regularly occurring noise maxima of the existing noise climate are around 60 dB L_{AFmax} with some peaks at 70 – 75 dB L_{AFmax}. As demonstrated in Table 4, impulsive noise from vocal shouts and footballs hitting fencing are likely to be significantly below this.

9.5 The most prominent impulsive noise sources as indicated in Table 4 are hockey balls impacting on goal boards and the referee's whistle. At the worst-affected NSR (NSR 1), noise from these sources would be exceed the existing typical maxima by 3 – 6 dB.

10. Contextual Factors

10.1 There are existing sports pitches in lawful use at the school, which would generate the same types of noise sources as the proposed MUGA, albeit not at the same level or during the same time periods. This would lessen the 'Observed Effect level' which might arise from residents being able to hear occasional referee's whistles or other sources, as these are an existing part of the noise climate.

11. Assessment of Noise Impact

11.1 Predicted $L_{Aeq,1hr}$ noise emissions from the MUGA would be below 50 dB at all NSR locations, which conforms with Sport England guidance and indicates a low noise impact. However, because background levels are relatively low, this parameter needs to be accompanied by a comparison against the existing noise climate in order to fully assess the noise impact.

11.2 Predicted $L_{Aeq,1hr}$ noise levels of sports sessions would begin to exceed the existing residual noise levels from approximately 9pm on the weekdays (using Friday evening as the reference point) and 8pm on the weekends (using Saturday evening as the reference point; marginally higher residual levels were present on Sunday evening). This indicates that adverse noise impacts may arise in the evenings.

11.3 Without mitigation, maximum individual noise events of hockey balls hitting back boards are likely to be audible amongst the residual noise climate at the NSR locations. This could be a fairly intrusive noise and so presents a potential for adverse noise impacts. Noise from this source can be mitigated relatively easily as discussed in Section 12.

11.4 Under the proposed scheme, sound levels from referee's whistles are likely to be marginally above the existing noise maxima (by 3 – 6 dB) at the NSR locations. The impact of this in practice may be lessened by the context in that these are likely to be an existing part of the noise climate, and the observed effect on residents is therefore likely to be low.

11.5 The assessment has thus far been made to the external levels without considering the attenuation through an open window. During the evening time when residual levels are lower, internal levels may be more relevant than the external levels and the sound of a whistle is likely to be attenuated fairly readily by a partially open window and attenuated significantly by a closed window. With all factors considered, the noise impact of referee's whistles is low during the day but may become problematic during the evening when residual noise levels drop off, as described in Para. 11.2.

11.6 It is considered that the potential for adverse noise impacts upon local residents is significant enough to justify mitigation measures. This is primarily due to the predicted noise impact during the late evening. Mitigation proposals are discussed in Section 12.

12. Mitigation

12.1 The scale of the mitigation required is dependent on the hours in which the MUGA is to be granted permission for use. Table 5 sets out times of the day when the noise impact is considered acceptable without the need for acoustic screening.

Table 5: Usage Times not Requiring Sound Attenuation Measures

Day	**Suggested opening times *(times which would be allowable without sound attenuation measures)***
Mon - Fri	08:00 – 21:00
Sat / Sun	08:00 – 20:00

12.2 During the above opening times, noise emissions from the MUGA would be at or below the residual noise level ($L_{Aeq,1hr}$) based on the measured noise data, except for a marginal exceedance of 1.2 dB from 19:00 – 20:00 on Saturday. This is considered an acceptable exceedance because the predicted noise emissions have been based on the most onerous noise data (Sport England guidance) whereas predicted noise levels would be lower when considering the other measured data. Absolute noise levels from the MUGA would also be below 50 dB $L_{Aeq,1hr}$ and are therefore compliant with the Sport England suggested criterion.

12.3 Should it be desirable to allow use of the sports pitch outside of the hours suggested in Table 5, sound attenuation measures are recommended in the form of acoustic screening, which should conform to the following specifications:

Table 6: Acoustic Screening Specification

Location	As shown in **Appendix G.**
Height	As shown in **Appendix G.**
Construction	**Either:** Timber-type Acoustic Grade Fencing with a minimum surface density of 15kg/m^2 (an example of a manufacturer that produces such fencing is *Jacksons*). **Or:** Acoustic barrier membrane with a Sound Reduction Index of >20dB, such as 'Acoustifence' (www.acoustiblok.co.uk). (This is likely to be more cost-effective)
Other Requirements	- Screening should form a solid barrier with no gaps along the recommended location. - Fencing should be kept in a good state of repair during the throughout the lifetime of the facility.

12.4 Hockey goal backboards should be lined with a resilient rubber layer of the type supplied by sports surfacing manufacturers such as 'Nottsport'. Advice should be taken from the supplier and the correct selection of materials could be validated using a simple noise measurement. The noise level of a hockey ball hitting the goal board should be less than 85 dB(A) L_{AFmax} at 5m; the research conducted by Apex Acoustics (See Section 7) indicates that this is entirely feasible. **Note this recommendation applies regardless of the permitted opening times or whether acoustic screening is to be installed.**

12.5 Good practice should be exercised in the design of the pitch and selection of materials and products; the following are recommended to further minimise the noise impact:

- Inner fencing should be securely clamped with resilient fixings to avoid rattling sounds occurring when objects impact on the fence. The state of repair of the inner perimeter fence should be reviewed on an annual basis.

- Football goals consisting of a fabric mesh which does not rattle when goals are scored should be selected.

- Any objects likely to rattle (such as sheet metal advertising signs) should be positioned where they are not likely to be hit by footballs.

13. Mitigated Noise Impact

13.1 The acoustic screening detailed in Section 10 has been inputted into the acoustic model and the following revised noise levels from sports sessions were calculated at NSR locations.

Table 7: Predicted Noise Levels of Sports Sessions (Considering Acoustic Screening)

Receiver Location	Noise Source	Noise Level at NSR Location dB L_{Aeq}
NSR 1	Sports Session (Sport England Referenced Level)	44.3
NSR 2	Sports Session (Sport England Referenced Level)	42.1

13.2 Predicted L_{Amax} levels considering the recommended mitigation, including the screening and the use of resilient goal boards, are shown in Table 8:

Table 8: Predicted Noise Levels of Impulsive Sources (Considering Acoustic Screening)

Receiver Location	Noise Source	Maximum Noise Level at NSR Location dB L_{AFmax}
NSR 1	Ball Impacting Wire Fence	34.3
	Human Voice (Shout)	40.4
	Hockey ball impacting goal board	40.5
	Referee's Whistle	59.2
NSR 2	Ball Impacting Wire Fence	32.1
	Human Voice (Shout)	38.2
	Hockey ball impacting goal board	38.5
	Referee's Whistle	59.5

13.3 With the screening in place, $L_{Aeq,1hr}$ noise levels of sports sessions would be reduced in comparison to the residual noise level, lessening the noise impact at both NSR locations. **Graphs B** and **C, Appendix E** show the mitigated MUGA noise level compared with the residual level.

13.4 The recommended mitigation would place predicted L_{Amax} levels within the range of the existing noise maxima which would further reduce the noise impact at the NSR locations.

13.5 Based on the predicted noise levels, it is considered that the mitigation would allow for operation of the MUGA up until 22:00 on any day.

14. Conclusion

14.1 A Noise Impact Assessment has been conducted for a proposed Multi-Use Game Area at Luckley House School.

14.2 Noise has been assessed by analysing predicted absolute noise levels and by comparison of predicted noise levels against the existing noise climate.

14.3 In accordance with Sport England guidance ('Artificial Grass Pitch (AGP) Acoustics – Planning Implications'), predicted noise levels resulting from the new MUGA would be below 50 dB $L_{Aeq,1hr}$ at the receiver locations.

14.4 For most of the time, $L_{Aeq,1hr}$ noise levels generated by sports sessions at the MUGA would be below the existing residual noise climate calculated at the NSR locations. However, during the evening, noise levels would begin to exceed the residual noise climate and become the dominant source at the NSR locations.

14.5 The most prominent impulsive noise sources were predicted to be hockey balls impacting on goal backboards and referee's whistles. Mitigation against hockey ball impacts has been recommended. Sound from referee's whistles would be marginally above the existing noise maxima; in context, this has been considered acceptable during the middle of the day but could cause adverse noise impacts during the evening when residual levels are lower.

14.6 The report sets out time ranges in Section 10 whereby the MUGA could be operated without the need for acoustic screening.

14.7 Should it be considered desirable to operate beyond the hours set out in Section 10, acoustic screening is recommended to ensure that noise levels remain approximately at or below the existing residual noise levels at the NSR locations. This would allow operation of the MUGA up until 22:00 on any day and would also have a positive effect on maximum individual noise events, which would be reduced to within the range currently observed in the existing noise climate.

14.8 Following implementation of the recommendations of the report, it is considered that the proposed sports pitch is unlikely to give rise to adverse noise impacts at noise-sensitive receptors.

APPENDIX A - Measurement Details

Measurement	Kit	Start Date	Start Time	End Date	End Time
M1	A2	30/11/18	10:25	03/12/18	15:22

APPENDIX B - Equipment Details

Kit	Equipment	Make	Model	Class	Serial Number
A2	Sound Meter	Svantek	971	1	40305
A2	Pre-Amp	Svantek	SV12L	1	32484
A2	Calibrator	Svantek	SV31	1	90274

APPENDIX C - Meteorology Details

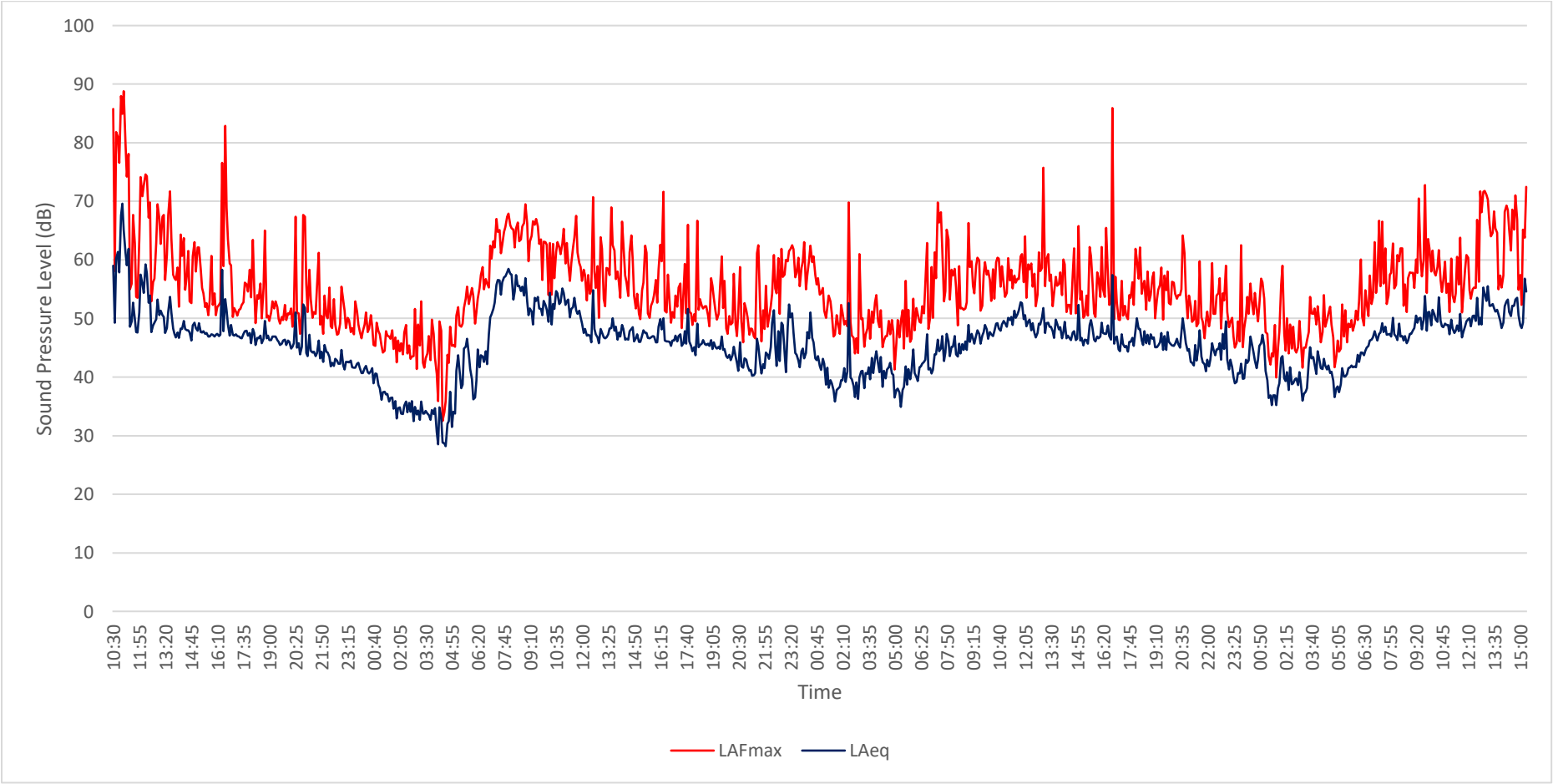
Measurement	Date	Temp C	Wind Speed m/s	Wind Direction	Humidity %	Precipitation mm	Cloud Cover (Oktas)
M1	03/11/18	10	2 - 4	SW	80	0.0	0/8

APPENDIX D - Calibration Details

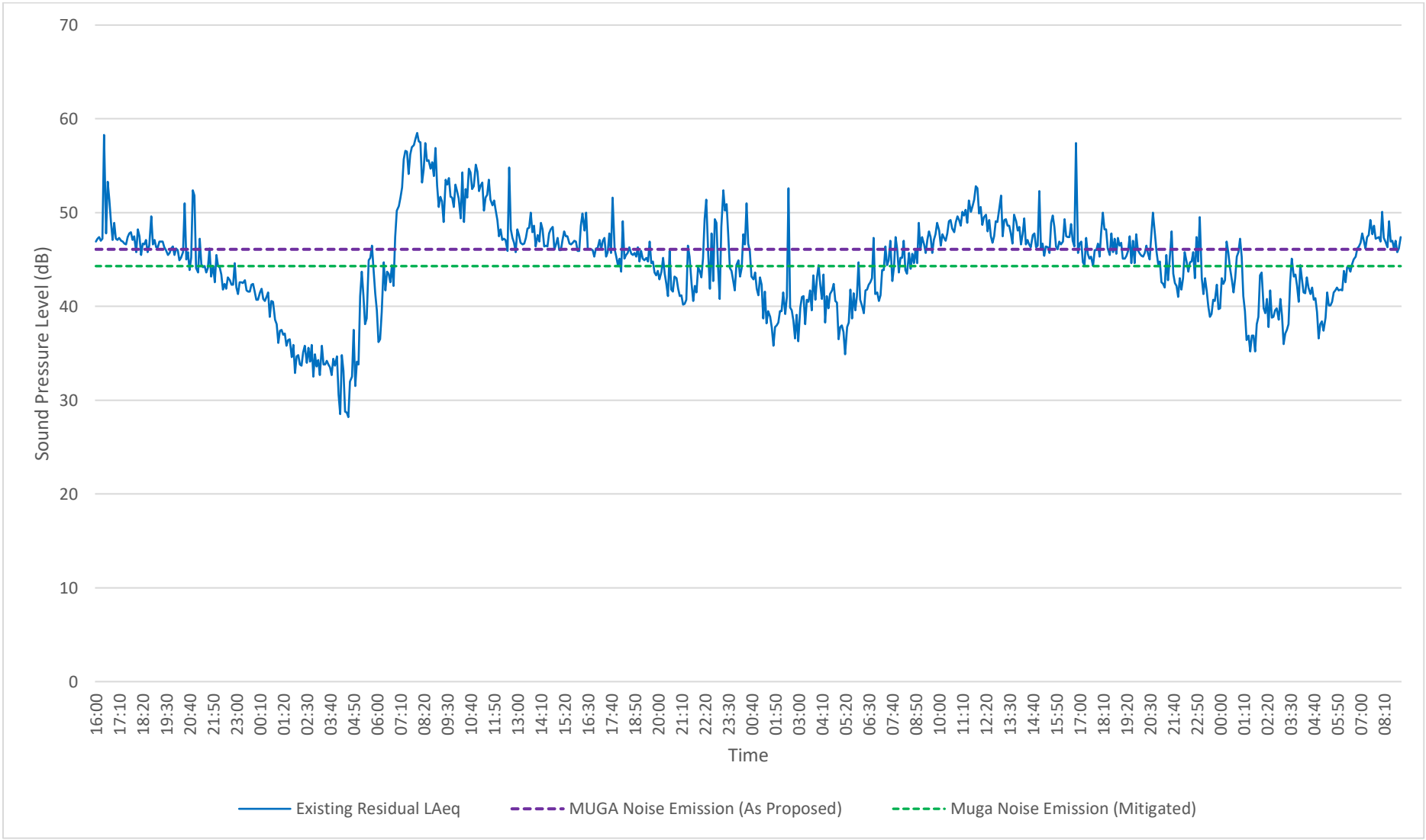
Measurement	Calibrator Ref Level (dB)	Level Before (dB)	Deviation Before (dB)	Level After (dB)	Deviation After (dB)
M1	113.8	112.1	1.7	112.0	1.8

APPENDIX E – Ambient Noise Graphs

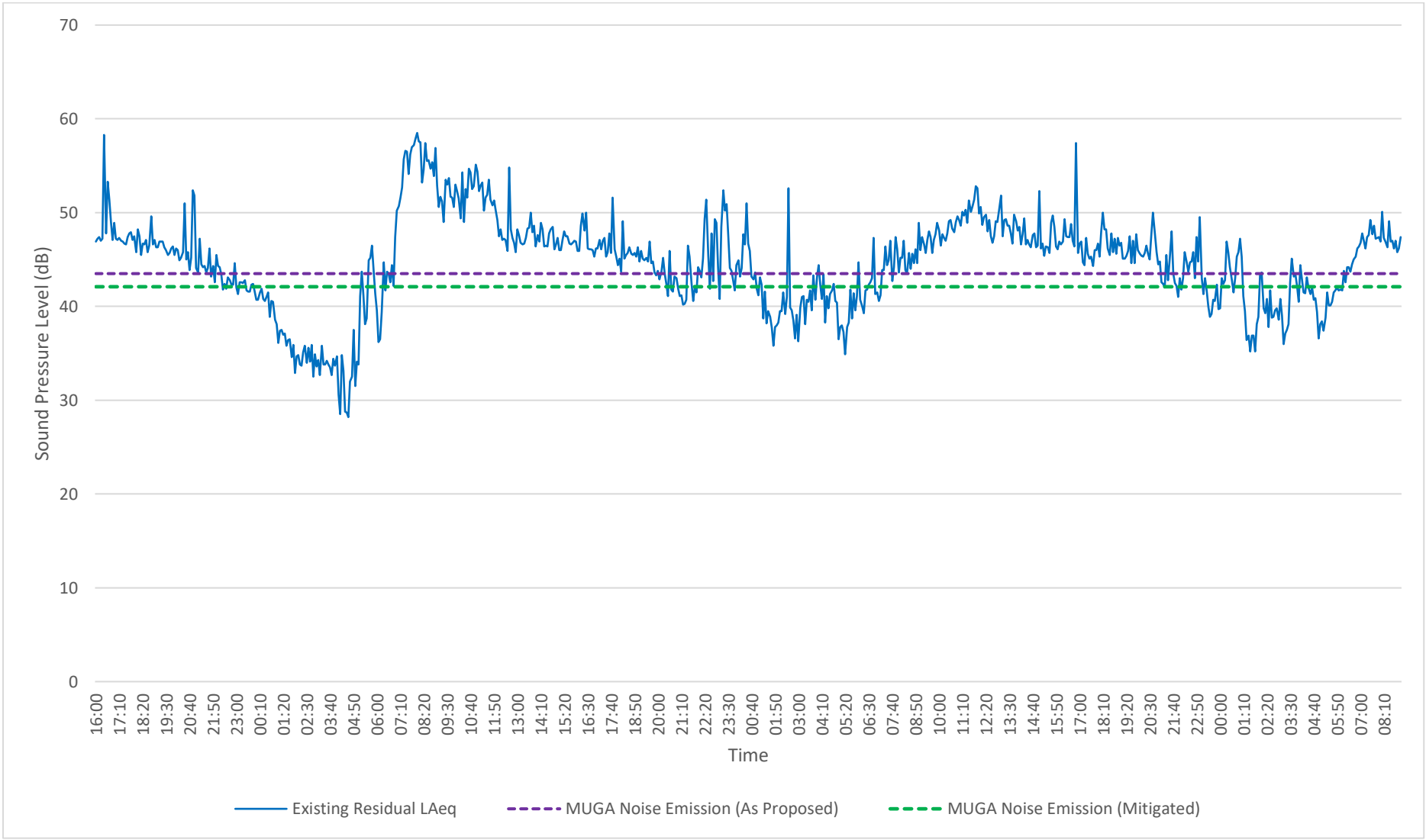
Graph A: *Measured Ambient and Maximum Noise Levels, 30th Nov – 3rd Dec 2018, M1*



Graph B: *MUGA Activity Noise vs Existing Residual Level at* ***NSR 1***
Residual levels displayed are Fri – Mon



Graph C: *MUGA Activity Noise vs Existing Residual Level at* ***NSR 2***
Residual levels displayed are Fri – Mon



APPENDIX F – Acoustic Screening Plan