Chartered Building Consultancy

Acoustic South East

Noise Impact Assessment Change to the Hours of Use

Site: **The Drill Hall, Denne Road, Horsham**
Client: **Life Spring Church, Horsham**

Report by: Simon Barrett BSc(Hons) MSc MIOA
Checked by: Peter Attwood BSc(Hons) MSc MCIOB MIOA
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Project: J3924
Issue 1

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Issue No.	Date	Comment(s)
1	21/10/2024	Initial Issue

This report has been prepared by Acoustic South East with all reasonable skill, care and diligence and presents information included within the scope agreed with the client. If any third party whatsoever comes into possession of this report, they rely on it at their own risk and Acoustic South East accepts no duty or responsibility (Including in negligence) to any such third party.

1 Introduction

Acoustic South East have been appointed to undertake an acoustic assessment of the proposal by Lifespring Church to change the use of The Drill Hall, Denne Road, Horsham and extend the hours of use very slightly at either end of the day – Horsham District Council Planning Application DC/24/1465 refers.

Standards and guidance referenced for this assessment include:

- ISO9613 (Attenuation of sound during propagation outdoors) 1996.
- National Planning Policy Framework (NPPF) 2023
- Planning Noise Advice Document Sussex – 2023
- BS8233 Guidance on sound insulation and noise reduction for buildings 2014

Three class 1 sound level meters were installed on site: One internally and two externally at the front and rear facades between the period of 10th October – 17th October 2024 to measure the A-Weighted Leq Ambient and Leq Residual sound levels and the L90 background sound levels across the 1/3rd octave band frequency profile. This period of monitoring also was able to capture a typical Sunday church service by use of the internal meter.

In addition, a noise-breakout assessment of the venue (with all doors closed) was carried out using pink noise to assess the effectiveness of each of the 4 facades of the venue. The results then enabled a noise contour map to be produced showing how the hall's sound propagates across the nearby area.

The assessment shows that even with the loudest 5-minute period from the church service (which is the worst-case scenario), the resultant external sound pressure level once it reaches the nearest NSRs is significantly below the existing A-Weighted L90 Background Sound Levels for the area.

The SPLs reaching the NSRs due to the loudest measured 5-minute LAeq from the church service was significantly below the requirements of BS8233:2014 when outside. Once inside the NSR this would then be at least 13dB lower (assuming an open window).

For the areas where it was not possible to assess the existing L90 Background due to equipment power failure, alternative methods have been used to show what the resultant effect would be on the NSR (Mill River Lodge) and these calculations show that the SPLs are insignificant.

No additional mitigation measures will be required and therefore, based upon the above assessment, it is recommended that planning consent is granted without issue.

2 Context, Noise Criteria & Noise Assessment Methodology

2.1 Context and Location

The Drill Hall is located on Denne Road, which is to the South East of the town centre. Immediately to the front (west) of the hall is Denne Road, and to the other side of this road, a series of residential dwellings.

To the rear of (east) of the hall is a car park that is used for those who work in Horsham and those who live in the area.

This carpark is accessed by a lane immediately to the south of the building.

To the north of the building is an alleyway and residential dwellings beyond that.

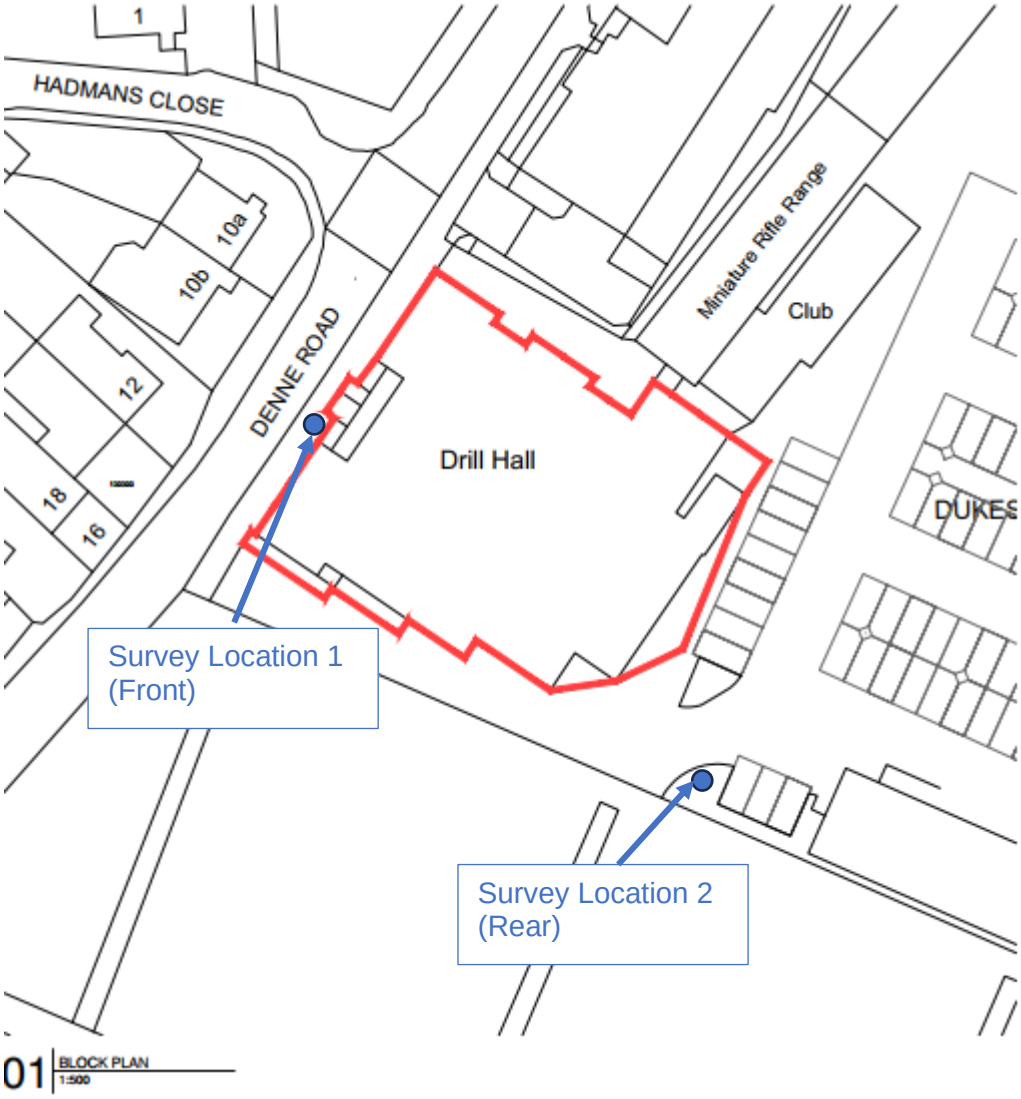


Figure 1. Location Plan showing The Drill Hall and External Measurement Locations

At present, the building has the following operational restrictions:

- Monday to Thursday : 10am to 11pm
- Friday and Saturday : 10am to midnight
- Sunday and Bank Holidays : 10am to 10.30pm

An amendment to the above is sought:

Monday to Thursday: 7am to 11pm

- Friday and Saturday : 7am to midnight
- Sunday and Bank Holidays : 9am to 11pm

The following change in terms of the possibility of playing amplified music is also sought:

- Monday to Thursday: 8.30am start instead of 10am (+1.5hrs)
- Friday and Saturday: 8.30am start instead of 10am (+1.5hrs)
- Sunday and Bank Holiday: 9am start instead of 10am (+1hr), and a finish of 11pm instead of 10.30pm (+0.5hrs)

2.2 Requirements of the Local Authority

The Environmental Health Officer for this planning application has stated the following:

Planning Application Drill Hall, Denne Road, Horsham, RH12 1JF – DC/24/1465 Change of use from Use Class F2 to a mixed-use comprising Use Class F1 and Use Class F2 together with amended hours of operation.

I am considering the above application and have a consideration as follows;

- Amplified music, is it intended to provide amplified music events/band practice from 08.30hrs as identified in the extended operating hours. If this is the case then a noise impact assessment needs to be undertaken by a competent person.

2.3 Methodology and Approach

To ensure that sufficient information is presented to accompany the change of use application, the following approach is taken:

1. Measure existing ambient sound levels and background sound levels over both the 1/3rd Octave Band Frequency range and broadband A-Weighted at the front of and rear of the site over the period of 5 – 7 days to include the weekend.
2. Measure the internal ambient sound level within the main hall to capture the sound pressure level of the church service and associated set-up and pack-down activities for both A-weighted and across the 1/3rd octave band frequency range.
3. Carry out an inside-to-outside noise-breakout test for the building façade (all doors and windows closed) using pink noise in order to determine the effectiveness of the building at containing sound across the 1/3rd octave frequency range between 25Hz – 10kHz.
4. Calculate the sound breakout from the noisiest part of the church service (musical worship section), based on the building façade's measured sound insulation.
5. Compare the calculated external sound pressure levels due to the Sunday morning church service associated time period against the measured existing ambient sound pressure levels for the same area during the same time period on days when the church does not meet.
6. Calculate the sound pressure levels reaching the nearest noise sensitive receptors (NSRs) on all 4 sides of the hall due to outdoor propagation.
7. Compare the *measured* ambient noise levels across all days
8. Conclude

2.4 National Planning Policy Framework Dec 2023

The National Planning Policy Framework (Dec 2023) defines the Government's planning policies for England and how these are expected to be applied. It sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate and necessary to do so.

The following paragraphs are relevant within NPPF Section 15 (Conserving and enhancing the natural environment) states the following:

Paragraph 180(e) - Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability, and

Paragraph 191 - Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and

c) Paragraph 193– Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

3 Background/Ambient Sound Survey Baseline Conditions & Results

A long-term unattended background noise survey was carried out from 10th to 17th October 2024 to assess the existing Leq ambient sound levels and L90 Background Sound Levels at the application site. The survey saw a class 1 sound level meter placed outside of the front the site close to nearest 3rd party residential receptors along Denne Road. A second Class 1 sound level meter was placed out to the rear of the site. A 3rd Class 1 Sound Level meter was then placed inside the main hall. The survey equipment was able to include a church service during its measurement time period.

The rationale for the positions of the sound level meters was to ensure that sound levels were assessed which were representative to the nearest noise sensitive receptors, but whilst remaining secure.

3.1 Background and Existing Noise Survey Details

Survey(s) carried out by	Simon Barrett BSc(Hons) MSc MIOA
Equipment Used	Position R1: 01dB Black Solo Class 1 Sound Level Meter Position R2: Norsonic Nor118 Class 1 Sound Level Meter Position Int 1: Svantek 971 Class 1 Sound Level Meter
Equipment Used	Norsonic Type 1443 Acoustic Calibrator.
Location	Position R1: Pole Mounted at 1st Floor Level on to Denne Road Position R2: Fixed to a vertical pole close to QM Studios Position Int 1: Over-sailing the hall, mounted on the balcony
Duration	10th October – 17th October 2024

Table 1. Survey Equipment

The sound level meters were calibrated before and after commencing the noise measurements (@114dB with no drift).

On retrieving the equipment, it was found that there was a power issue to the Sound Level Meter (Norsonic Nor118 at the rear of the hall) causing it to switch off after approximately 8 hours. However, this sound level meter location was not a critical position and the assessment was able to be completed without its inclusion.

The unattended external and internal sound level meter locations can be seen below in Figure 2, 3 and 4.



Figure 2. Survey Position RP1



Figure 3: Survey Position RP2



Figure 4: Survey Position Int1

3.2 Known Church Service

A known church service occurred on 13th October 2024. Setup for the service began at 8:30am and Sound Check began at 9:30am. This was confirmed by the client. The church service then started at 10:30am and ran until 12:15pm, followed by pack-down.

3.3 Measured Representative LA90 Background Sound Levels

The survey monitoring position was chosen to represent an “area” background sound level representative to the site.

A summary [of the representative background sound levels] is shown in the table below. The time periods assessed are Daytime (07:00 – 23:00hrs), Morning Only (07:00 – 10:30hrs) and the initial night time period of 23:00 – 00:30hrs (for the Saturday only), which will account for the desired operation extension until midnight.

Reception Point	Daytime 07:00 – 23:00 L_{90} (dBA)	Morning Only 07:00 – 10:30 L_{90} (dBA)	Initial Night time (Sat) 23:00 – 00:30 L_{90} (dBA)
RP1	38	40	39

Table 2: Summary of Representative Background Sound Levels at Denne Road

3.4 Measured Existing LAeq Ambient Sound Pressure Level

Continuing on from the survey results shown in section 3.3 for the L90 background sound level, it is also important to consider the existing ambient sound pressure levels (also known as “Residual Level”).

A full-time history graph for daytime hours is included in the Appendices of this report, which shows the LAeq,5min values for each day of the survey between the time period of 07:00 – 23:00hrs.

A summary average for each period of interest (listed below) is shown in the table beneath:

- LAeq,16hour (07:00 – 23:00hrs)
- LAeq,3.5hr (07:00 – 10:30hrs)
- LAeq,1hr (08:30 – 09:30) – Sunday Only
- LAeq,3hr (07:00 – 10:00hrs) – Monday to Saturday

Period of Interest	Leq,T for each period per day					
	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday
Leq,16hr	59.2	58.9	57.7	62.2	59.1	58.1
Leq,3.5hr	62	58.8	58.8	62.9	61	59.8
Leq,1hr	N/A	N/A	57.9	N/A	N/A	N/A
LAeq,3hr	61.9	58.8	N/A	63.0	61.2	60.0

Table 3: A-Weighted Existing Ambient Leq for periods of interest

Assessing the (previously outlined) time-history graph of the all-encompassing LAeq,5min for each day, captured for Denne Road, it is clear that there is little difference between them including the Sunday when the church service was running.

4 Sound Pressure Levels Generated by Life Spring Church

During the initial long term survey period of 10 – 17th October 2024, a church service took place within the main hall (13th October 2024)

A Class 1 sound level meter (Svantek 971 "Moles") was used to obtain internal sound levels within the venue and was placed within the main room in a location that was least intrusive to the service but still able to obtain valid reverberant sound pressure level readings.

The loudest Leq,5min sound level recorded was 86.2dBA within the venue, at 10:50hrs. The C-Weighted Leq,5min sound level at this time was 94.1dB. The A-Weighted Leq,5min periods for the whole of the church service have been plotted on a time-history graph and this is shown below with annotations:

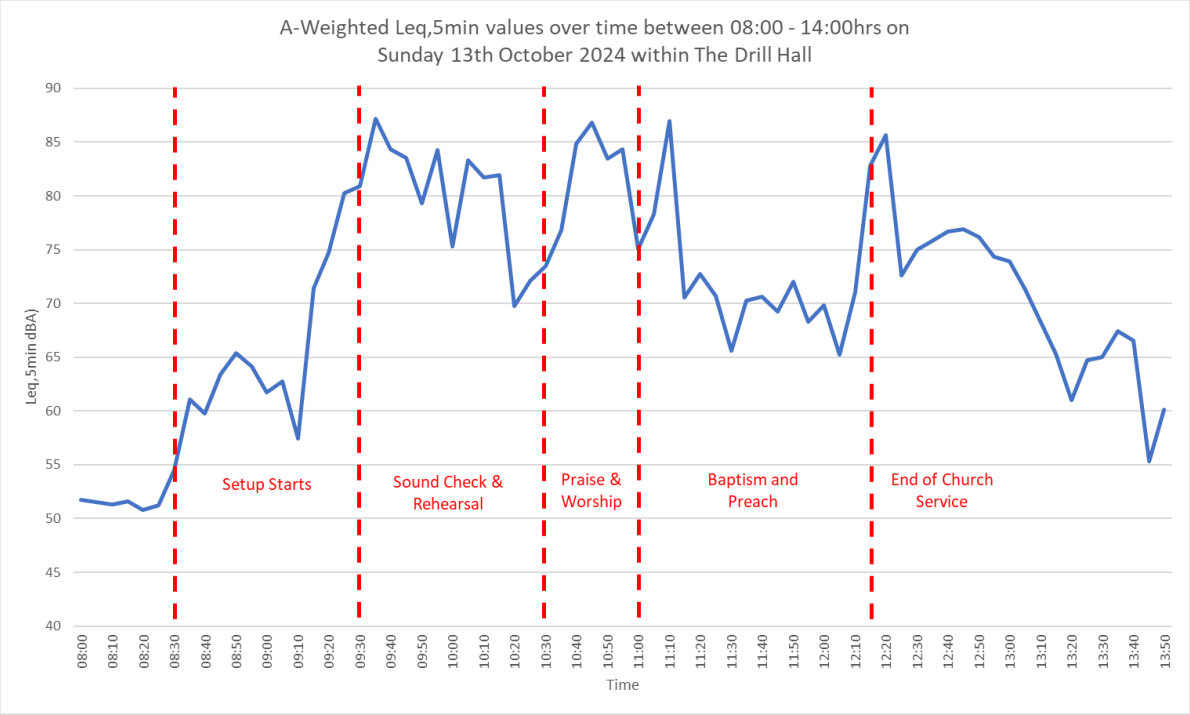


Figure 5: 5-minute values of LAeq within the Drill Hall due to Life-Spring Church

The loudest 5-minute value from the church service has been analysed to show the 1/1 whole-octave-band frequency profile of the music, which, having viewed the live-stream from the service, was a full band with drums, bass guitar, electric guitar, keyboard and two vocals. The frequency profile is shown below:

	1/1 Octave Band Frequency (Hz)								
Measurement Location	31.5	63	125	250	500	1000	2000	4000	8000
Loudest 5min of Worship	38.2	65.8	73.8	76.3	80.1	82.2	78.6	71.5	62.2

Table 4: Loudest Leq,5min of the church service (linear frequency profile)

5 Sound Insulation Break-Out Test

A sound insulation test was carried out to measure the effectiveness of the building's four façades at resisting the passage of sound from inside to outside, based on pink noise being generated at a high level within the main hall:

Pink Noise was generated within the main hall using a pair of full-range loudspeakers supplemented by a subwoofer using two independent uncorrelated but similar signals.

The reverberant sound pressure level was measured in the middle of the room over the 1/3 octave band frequency range of 25Hz – 10kHz, spatially averaged over a time of 30 seconds.

With the sound source still operating, measurements were then carried out at four different external locations, representing the four different facades of the building, again over the 1/3 octave band frequency range of 25Hz – 10kHz and spatially averaged over a time of 30 seconds (each). The outdoor measurements were all 3m from the façade in order to be in free-field conditions.

The same external measurements were then carried out once again without the sound source operating in order to be able to account for any extraneous sound sources and remove their influence from the readings.

This enabled the sound insulation of each façade to be calculated across the frequency range. However, the results were converted to whole octave bands for the purpose of being more easily presentable and able to be compared with building materials if required.

The results are shown in the table below:

	1/1 Octave Band Frequency (Hz)								
Measurement Location	31.5	63	125	250	500	1000	2000	4000	8000
Front Steps (Denne Road)	39.7	44.4	49.8	54.9	56.7	57.2	52.3	55.8	63.1
Carpark Access Side Road	37.3	43.1	49.4	57	63.5	60.8	58.6	60.6	65.1
Rear (carpark location)	28.1	28.3	33.4	36.5	39.4	42.3	40	44.7	47.6
Alleyway (North of building)	40.6	39.1	45	49.4	53	56.1	43.1	55.5	66.4

Table 5: Sound Insulation of Building Façade (linear frequency profile)

6 Calculated Outdoor Level due to the Church Service

With the values from Table 4 and the sound insulation results from Table 5, it is now possible to show the sound pressure levels outside at each façade due to the church at its loudest point and the resultant broadband LAeq sound pressure level.

This is shown in Table 6, below:

Location	1/1 Octave Band Frequency (Hz)									dBA
	31.5	63	125	250	500	1000	2000	4000	8000	
Front Steps (Denne Road)	-1.5	21.4	24	21.4	23.4	25	26.3	15.7	-0.9	**30.2**
Carpark Access Side Road	0.9	22.7	24.4	19.3	16.6	21.4	20	10.9	-2.9	**25.1**
Rear (carpark location)	10.1	37.5	40.4	39.8	40.7	39.9	38.6	26.8	14.6	**44.3**
Alleyway (North of building)	-2.4	26.7	28.8	26.9	27.1	26.1	35.5	16	-4.2	**37.3**

Table 6: SPL outside due to loudest 5 minutes of church service

To calculate the SPL actually reaching the nearest receptor, it will be necessary to carry out further distance attenuation calculation.

At the front of the hall (Denne Road) there is a further 15 metres to the nearest NSR (10b and 12 Denne Road) from the measurement location.

Beyond the carpark access road to the south, there is a further 65m to the nearest NSR located half way along St. Mary's Church's Cemetery at its entrance from the measurement location.

Beyond the Dukes Square carpark to the rear of the hall (East) is Mill River Lodge Care Home, some 55m away from the measurement location.

Beyond the alleyway to the North of the hall, there is a further 16 metres to the nearest NSR (what appears to be a care-home) from the measurement location.

Sound emanating out of a building façade is effectively a plane-wave and thus will propagate differently depending upon the distance the NSR is away from that façade.

Finding the dimensions of the relevant part of the hall's external façades and dividing them by Pi will then enable us to know at what point the distance attenuation behaviour changes. From Plane Wave, to Line Source, to Point Source.

Based on the dimensions of the height and width of each façade, it has been calculated that the NSRs are all at distances far enough away that the propagation is fully Point-Source behaviour, and thus is a 20Log relationship.

Using the inverse square law it is possible to to find the extra attenuation to apply to the values in Table 6, to see the result at the nearest NSRs described above.

The equation to use is $20 * log(r2/r1)$

Where:

r2 = New Measurement Distance and r1 = Original Measurement Distance

(in all cases, r1 will be 3m as this was the distance from the façade for the outdoor measurements as described in Section 5).

Therefore, the attenuation to apply is seen in table 7, below:

Location	dBA at Original Location	Distance Attenuation	**dBA at nearest NSR due to loudest church service period**
10b Denne Road	30.2	14	**16.2**
Middle of St. Mary's Cemetery	25.1	26.7	**-1.6**
Mill River Lodge	44.3	25.3	**19**
Care Home to North	37.3	14.5	**22.8**

Table 7: SPL at nearest NSRs due to church service's loudest 5-minutes

When comparing the results at the NSR with the criteria of BS8233:2014 for internal ambient sound levels within lounges and bedrooms (35dBA and 30dBA respectively), it is clear that all of these results (which are external to the NSR) are already significantly below. Once attenuated through even just an open window (which provides 13dB attenuation) the internally received levels will be lower still.

6.1 Assessment of results vs Existing Sound Pressure Levels

Assessing these calculated results against the existing L90 Background Sound Levels, shown in Tables 2, it is clear that all results are significantly below the background during each period of time where extensions have been requested.

This is shown in the following table:

Location	dBA at nearest NSR due to loudest church service period	Existing L90 Background (dBA)	Result minus Background
Morning Only 07:00 – 10:30 hrs			
10b Denne Road	16.2	40	-23.8
Middle of St. Mary's Cemetery	-1.6	40	-41.6
Mill River Lodge*	19	40	-21
Care Home to North	22.8	40	-17.2
Complete Daytime 07:00 – 23:00 hrs			
10b Denne Road	16.2	38	-21.8
Middle of St. Mary's Cemetery	-1.6	38	-39.6
Mill River Lodge*	19	38	-19
Care Home to North	22.8	38	-15.2
Saturday Night 23:00 – 00:30 hrs			
10b Denne Road	16.2	39	-22.8
Middle of St. Mary's Cemetery	-1.6	39	-40.6

Mill River Lodge*	19	39	-20
Care Home to North	22.8	39	-16.2

Table 8: Results vs Background

* In the table above, it is relevant to note that the Background Sound Level being compared to is from the front of the hall, on Denne Road. It was not possible to compare against an L90 Background Sound Level at the rear of the hall due to equipment failure.

HOWEVER, it is clear from the calculated results of the church's music at the point where it reaches the façade of Mill River Lodge, that the Leq,5min SPL is only 19dBA. Using the 13dB attenuation due to an open window (as the widely accepted attenuation value to apply), the internal sound level within a care home room due to the church's operation would be only 6dBA.

Additionally, it is highly unlikely that there will be any significant change in the L90 Background Sound Level in this area, compared to the values measured on Denne Road, due to the nature of the area.

It follows that any time extension permission requests where there is not going to be music involved, would also not present any issue to the nearest NSRs.

It is also worth noting that sound at levels this amount below the background sound level are likely to be inaudible to residents of nearby buildings, whether internally or externally.

7 Uncertainty

The sound level meters used were calibrated before and after the survey in situ @114dB, without any drift having occurred, to ensure that the information and data being obtained was representative and that the sound level meter was operating correctly.

With any calculations made, including the determination of background sound levels, there has not been any additional rounding of numbers to prevent double handling, this has only occurred once at the final part of the sum and is presented to the reader with an easy-to-understand reference level or single figure.

In deriving the background sound levels, attention has been paid to the hours for what extensions have been requested.

Whilst there was an equipment failure, meaning L90 background sound levels could not be seen for the rear of The Drill Hall, calculations have been able to take place using other methods, which clearly show that the resultant SPL from the church service is insignificant to the residents of Mill River Lodge.

8 Conclusion

Acoustic South East have been commissioned to assess the noise breakout from The Drill Hall, with respect to the planning application to extend hours, both generally, but also with an extension to music use.

The assessment shows that even with the loudest 5-minute period from the church service (which is the worst-case scenario), the resultant external sound pressure level once it reaches the nearest NSRs is significantly below the existing A-Weighted L90 Background Sound Levels for the area.

The SPLs reaching the NSRs due to the loudest measured 5-minute LAeq from the church service were significantly below the requirements of BS8233:2014 when outside. Once inside the NSR this would then be at least 13dB lower (assuming an open window).

For the areas where it was not possible to assess the existing L90 Background due to equipment power failure, alternative methods have been used to show what the resultant effect would be on the NSR (Mill River Lodge) and these calculations show that the SPLs are insignificant.

No additional mitigation measures will be required and therefore, based upon the above assessment, it is recommended that planning consent is granted without issue.

9 Appendix A – Leq,5min Time History Graph – Daytime Hours Only

