INFINITY ACOUSTICS

December 2023

Noise Assessment

Hotham Hall,

The Park,

Hotham,

YO43 4UA

INFINITY ACOUSTICS

Project Description:

Entertainment and Mechanical Plant Noise Impact Assessment

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1. Introduction

1.1 Infinity Acoustics Ltd has been appointed to undertake a noise assessment to assess the potential impact of a proposed events venue and spa building at Hotham Hall, The Park, Hotham, YO43 4UA.

1.2 The client will be submitting a planning application to the local planning authority for a proposed events venue within the existing stable building at the site along with a proposed new spa building.

1.3 The aim of the noise survey and assessment below is to provide the relative information to assist the client and local planning authority in approving the application in relation to potential noise impact and satisfying any concerns regarding this. The noise levels at the site will be measured and assessed according to the relative standards a sound insulation scheme and noise control measures will be provided where necessary to ensure the amenity of the nearby residents can be protected from any potential noise impact caused by the development including that of entertainment noise from the stable venue and mechanical plant noise from the proposed spa building. Before the installation of any noise control measures or sound insulation works the contents of this report should be fully approved by the local authority.

1.4 The following noise assessment will be undertaken in line with the National Planning Policy Framework 2021 and the Noise Policy Statement for England 2010 as well as the following guidance:

BS4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound.

BS4142 is a British Standard that provides guidance and a standardised methodology for assessing industrial and commercial noise sources. BS4142 outlines methods for defining specific sound levels from a given development and/or noise source. Rating penalties are then applied to account for the acoustic characteristics of the noise source. Rating penalties can be applied for the following:

- Tonality
- Impulsivity
- Intermittency

Using the subjective method, the penalties vary in magnitude depending on how perceptible the acoustic characteristic is to the human ear. The rating noise level is then compared to the underlying L_{A90} background sound level of the area without the source under assessment operating to assess the likely noise impact. The level by which the rating noise level exceeds the background L_{A90} defines the potential for noise impact. The table below outlines the relevant criteria bandings described in BS4142.

Description	Impact Rating
Rating noise levels +10 dB above the background	Significant adverse impact, depending on the context.
Rating noise levels +5 dB above the background	Adverse impact, depending on the context.
Where the rating level does not exceed the background	Low impact dependent on Context

Table 1.0 – BS4142 Noise Criteria

This methodology will be used to assess the plant noise associated with the development only. it is assumed that plant rating noise levels equal to or lower than the background would indicate low impact and 'No Observed Effect Level' when assessed in accordance with the NPPF and NPSE.

Institute of Acoustics: Good Practice Guide on the Control of Noise from Pubs and Clubs.

The Institute of Acoustics (IOA) Good Practice Guide provides guidance for local authorities and venue management with the aim to prevent and reduce noise disturbance and complaints resulting from premises using amplified music such as pubs and events venues. The overall aim of the document was to outline objective criteria in order to assess entertainment and music noise. However, ultimately the Good Practice Guide was published not including criteria. The criteria presented below are taken from the original Good Practice Guide and were published in a later article (2003). The table presented below is taken from the DEFRA Noise from Pubs and Clubs Report.

Frequency of Events	Criteria	Outcome
>30 times per year	L_{Aeq}, 15mins entertainment noise should not exceed L_{A90} background by more than 5dB	Entertainment noise will generally be audible but not overly obtrusive inside noise sensitive properties
<30 times per year	L_{Aeq} Entertainment noise should not exceed L_{A90} Background by more than 5dB and the L10 entertainment noise should not exceed L90 background by more than 5dB in any 1/3 octave band between 40 and 160Hz	Entertainment noise will generally be audible but not overly obtrusive inside noise sensitive properties.
More than once a week or after 23:00	L_{Aeq} Entertainment noise should not exceed L_{A90} and L10 entertainment noise should not exceed L90 Background in any 1/3 octave band between 40 and 160Hz	Entertainment noise will be virtually inaudible inside noise-sensitive properties

Table 2.0 – Entertainment Noise Criteria.

It should be noted that the above criteria are designed for assessing the noise impact of existing and operating entertainment venues playing amplified music and thus are not strictly applicable when assessing venues or properties still in the design and planning stages. This is largely due to the lack of sound reduction data for materials and constructions in 1/3 octave bands, which would be required for the design of a sufficient sound insulation scheme and are generally not published by manufacturers and because the site is not yet operational the music breakout cannot be effectively measured. Given the above, these criteria can be adapted to suit this specific situation. Given the above, the 1/1 octave band L_{eq} noise levels from the music break out will be compared to underlying 1/1 octave band background sound levels to assess the potential for noise impact. Assuming any external amplified music noise does not exceed the background sound levels low impact is expected at the surrounding Noise Sensitive Receptors. Typically, a target of 5 - 10 dB below the background sound level would be deemed appropriate and music levels falling below the background sound level at the NSR by this amount would generally be considered to be largely inaudible. Should these criteria be achieved it is assumed they represent 'No Observed Effect Level' When assessed in accordance with the NPPF and NPSE'.

IEMA Guidelines for Noise Impact Assessments

The IEMA Guidelines for Noise Impact Assessment specify general methods for assessing noise and the potential for noise impact. Specifically, this guidance can be used to assess the potential impact of noise sources for which there are no specifically designed standards or guidance, such as noise from patrons. These guidelines outline an approach whereby the magnitude by which the ambient acoustic environment increases due to the development directly relates to the potential for noise impact. The table below indicates the significance of changes in ambient noise levels in incremental intervals.

IEMA Guidelines for Noise Impact Assessment Criteria	
Effect Description	**Definition**
None / Not significant	Less than 2.9dB L_{Aeq} change in sound level and/or all receptors are of negligible sensitivity to noise.
Slight	A 3dB to 4.9dB L_{Aeq} change in sound level at a receptor of some sensitivity.
Moderate	A 3dB to 4.9dB L_{Aeq} change in sound level at a sensitive or highly sensitive receptor, or a greater than 5dB L_{Aeq} change in sound level at a receptor of some sensitivity.
Substantial	Greater than 5dB L_{Aeq} change in sound level at a noise-sensitive receptor, or a 5dB to 9.9dB L_{Aeq} change in sound level at a receptor of high sensitivity to noise.
Severe	Greater than 10dB L_{Aeq} change in sound level at a receptor of high sensitivity to noise.

Table 3.0 – IEMA Guidelines on Noise Impact Assessment Criteria

It is assumed that when assessing the increase in noise level from the development a ‘Not Significant ‘ Increase of below 3 dB would equate to ‘Lowest Observed Effect Leve;’ when assessed in accordance with the NPPF and NPSE.

2. Site & Surroundings

2.1 The site is situated on the outskirts of the village of Hotham the general area surrounding the site could be considered rural with a mixture of both residential dwellings and arable farmland.

2.2 To the north of the site is Harrybeck Lane which facilitates low levels of traffic flow. To the west of the site approximately 335m away is North Cave Road which also facilitates a moderate level of road traffic flow.

2.3 To the northeast, there are a number of residential dwellings situated adjacent to the entrance to Hotham Hall's grounds. Due to the proximity of these dwellings, they will be considered the primary Noise Sensitive Receptor (NSR 1) in the subsequent assessment.

2.4 To the south of the site is the village of North Cave which has multiple residential dwellings this location will be considered the secondary Noise Sensitive Receptor in the subsequent assessment (NSR2). All noise-sensitive receptor locations can be found in Appendix B.

2.5 The section of the stables that will be utilised for events and weddings is a listed building and of typical construction with standard single-glazed windows, masonry stone facades and timber and slate roof system.

2.6 The proposed events venue bar and music area will be located in the southwestern section of the existing stables at the site and the proposed new spa will be located to the south of the existing stables. Both locations are highlighted in the figure below:

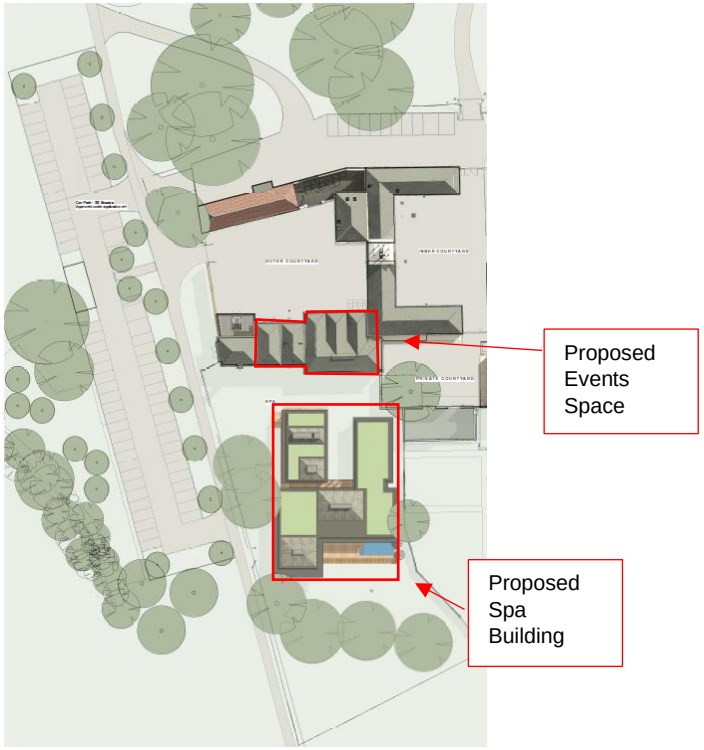


Figure 1.0 – Proposed Development

2.7 In general, the acoustic environment surrounding the site could be considered tranquil and typical of a rural location with distant and intermittent road noise being the dominant feature of the acoustic environment. During the set-up of the equipment, it was also noted that there were some construction works being undertaken at the site however, it is understood that generally this would not be included in the weekend noise measurements.

3. Survey

3.1 A noise survey of the site was undertaken between Friday the 22nd of September to Monday the 25th of September 2023 in order to establish the background sound levels of the area.

3.2 The following equipment was used to undertake the noise survey. All equipment used was field calibrated at 1kHz to 114.0 dB with a drift of less than 0.5 dB before and after the measurement. Calibration certificates for the equipment can be provided upon request.

- SVAN 971A Class 1 Sound Level Meter – SN – 113352
- SVAN 971A Class 1 Sound Level Meter – SN – 139441
- SVAN SV33B Class 1 Calibrator – SN – 122241

3.3 The long-term noise meter and associated microphone at Measurement Location 1 (ML1) were located approximately 1.5m from the ground and affixed to a timber fence post in close proximity to NSR 1. The meter had no other reflective surfaces in close proximity.

The long-term noise meter at Measurement Location 2 (ML2) was located within the village of North Cave and mounted on a telegraph pole approximately 3.5m from the ground with no other reflective surfaces in close proximity.

3.4 The weather during the setup of the equipment was 16 degrees Celsius with wind speeds of 3.9 m/s and no precipitation. During the collection of the equipment, the temperature was 16 degrees Celsius and wind speeds of 1.7m/s with no precipitation. Generally, the weather across the majority of the survey complied with the requirements of BS 7445-2. A full weather summary for the duration of the survey is outlined in the table below. The weather data is taken from the nearest functioning weather stations and historical data.

Weather Data 22/09/23 – 25/09/23					
Date	**Temp (C)**	**Rain Fall (mm)**	**Wind Speed (m/s)**	**Prevailing Wind**	**Mean Relative Humidity (%)**
22/09/23 Day 1	7.2 – 16.2	0.0	0.0 – 5.8	S	83.5
23/09/23 Day 2	10.6 – 16.0	0.0	0.0 – 4.8	SW	78.0
24/09/23 Day 3	11.8 – 20.3	0.0 – 2.2*	0.8 – 8.2*	SSE	81.5
25/09/23 Day 4	13.0 – 19.7	0.0 – 0.2	0.0 – 8.7*	S	77.0

Table 4.0 – Weather Data

**Periods of rain and elevated wind not included in the assessment*

3.5 The summary results of the noise survey are presented in the tables below and will be used in the subsequent Noise Assessment. A full noise survey time history can be found in Appendix C.

16 & 8 Hour Results ML1			
Time Period	**$L_{Aeq\ (dB)}$**	**$L_{Afmax\ (dB)}$**	**$L_{A90(dB)}$**
Day – 22/09/23 – 10:00 – 23:00	57.0	93.0	38.0
Night – 2209/2023 – 23:00 – 07:00	35.0	74.0	27.0
Day – 23/09/2023 – 07:00 – 23:00	44.0	70.0	34.0
Night – 23/09/2023 – 23:00 – 07:00	40.0	66.0	36.0
Day – 24/09/2023 – 07:00 – 23:00	51.0	69.0	45.0
Night – 23/09/2023 – 23:00 – 07:00	47.0	65.0	42.0
Day – 24/09/2023 – 07:00 – 10:15	56.0	92.0	44.0
16 & 8 Hour Results ML2			
Time Period	**$L_{Aeq\ (dB)}$**	**$L_{Afmax\ (dB)}$**	**$L_{A90(dB)}$**
Day – 22/09/23 – 10:30 – 23:00	52.0	81.0	44.0
Night – 2209/2023 – 23:00 – 07:00	39.0	75.0	31.0
Day – 23/09/2023 – 07:00 – 23:00	50.0	88.0	39.0
Night – 23/09/2023 – 23:00 – 07:00	43.0	76.0	37.0
Day – 24/09/2023 – 07:00 – 23:00	54.0	79.0	47.0
Night – 23/09/2023 – 23:00 – 07:00	48.0	78.0	43.0
Day – 24/09/2023 – 07:00 – 10:00	52.0	81.0	46.0

Table 5.0 – Noise Survey Summary

3.6 The following table indicates the background sound levels that will be used for the assessment of entertainment noise impact on the surrounding residential dwellings. It is assumed that the proposed stable venue will operate up until 01:00 analogous to the operation of the existing venue on site. As such the background sound levels presented below are taken from the 23:00 – 01:00 period which is deemed to be the period of highest potential impact due to music and entertainment noise.

Time Period	**Octave Band $L_{90,t}$ (Hz) (dB)**							**$L_{A90,t}$**	**$L_{Aeq,t}$**
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**		
ML1 – 23:00 – 01:00	35.0	33.0	22.0	24.0	25.0	20.0	19.0	27.0	30.0
ML2 – 23:00 – 01:00	35.0	32.0	31.0	29.0	28.0	22.0	21.0	31.0	34.0

Table 6.0 – Octave Band L90 Operational Hours Background Result

3.7 The table below indicates the background sound level that will be used in the BS4142 assessment of mechanical plant units associated with the proposed Spa. It is assumed that the spa will primarily operate during the day however mechanical plant associated with the site including any Air Source Heat Pumps and Swimming Poll Plant may need to operate at any point during the day or night time period. Therefore, both day and nighttime background noise levels are presented in the table below.

BS4142 Assessment Background Sound Level Results	
Time Period	**$L_{A90(dB)}$**
ML1 – Day Time 07:00 – 23:00	34.0
ML1 – Night Time 23:00 – 07:00	27.0
ML2 – Day Time 07:00 – 23:00	39.0
ML2 – Night Time 23:00 – 07:00	31.0

Table 7.0 –Background Sound Level Result

4. Sound Insulation Scheme and Noise Control Measures

4.1 In order to ensure the noise impact from entertainment noise and mechanical plant meets relative criteria to indicate low impact a set of noise control measures have been devised these are outlined in the section below:

4.2 All exterior doors and windows should remain closed during periods of significantly amplified music at the stable venue.

4.3 During periods of significantly amplified music, a single door should be designated for patron entry and exit for the venue. This door should be fitted with a lobby-style double door system to limit music breaking out of the building envelope.

4.4 The proposed stable venue should have an in-house P. A System installed this will allow the operator of the venue to have full control over music noise levels produced at the site. A distributed P. A system should be installed which utilises a larger number of smaller speakers positioned closer to the patrons thus allowing the music volume to be kept relatively low while still retaining the feeling of loudness for the patrons.

4.5 A music-limiting device should be installed at the site. The limiting device should be capable of limiting specific octave band frequencies and calibrated to ensure the music limit level below is not exceeded within the venue. Alternatively, the system could be calibrated to achieve inaudibility to the closest residential dwelling.

Description	Octave Band Frequency (dB) (Hz)							Global dBA
	63	125	250	500	1k	2k	4k	
Music Limit Level	89.0	94.0	89.0	94.0	92.0	90.0	88.0	97.0

Table 8.0 – Internal Music Limit Level

4.6 All new cittal glazing including glazed doors should provide the minimum sound reduction outlined in the table below. This can be achieved by standards double glazing 6mm Glass / 16mm Cavity / 4mm Glass however any other glazing achieving the minimum octave band sound reduction in the table below could be installed.

Description	Octave Band Frequency Sound Reduction (dB) (Hz)							Global Rw (dB)
	63	125	250	500	1k	2k	4k	
Glazing / Door Min Sound Reduction R	19.0	21.0	20.0	26.0	38.0	37.0	39.0	32.0

Table 9.0 – Minimum SRI of Glazed Areas and Doors

4.7 The roof of the stable building will need to be upgraded to ensure the minimum octave band sound reduction in the table below is achieved.

Description	Octave Band Frequency Sound Reduction (dB) (Hz)							Global Rw (dB)
	63	125	250	500	1k	2k	4k	
Roof Min Sound Reduction R	24.0	40.0	48.0	54.0	59.0	56.0	61.0	54.0

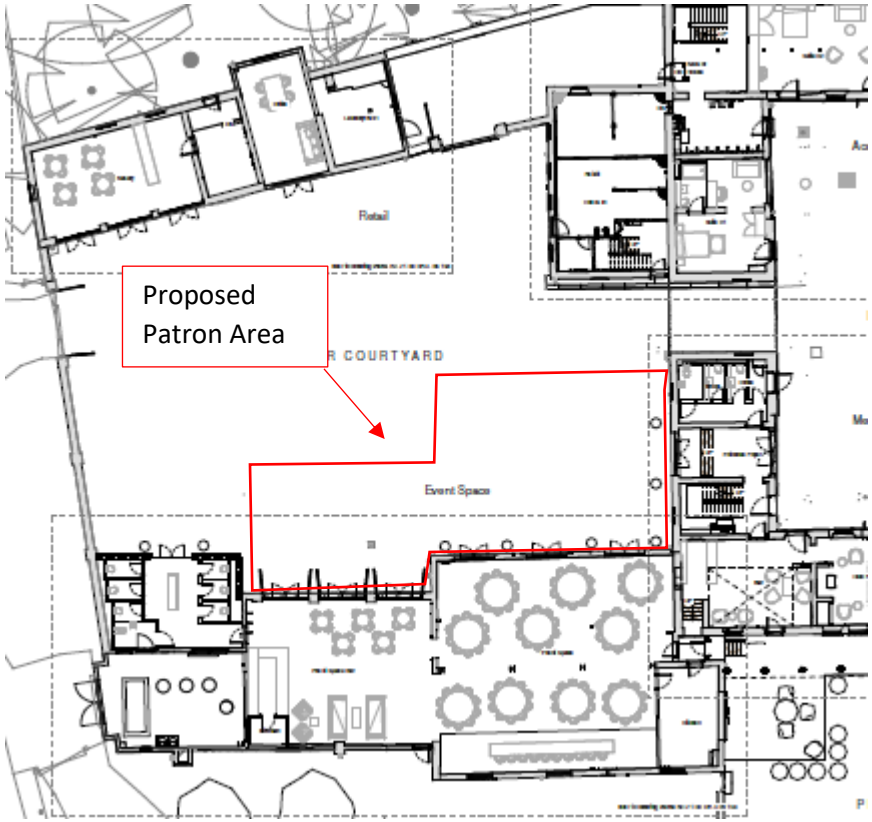
Table 10.0 – Minimum SRI of Roof

The following detail is sufficient to achieve the minimum required sound reduction however any detail could be installed provided the minimum requirement is achieved.

- Roof Tile
- Assumed 150mm Timber Roof Truss
- 150mm slab insulation minimum density 60kg/m^3
- 30mm resilient bar system

- No.2 layers of 15mm Soundbloc plasterboard (12.6kg/m^2 per board)

4.8 A defined patron area should be implemented at the site the patron area should be situated within the stable venue compound which is surrounded by walls and buildings providing maximum shielding. The figure below indicates an appropriate external patron area.



4.9

Figure 2.0 – Proposed Patron Area

4.10A noise management plan should be implemented at the stable venue building and all employees sufficiently trained in relation to the noise management plan and low-noise working practices. A brief Noise Management Plan is outlined below.

- Amplified music should not continue past the hours of 01:00.
- During periods of amplified music, all doors and windows are to remain closed.
- Glazed areas such as windows and doors should only be left open during periods of background music.
- All staff and employees including external entertainment should be made aware of the proximity of the nearby dwellings and potential noise impacts the venue may have on local residents.
- All external entertainment should be made to utilise the In-house P. A system to ensure effective control of the venue's noise emissions can be retained.
- A dedicated phone line should be set up for noise complaints and or communication with the local residents.
- A dedicated employee such as a manager or supervisor should be placed in charge of dealing with any noise complaints should they arise.
- A class 2 noise meter should be purchased and if a complaint has been received the dedicated manager or supervisor should take a noise measurement in proximity to the complainant's dwelling and note down the measured noise levels. The complaint should be investigated further and where possible measures taken to reduce the noise from the venue as soon as possible.
- Any and all noise complaints should be recorded within a log indicating the nature of the complaint, any measured noise levels, and the cause/resolution of the noise complaint.

- Patrons utilising the external areas of the venue should be effectively managed and retained within the defined patron area.

4.11 Given the need to keep doors and windows closed during significantly amplified music and the maximum number of patrons, it is likely that there will be a need for sufficient cooling for the prevention of overheating during these periods. Given that Air Conditioning may be required for the stable venue.

As well as the stable venue the proposed spa will have associated mechanical plant units. As the project is currently in the early stages the exact make and model of the proposed ASHP, Pool Plant, and any AC units associated with the spa and stable venue are not yet available. Therefore, in order to ensure the amenity of future residents can be fully protected from plant noise associated with the development a plant noise limit levels will be defined.

The table below shows the Cumulative Plant Limit Levels that have been defined to ensure low impact on the surrounding NSRs. Two limits have been defined the first is for all cumulative plant noise emissions during the day time and the second is for cumulative plant noise emissions for plant operating during the night time.

The mechanical plant noise emissions started in the table below should not be exceeded. The limit levels are inclusive of any appropriate rating penalties that need to be applied in accordance with BS4142.

Plant Rating Noise Limit Levels at NSR	
Description	**Noise Level (dBA)**
Cumulative Day Time Plant Rating Noise Limit Level at Closest NSR	29.0
Cumulative Night Time Plant Rating Noise Limit Level at Closest NSR	22.0

Table 11.0 – Plant Rating Noise Limit Levels

5. Computer Noise Model Results

5.1 In order to calculate the sound levels at the façade of the nearest noise sensitive receptor a computer sound model has been generated using DGMR Noise Prediction Software. This software undertakes calculations using the methods outlined in ISO 9613-2:1996.

5.2 The computer sound model assumptions are outlined below:

- The ground in the area has been considered a mixture of hard and soft.
- The topography of the site and surrounding land has been taken from Google Earth and information gained on-site.
- The elevations and building heights for the proposed development have been obtained from the associated plans and information gained on-site.
- Noise Breaking out of the building has been calculated considering the recommendations in Section 4.0 have been implemented. Breakout calculations can be found in Appendix D.
- The noise breaking out of the stable building has been inputted into the model as area sources set at Lw/m^2.
- All doors and windows associated with the venue's events and function area where music will be utilised have been considered closed.
- When patron noise has been modelled each patron has been inputted into the model as a point source at a height of 1.5m.
- For average L_{Aeq} patron noise levels, it has been assumed that 120 patrons are located externally undertaking typical conversation 1 person talking and one person listening equating to 60 noise sources. 50% of the noise sources have been considered as raised voices and 50% of the voices have been considered to be talking in normal voices.
- Normal voice levels at 60 dB at 1m (68 dB LwA). Raised Voices equate 66 dB at 1m (74 dB LwA).
- For the L_{Afmax} patron model, it has been assumed that 6 people could be shouting simultaneously in the external patron area. This is deemed a conservative approach. Each shout has been input into the model as a point source of 98 dB LwA.

5.3 The table below indicates the specific music noise breakout for the proposed development considering amplified music being played within the stable venue and all noise control measures have been implemented.

Amplified Music Breakout Noise Levels								
Description	**Z-Weighted Octave Band Noise Level (Hz) (dB)**							**A-Weighted (dB)**
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	
Music Level at NSR 1	30.0	23.0	17.0	16.0	2.0	2.0	0.0	16.0
Music Level at NSR 2	20.0	10.0	2.0	4.0	0.0	0.0	0.0	4.0

Table 12.0 – Specific Music Noise Level at NSR

5.4 The table below indicates the specific patron noise levels at the closest residential NSRs. Both average L_{Aeq} noise levels and L_{Afmax} noise levels from shouts are presented.

Patron Noise Levels		
Location	**$L_{Aeq,t}$ (dB)**	**$L_{Afmax,t}$ (dB)**
Patron Noise at NSR 1	28.0	43.0
Patron Noise at NSR 2	11.0	28.0

Table 13.0 – Specific Patron Noise Levels at NSR

6. Noise Breakout Noise Impact Assessment

6.1 The following section of the report undertakes an assessment of the music noise breaking out of the stable venue development during the proposed most sensitive operational hours between 23:00 – 01:00.

6.2 The assessment below is undertaken at the most exposed receptor NSR1. Provided low impact is indicated at the location low impact will also be achieved at NSR 2 and all other surrounding NSRs.

6.3 The table below compares the specific music noise breaking out of the development to the lowest background sound levels at NSR 1 during the proposed extended operational hours to assess the potential for impact. Full breakout calculations and noise model contours can be found In Appendix D.

NSR 1 Noise Breakout Assessment								
Description	**Octave Band Noise Level (Hz) (dB)**							**A-Weighted (dB)**
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	
Specific Music Noise Levels at NSR	30.0	23.0	17.0	16.0	2.0	2.0	0.0	16.0
Background Sound Level L_{90}	35.0	33.0	22.0	24.0	25.0	20.0	19.0	27.0
Level above background L_{90}	-5.0	-10.0	-5.0	-8.0	-23.0	-18.0	-19.0	-11.0

Table 14.0 – Music Noise Breakout Assessment NSR 1

6.4 The assessment has been undertaken assuming all noise control measures in Section 4.0 have been implemented. As can be seen in the breakout assessment above the music noise at the closest Noise Sensitive Receptor NSR1 falls a minimum of 5 to 23 dB below the background when considering the Z-weighted 1/1 Octave Band noise levels and 11 dB below the background sound level when considering the A-weighted noise levels.

7. Patron Noise Impact Assessment

7.1 The following section of the report undertakes an assessment of the patron noise incident on the NSR considering patrons within the proposed external patron area.

7.2 The table below undertakes an increase in ambient noise levels assessment of the patron noise at the most exposed NSR. Should low impact be achieved at this location it will also be achieved at all other NSRs.

7.3 The patron noise is added to the ambient noise levels during the most sensitive period of operation 23:00 – 01:00. The higher the increase in noise levels at the NSR due to patron noise the higher the potential for noise impact.

Patron Increase in Ambient Noise Level Assessment	
Location	**Noise Level (dB)**
Patron Noise at NSR 1	28.0
Lowest Ambient 23:00 – 01:00	30.0
Resulting Noise Level at NSR	32.1
Increase in Noise Level	+2.1
IEMA Impact Rating	'Not Significant'

Table 15.0 – IANL Assessment – Patron Noise

7.4 As can be seen in the assessment above, provided all recommendations in Section 4.0 of the report are implemented and when considering 120 people in the external patron area the increase in noise level at the NSR is expected to be 'Not Significant' when assessed in accordance with the IEMA Guidelines on Noise Impact. This would equate to the 'Lowest Observed Effect Level' when assessed in accordance with the NPPF and NPSE.

7.5 The table below analyses the L_{Afmax} noise levels from patrons shouting in the external patron area of the stable venue. The L_{Afmax} noise levels within the NSR assuming an open window are compared to the bedroom L_{Afmax} criteria for nighttime outlined in the W.H.O Guidelines on Community Noise.

Open Window Assessment	
Location	**Noise Level (dB)**
External Shout L_{Afmax} at NSR	43.0
Attenuation of an open window	-15.0
Internal Noise Level	28.0
W.H.O Criteria	45.0
Level below criteria	-17.0

Table 16.0 – Open Window Assessment – Patron Noise

7.6 The table above indicates all internal noise criteria can be achieved at the NSR when considering shouts from external patrons at the stable venue. This indicates low impact and 'No Observed Effect Level' When assessed in conjunction with the NPPF and NPSE.

8. BS4142 Mechanical Plant Noise Assessment

8.1 The following section of the report assesses the potential noise impact from any externally mounted mechanical plant to plant noise breaking out of plant rooms associated with the spa and stable section of the development.

8.2 The following table indicates the BS4142 Assessment of associated mechanical plant noise providing the defined cumulative Plant Noise Rating Limit Levels have been achieved.

BS4142 Assessment		
Description	**Day Time (dB)**	**Nighttime (dB)**
Rating Noise Limit Level at NSR	29.0	22.0
Background L_{A90}	34.0	27.0
Level Above Background	-5.0	-5.0

Table 17.0 – BS4142 Assessment

8.3 As can be seen in the assessment above provided the plant rating noise limit level is achieved the cumulative plant noise emissions are expected to fall below the lowest measured background sound level during the proposed extended operational hours by a minimum of 5 dB. This indicates ‘Low Impact’ When assessed in accordance with the NPPF and NPSE this equates to ‘No Observed Effect Level’.

9. Cumulative Noise Assessment

9.1 The following section of the report assesses the potential cumulative noise impact from the site considering all likely noise sources, including music breakout, plant noise and patron noise.

9.2 The assessment has been undertaken assuming all noise control measures in Section 4.0 of the report have been implemented and is also undertaken assuming the most sensitive period of operation between 23:00 – 01:00 in the night time. In the following table, the cumulative noise levels at the NSR have been calculated.

Cumulative Noise Level at NSR 1 23:00 – 01:00	
Location	**Noise Level (dB)**
Music Noise at NSR 1	16.0
Patron Noise at NSR 1	28.0
Plant Rating Limit Level at NSR 1	22.0
Cumulative Noise Level at NSR 1	**29.0**

Table 18.0 – Cumulative Noise Levels at NSR 1

9.3 The Increase in Ambient Noise Level Assessment assuming all noise sources operating simultaneously is indicated in the table below. The higher the increase in noise levels the higher the potential for noise impact. Again, it is assumed that if low impact is indicated at NSR 1, low impact will also be indicated at NSR 2 and all other residential dwellings in the area.

Patron Increase in Ambient Noise Level Assessment	
Location	**Noise Level (dB)**
Cumulative Noise Level at NSR 1	29.0
Lowest Ambient 23:00 – 01:00	30.0
Resulting Noise Level at NSR	32.5
Increase in Noise Level	+2.5
IEMA Impact Rating	‘Not Significant’

Table 19.0 – IANL Assessment – Cumulative Noise

9.4 As can be seen in the assessment above provided all recommendations outlined in Section 4.0 of the report are implemented the expected cumulative increase in noise levels at NSR 1 is 2.5 dB. This increase in noise level at the NSR is expected to be ‘Not Significant’ when assessed in accordance with the IEMA Guidelines on Noise Impact. This would equate to the ‘Lowest Observed Effect Level’ when assessed in accordance with the NPPF and NPSE.

10. Conclusion

10.1 In conclusion, a noise survey has been undertaken at the Hotham Hall, The Park, Hotham, YO43 4UA. The noise levels obtained during the survey have allowed a noise assessment to be undertaken in order to assess the potential noise impact from the proposed stable building venue and the mechanical plant noise associated with the proposed new spa building.

10.2 The noise breaking out of the proposed stable building has been calculated it has been identified that there is a low potential for adverse impact on surrounding Noise Sensitive Receptors should amplified music be utilised within the building between the hours of 23:00 – 01:00 and all recommendations within section 4 of the report are implemented. Specifically, the assessment indicated all noise levels would fall a minimum of 5 dB below the background sound level or more indicating 'No Observed Effect Level' when assessed in accordance with the NPPF and NPSE.

10.3 A Patron Noise Assessment was also undertaken which indicated that the increase in ambient noise levels at the NSR due to patron noise would be 'Not Significant' when assessed in accordance with the IEMA Guidelines on Noise Impact. This indicates the 'Lowest Observed Effect Level' when assessed in accordance with the NPPF and NPSE. The L_{Afmax} assessment of patrons shouting also indicated 'Low Impact'.

10.4 A mechanical plant rating noise limit level has been defined to ensure all noise from mechanical plant units associated with the proposed spa and stable building events venue fall sufficiently below the background sound level Ina accordance with BS4142. This indicates 'Low Impact'.

10.5 A cumulative nose assessment has been undertaken to assess the potential of noise impact when considering music noise breakout, patron noise and mechanical plant noise. The cumulative increase in ambient noise levels assessment indicated that, considering the most sensitive period of operation 23:00 – 01:00 and the cumulative noise levels the increase in noise levels would be 'Not Significant'. This equates to 'Lowest Observed Effect Level' When assessed in accordance with the NPPF and NPSE.

APPENDIX A – List of Terms and Glossary

The following section of the report outlines a glossary of terms used in the assessment to assist the reader in understanding the assessment above which is by necessity technical in nature.

Decibel DB - The decibel often denoted as dB is the logarithmic unit used to describe the magnitude of sound or noise levels. The typical range of sound pressure levels is from 0 dB, defined as the threshold of hearing to 120dB defined as the threshold of pain.

Frequency Hz – As well as the decibel sound and noise is also measured and defined in frequency. Frequency or Hertz (Hz) is an expression of the number of cycles a sound wave will complete per second. Lager frequencies may be expressed in Kilo Hertz (kHz). The typical range of human hearing is from 20 Hz to 20,000Hz however with age the audible frequency range decreases in most humans.

A - Weighting – The A-weighting is the most commonly used weighting curve taken IEC 61672:2003 and is applied to sound pressure level measurements. The A-weighting is applied to measured sound levels to account for the loudness perceived by the human ear, as the ear is less sensitive to low audio frequencies.

LAeq - The A-weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over any given time period. L_{Aeq} is the level of a continuous noise that has the same total (A-weighted) energy as the real fluctuating noise, measured over the same time period. The A-weighting represents a curve that is applied to the measured noise levels to represent the way the human auditory system perceives sound.

LAfmax - The maximum A-weighted noise level that was recorded during the monitoring period using a fast time weighting. This acoustic parameter represents more transient sound levels within the acoustic environment which may only occur for a few seconds or minutes.

LA10 - This is the A-weighted noise level exceeded for 10% of a given time period. This parameter is typically used to measure and predict road traffic noise.

LA90 - This is the A-weighted noise level exceeded for 90% of any given time period. Generally, this acoustic parameter represents the underlying background sound level in a given area and doesn't generally include transient or short-term noise events that may occur within the surroundings.

Sound Pressure – Sound pressure is the difference between the instantaneous pressure at a point in the presence of a sound wave and the static pressure of the medium. Sound pressure fluctuates due to refractions and compressions of air molecules.

Sound Reduction Index – The sound reduction index denoted by the parameter 'R' is the laboratory-measured sound reduction given material or construction. R is measured in 1/3 octave band frequencies. The R_w sound insulation parameter stands for the weighted standardised sound reduction index and is a single-figure global rating of the sound insulation of a given material or construction.

APPENDIX B – Site Surroundings and Location

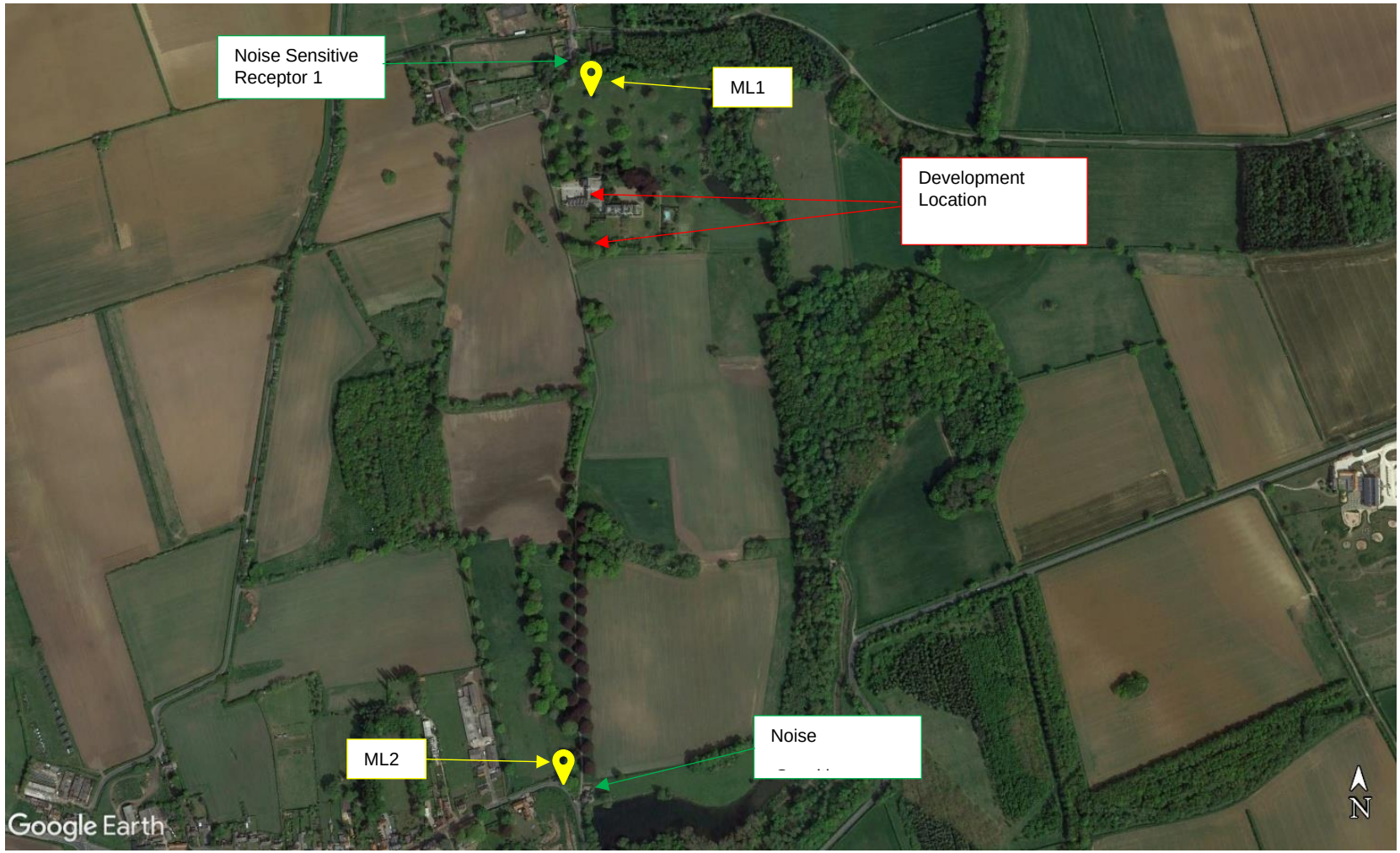


Figure 3.0 – Site and Measurement Location

Figure 4.0 – Site Plans

APPENDIX C – Noise Survey History and Background Noise Data

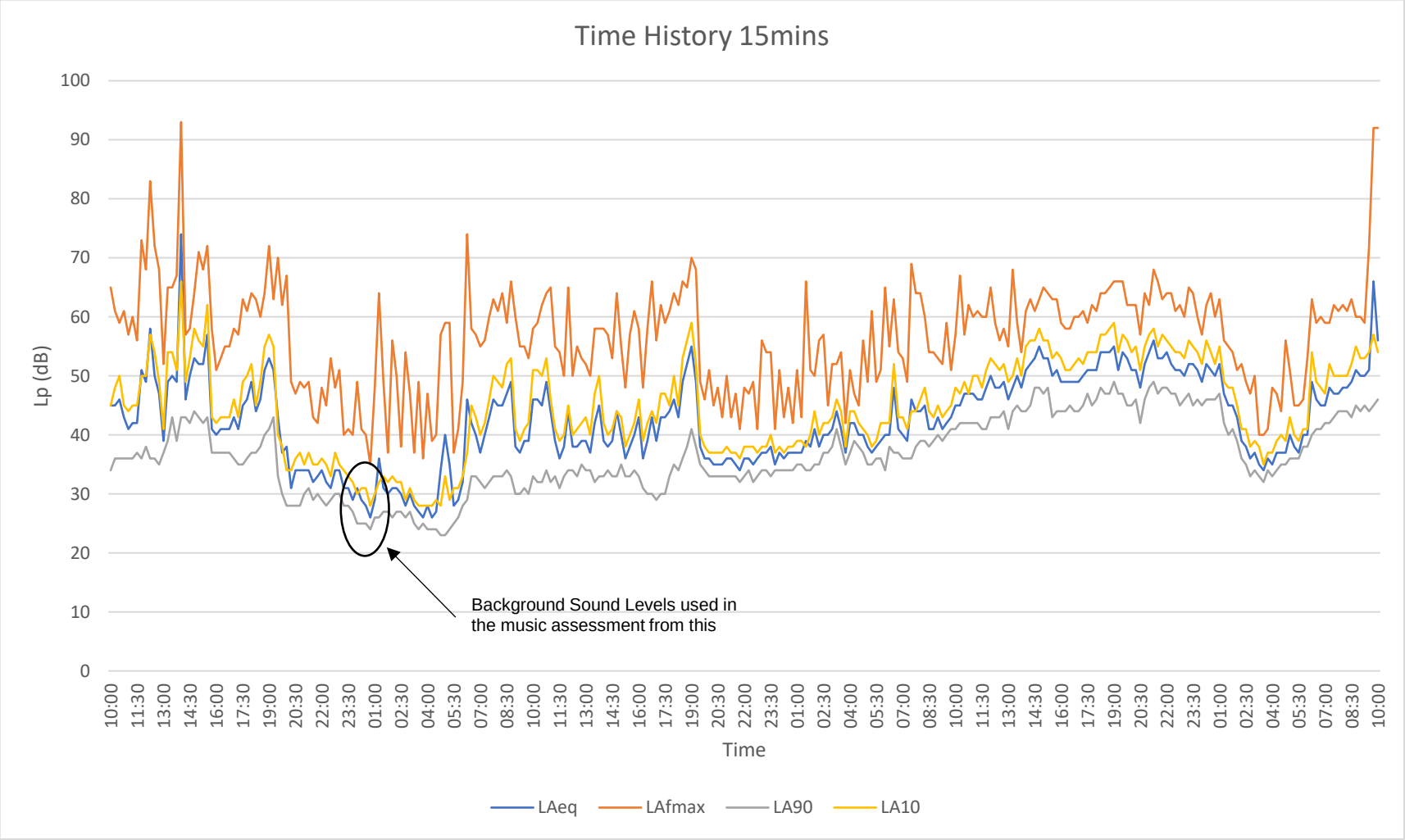


Figure 5.0 – Noise Survey Time History – ML1

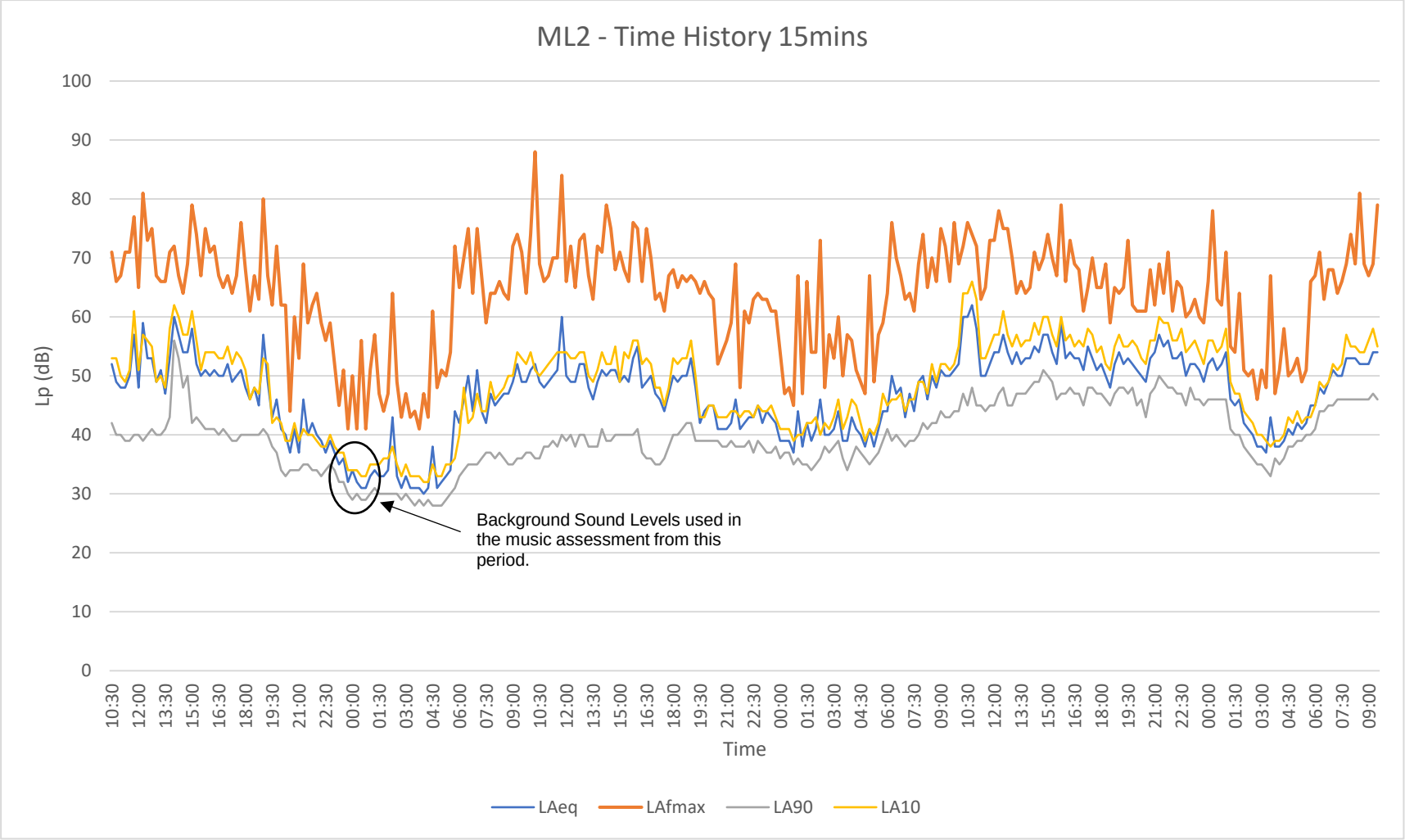


Figure 6.0 – Noise Survey Time History – ML2

APPENDIX D – Calculations & Noise Contours

D1 – Building Envelope Breakout Calculations

The tables below calculate the noise breaking out of the development considering the existing construction of the stable building facades and the recommendations outlined in Section 4.0 of the report. The sound reduction of each building element has been calculated using INSUL 9.0 Sound Insulation Prediction Software. These levels have then been input into the noise model as area sources Lw/m^2. This assumes the conversion from sound pressure to sound power as per the formula +10*log(s).

Noise Breakout Calculations							
	1/1 Octave Band Frequency (Hz) (dB)						
Upgraded Glazing Breakout	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**
Internal Music Limit Level	89.0	94.0	89.0	94.0	92.0	90.0	88.0
R 6/16/4 Cittal Glazing Section 4.0	19.0	21.0	20.0	26.0	38.0	37.0	39.0
External L1-R-6	64.0	67.0	63.0	62.0	48.0	47.0	43.0
Existing Single Glazing	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**
Internal Music Limit Level	89.0	94.0	89.0	94.0	92.0	90.0	88.0
R 4mm Single Glazing Existing	15.0	17.0	20.0	26.0	32.0	23.0	26.0
External L1-R-6	68.0	71.0	63.0	62.0	54.0	61.0	56.0
Façade	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**
Internal Music Limit Level	89.0	94.0	89.0	94.0	92.0	90.0	88.0
R 300mm Masonry Existing	40.0	38.0	46.0	53.0	59.0	64.0	69.0
External Level L1-R-6	43.0	50.0	37.0	35.0	27.0	20.0	13.0
Roof	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**
Internal Music Limit Level	89.0	94.0	89.0	94.0	92.0	90.0	88.0
R Roof Upgrade Section 4.0	24.0	40.0	48.0	54.0	59.0	56.0	61.0
External Level L1-R-6	59.0	48.0	35.0	34.0	27.0	28.0	21.0

Table 20.0 – Music Noise Breakout Calculation

D3 – Noise Map Contours

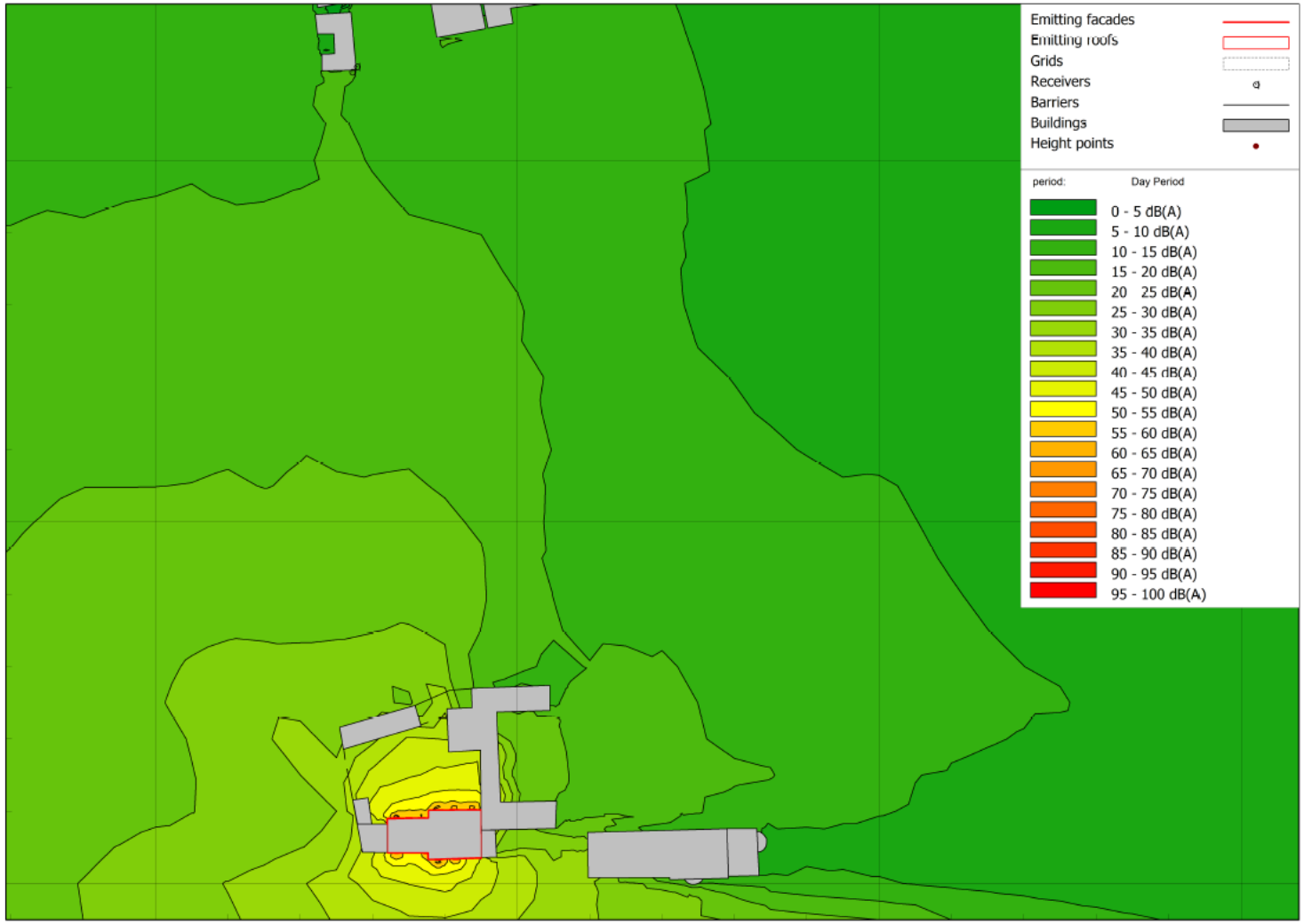


Figure 7.0 – Amplified Music Noise Breakout – 1.5m Grid Height – Ground Floor

Figure 8.0 – Patron Noise $L_{Aeq,t}$ – 1.5m Grid Height – Ground Floor

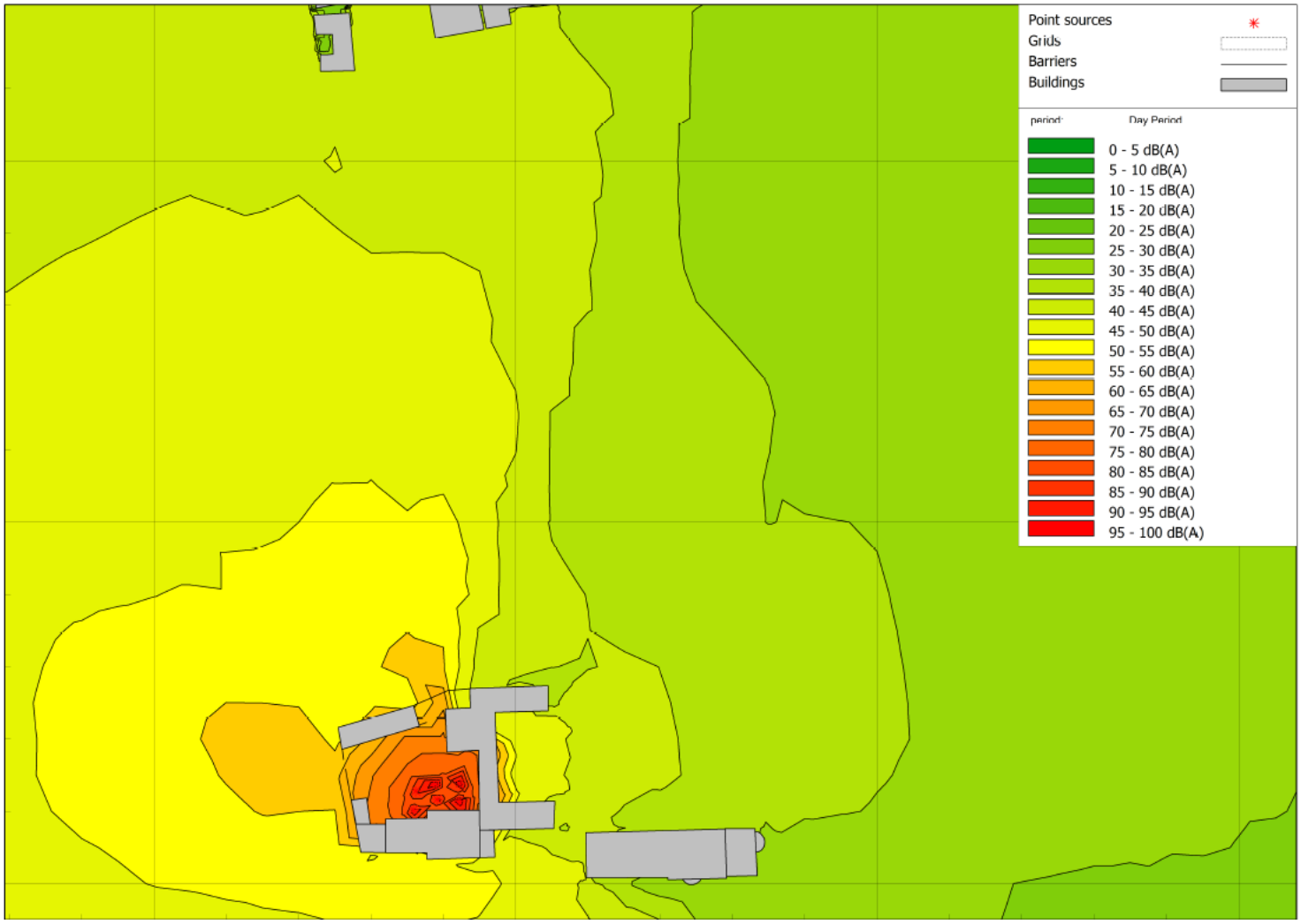


Figure 9.0 – Patron Noise L_{Afmax} – 1.5m Grid Height – Ground Floor

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