Exeter Winter Wonderland, Northernhay Gardens, Exeter

Noise management plan

for

Rowland Events Ltd.

ACT Acoustics

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Document information

Client	Rowland Events Ltd.
Site address	Exeter Winter Wonderland, Northernhay Gardens, Exeter
Project number	39348363
Author	Mike Wood PhD MIOA
Phone	01392 248111
Email	m.wood@actacoustics.co.uk

Revision history

Version	Author	Date	Comments
1.0	Mike Wood	11 October 2024	First issue
1.1	Mike Wood	31 October 2024	Updated with noise model and background noise assessment. Also updated procedures for noise management during the event.

Executive Summary

Rowland Events Ltd. has commissioned ACT Acoustics to provide a noise management plan for Exeter Winter City, which is to take place at Exeter Winter Wonderland, Northernhay Gardens, Exeter between 22 November and 23 December 2024.

We have:

- Determined suitable sound limit levels;
- Reviewed the noise sources likely to be present;
- Created a sound model to predict noise egress;
- Provided procedures for sound control; and
- Provided a noise management plan.

The sound control procedures include:

- sound testing on the first day of the even;
- sound monitoring throughout the event;
- dealing with complaints;
- method for taking sound measurements; and
- methods for reducing the sound egress from the site, should this be required.

We have also included a general noise management plan for the event.

Should the guidance in this report be followed, we expect this impact will be minimised.

1 Introduction

1.1 Site address

Exeter Winter Wonderland, Northernhay Gardens, Exeter

1.2 About the event

Exeter Winter City 2024 is to be held at Northernhay Gardens, Exeter between November 22, 2024 and 24 December 2024 with proposed opening hours between 1000 and 2200. The event is to include and ice rink, Santa's grotto, Christmas Market and a funfair*. It also includes a bar and food vendors.

The location of the proposed event is shown below:

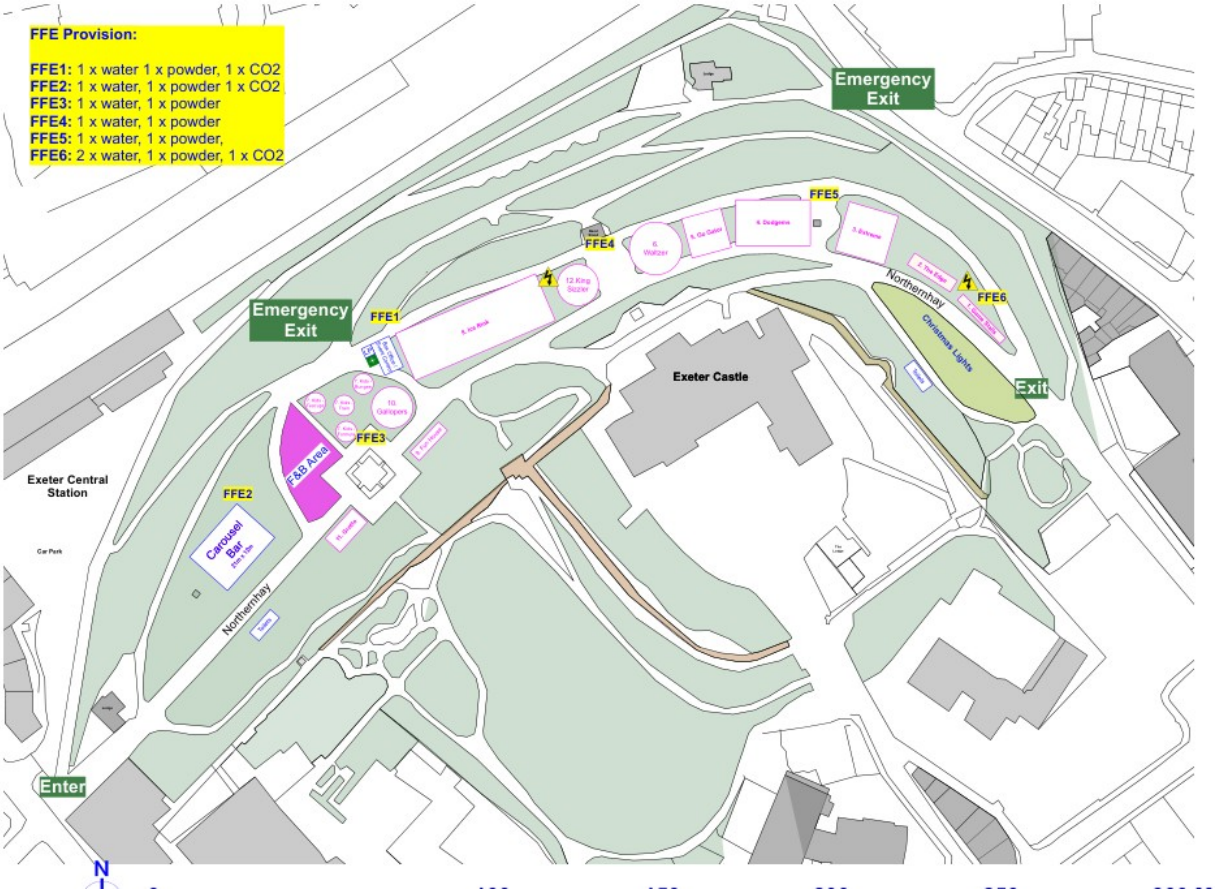


Figure 1: The plan of the proposed site

* Although no 'thrill rides' will be permitted.

1.3 Scope and limitations

The scope of our assessment is limited to the provision of a noise management plan for the event. This report does not consider the requirements of the Control of Noise at Work Regulations 2005. Please make sure that you have read and understood the disclaimer at the end of this report.

2 Regulations and Standards

The regulations and standards relevant to this noise management plan are detailed below:

2.1 Noise Council's Code of Practice on Environmental Noise at Concerts

The Noise Council has published guidelines for environmental noise control for concerts, which is detailed its Code of Practice (The Noise Council. Code of Practice on Environmental Noise Control at Concerts 1995). Although this is not directly applicable to events such as the Exeter Winter City, the guidance provides useful benchmarks for noise levels which we can use for setting reasonable noise limits for the event.

The Code of Practice for concerts and outdoor events sets recommended noise limits for events that are held between 9am and 11pm. The music noise level, or MNL, is the average noise level from music over a 15-minute period. The units of measurement for the MNLs are LAeq dB at 1 m from the facade of noise sensitive premises. It recommend that following noise limits:

Limit type	Concert days per calendar year per venue	Venue category	Guideline
A	1 – 3	Urban stadia or arenas	The MNL should not exceed 75 dBA over a 15-minute period
B	1 – 3	Other urban or rural venues	The MNL should not exceed 65 dBA over a 15-minute period
C	4 – 12	All venues	The MNL should not exceed the background noise level over a 15-minute period

The noise limits in the guidance depend on the number of events per year. The Exeter Winter City could be considered to be one event, but since it spans a period of 32 days, we recommend that that limit type C is used.

3 Significance assessment of sound sources

We have provided a preliminary assessment of sound sources below.

Table 1: Significance assessment of sound sources

Sound source	Potential risk	Proposed controls
Patrons using rides	Medium	No 'thrill' rides to be installed. Rides with the potential to generate higher levels are noise to be situated away from locations likely to cause disturbance.
Electrical generators	Medium	Noise levels from generators to be modelled in advance. The results of noise modelling and mitigation measures are discussed in detail in section 5.
Music from sound systems	Medium	All music systems are to be centrally controlled. These will be tested on the first day of the event with careful monitoring in place. Procedures for controlling noise from the centrally controlled system are detailed in section 6 of this report.

4 Baseline sound survey

4.1 Measurement methodology

British Standard 7445 (Description and measurement of environmental noise: Guide to quantities and procedures) provides guidance on the quantification of environmental noise. It provides the framework within which environmental noise should be quantified.

It comprises three parts:

- Part 1 (2003): provides a guide to quantities and procedures;
- Part 2 (1991): provides a guide to the acquisition of data pertinent to land use.
- Part 3 (1991): provides a guide to the application of noise limits.

BS 7445 also refers to BS EN 61672, which details the required equipment necessary for proper measurement.

To facilitate the comparison of results (measurements of noise from different sources), it may be necessary to carry out measurements under selected meteorological conditions which are reproducible and correspond to quite stable sound propagation conditions [Part 2, paragraph 5.4.3.3].

These conditions include:

- Wind speed not exceeding 5 m/s (measured at a height of 3 to 11 m above the ground);
- No strong temperature inversions near the ground; and
- No heavy precipitation.

All measurements were taken in accordance with the above guidance.

4.2 Survey location and time

The noise survey was undertaken at the site on 29 October 2024 between 1900 and 2100 at the location shown below:

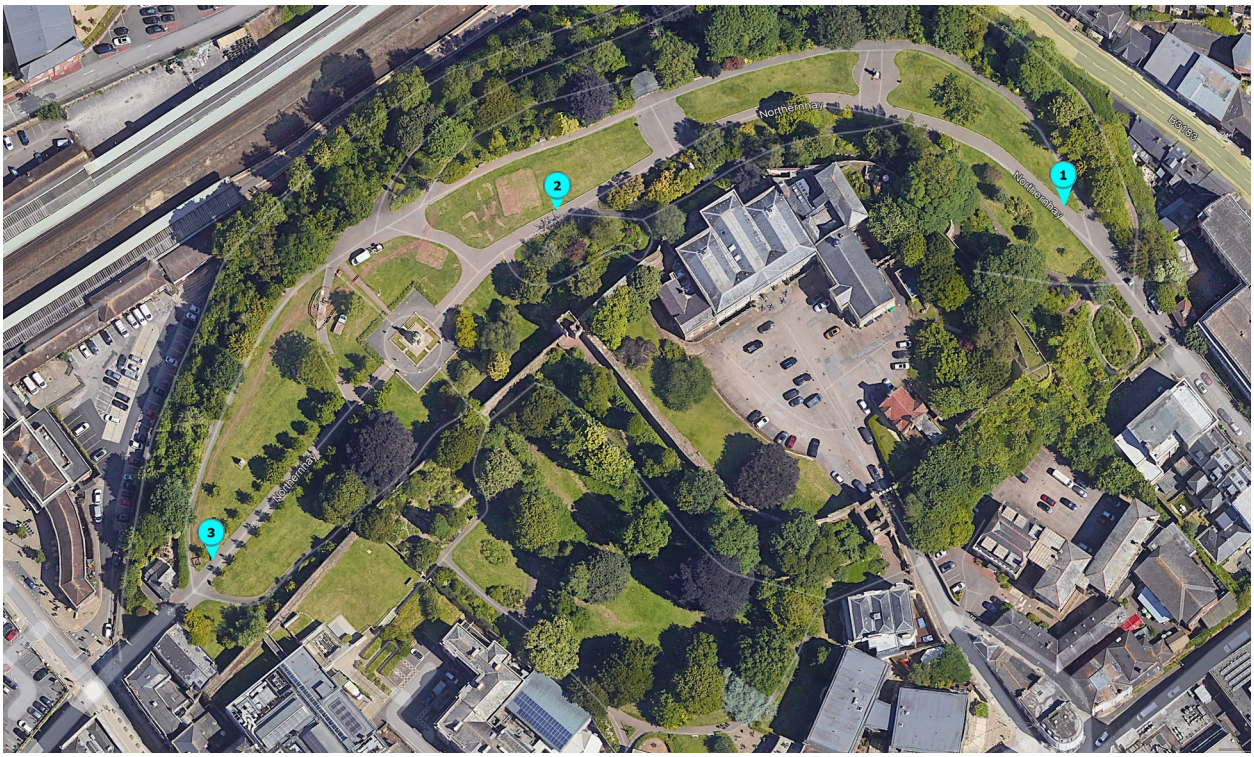


Figure 2: Survey measurement positions 1-3

Details of the equipment used are given in the appendix

4.3 Weather conditions

The weather conditions during the assessment were as follows:

- Temperature: 11-13 °C
- Wind speed: around 1.3 m/s
- Cloud cover: 8 Oktas
- Precipitation: None.

4.4 Soundscape

The soundscape of the area consisted primarily of:

- Road traffic noise (RTN);
- Trains arriving and departing Exeter Central Station; and

- Voices of people using the park.

4.5 Measurement results and sound limit

The results of the above measurements are summarised in the table below. We have also calculated the recommended sound limit from the event†:

Table 2: Background sound survey measurement results

Measurement location	Time (measurement end)	Duration	dB L_{Amax}	dB LA_{min}	dB L_{Aeq}	dB L_{A90}
1	1945	33 mins	58	44	53	45
2	2020	32 mins	50	38	42	38
3	2055	31 mins	49	40	43	41

Typical	41	**dB L_{A90}**
Recommended sound limit	56	**dB $L_{Aeq,15min}$**

† The background sound level plus 15 dB.

5 Sound modelling

5.1 Noise modelling assumptions

We created a noise model of the proposed development using iNoise 2024. The model was used to estimate noise egress from generators.

The settings used in the model were:

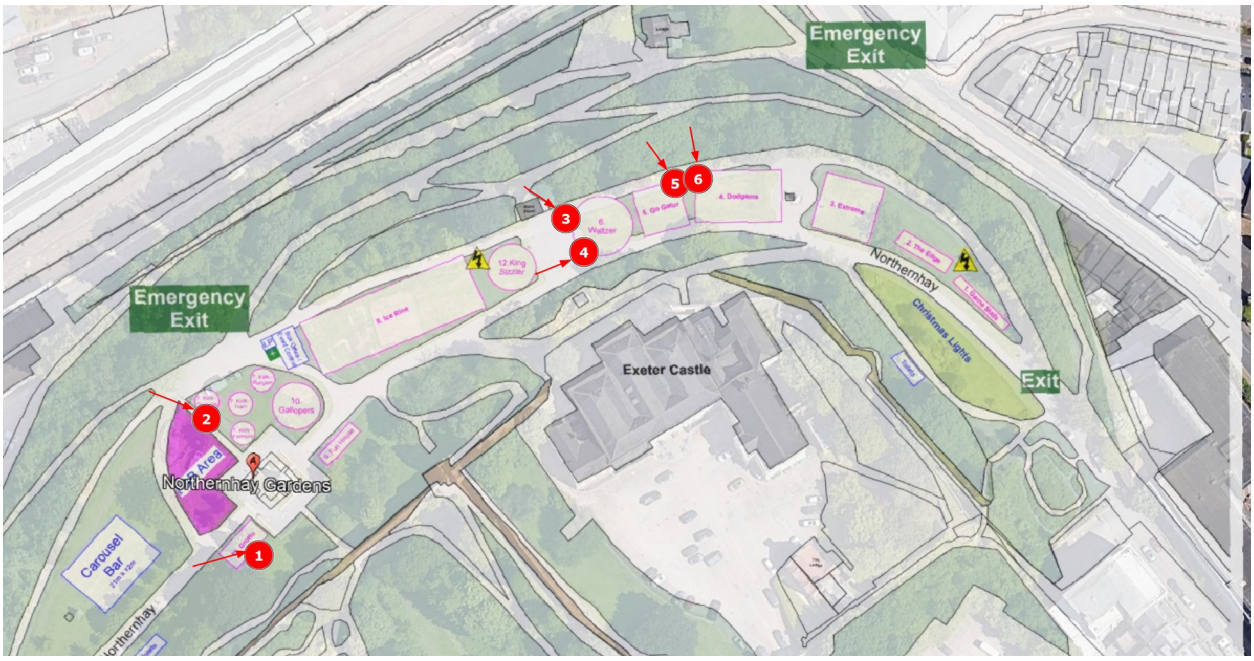
- Calculation methodology: ISO 9613-2
- Ground factor: 0.5 (mixed ground)
- D_{max} set in accordance with ISO 9613 (D_{max1} = 20.0, D_{max2} = 25)
- Temperature (Kelvin): 293.15
- Pressure (kPa): 101.33
- Air humidity (%): 60

We used the noise model to calculate the noise level across the study area for the generator noise levels for the opening period (10.00-22.00) at 5 m above ground level and at individual noise sensitive locations

5.2 Sound sources: Generators

The location of the sound sources being assessed are shown below. These locations have been chosen to ensure that the generators are as far as possible from sound sensitive locations whilst being close enough to deliver power to the required locations‡:

‡ Note that the proximity of dwellings at Exeter Castle is mitigated by the large stone wall that separates Northernhay Gardens from the castle grounds.



The make and model of individual generators is not known at this stage. We have therefore based our assessment on typical sound levels from similar generators:

Item nos.	Plant	Sound power level (L_{WA} dB)	Quantity
1-6	Generator	96	6

5.3 Usage assumptions (worst case assumed for sound model)

The usage patterns of the generator are unlikely to change during opening period. For the purposes of the sound model, we assume that all six generators are operating simultaneously and for 24 hours per day.

5.4 Sound-sensitive receptors

The key to the sound sensitive receptors used in the sound model are shown below:

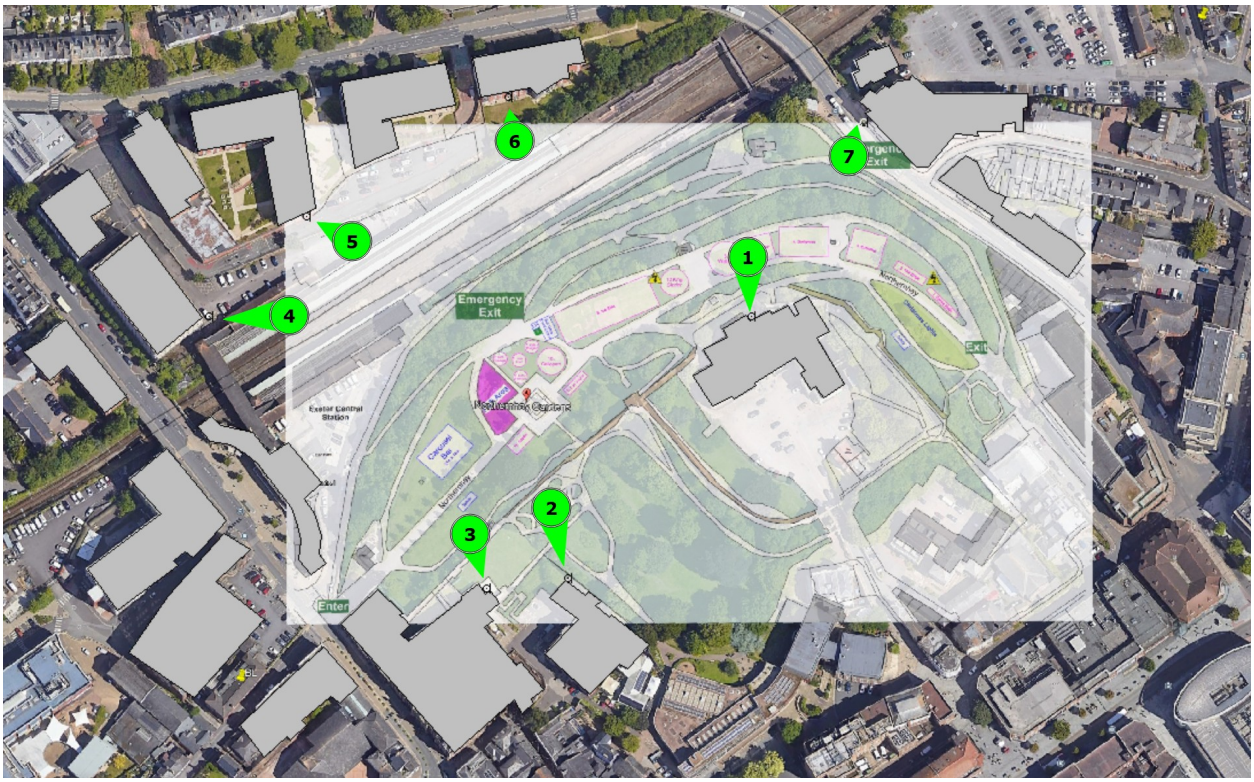


Figure 3: Key to sound sensitive receptor

5.5 Barriers

In creating the sound model, we have also assessed the impact of the sound barriers around the generators. We have assumed that the barriers themselves achieve at least 20 dB R_w sound reduction, are 2 m tall and are placed around 1 m from the proposed generator locations.

5.6 Sound model results: No barriers

The contours showing of the sound egress from the generators without the use of sound barriers is shown below:

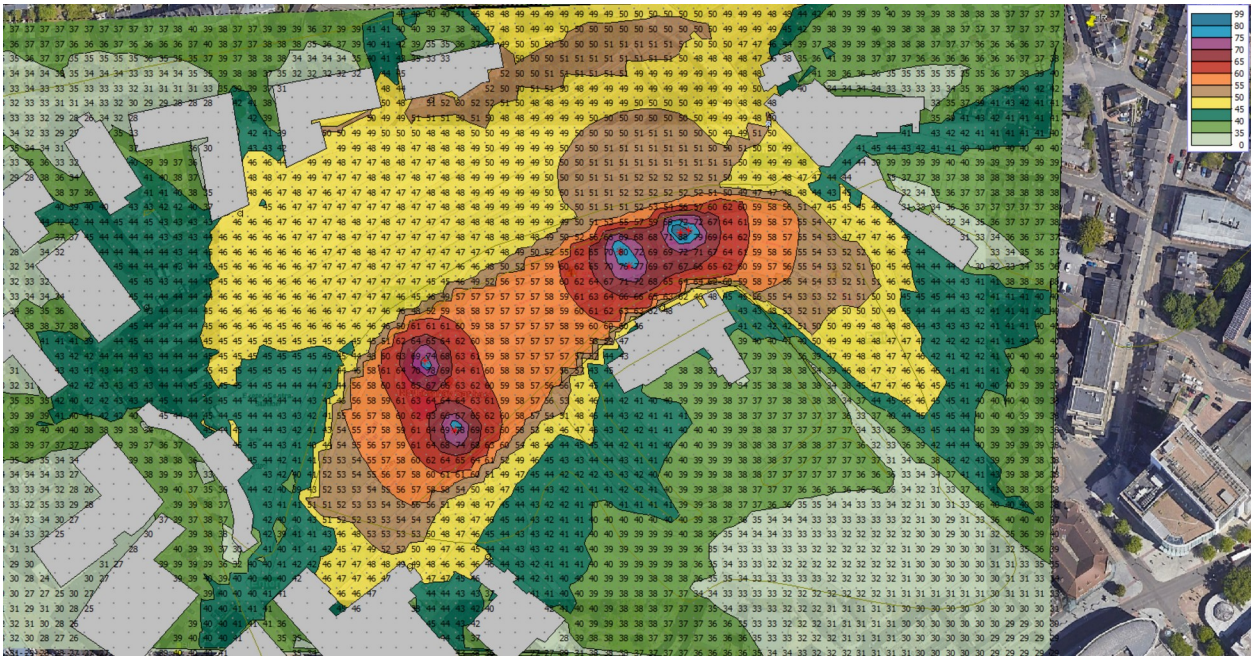


Figure 4: Sound model contours, no barrier

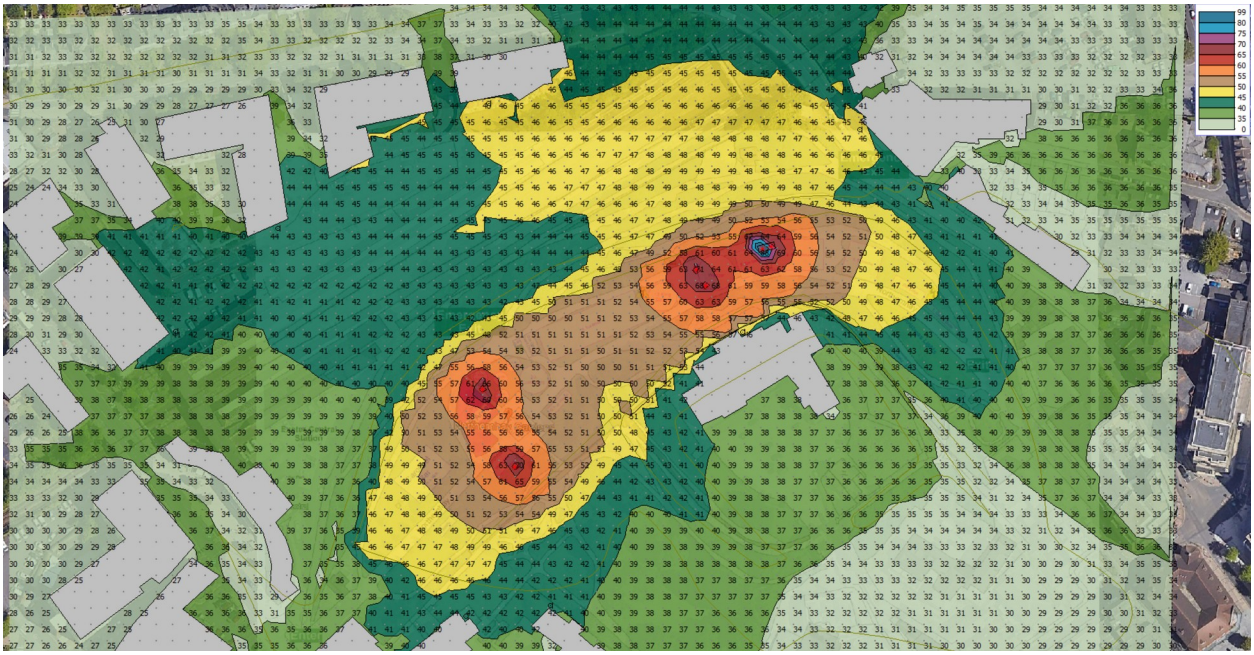
The tabular results at each sound sensitive location are:

Location ID	Generators, Sound pressure level (dBA SPL)	Recommended sound limit (dB LAeq,15min)	Difference (dB)
1	48	56	-8
2	44	56	-12
3	50	56	-6
4	44	56	-12
5	46	56	-10
6	49	56	-7
7	49	56	-7

Table 3: Noise levels from generators with no barrier

5.7 Sound model results: Barriers included

The contours showing of the sound egress from the generators using of sound barriers is shown below:



The tabular results at each sound sensitive location are:

Location ID	Generators, Sound pressure level (dBA SPL)	Recommended sound limit (dB LAeq,15min)	Difference (dB)
1	46	56	-10
2	41	56	-15
3	43	56	-13
4	41	56	-15
5	43	56	-13
6	43	56	-13
7	45	56	-11

Table 4: Noise levels from generators with when noise barriers are used

5.8 Comparison of barrier approaches

With no barrier present, the ‘worst’ performance location is location 3. Here, the sound from all generators is 6 dB below the required sound level. When barriers are present, the ‘worst’ location is location 5. At this location the sound level from generators is 10 dB below the sound limit:

	No barrier	Barrier
Location ID	3	5
Comparison with limit (dB)	-6	-10

Based on the above assessment, the generators are unlikely to result in an exceedance of the proposed sound limits. Adding barriers around them has some effect, but this is limited. We therefore only recommend noise barriers if individual generators are likely to have sound power levels greater than 96 dBA SWL.

6 Noise management plan: Routine procedures

The noise management has been carefully designed to meet the sound levels detailed above.

6.1 Procedure: First day

On the first day of the event, ACT Acoustics and the event's sound engineers will undertake noise propagation tests. These tests are designed to inform provide Rowland Events Ltd with reference noise limits for any recorded music played at the funfair, ice-rink or bars.

In setting the levels for, Rowland Events Ltd will be encouraged to leave headroom to provide a safety margin to insure against adverse climatic conditions (e.g.. temperature inversions).

6.2 Procedure: Throughout the event

The steps will be taken to ensure that the noise limits are met;

- Rowland Events Ltd will monitor the noise levels regularly during the month, with ACT acoustics advising on recommended locations and good practice as needed.
- Rowland Events Ltd will take action to reduce noise levels when necessary (see section 6.5).
- All sound level meters used for environmental monitoring will be integrating meters which are classified to Type 2 or Type 1 and capable of one-third octave band analyses (for monitoring and recording any low frequency noise egress) as well as audio recording.
- Although low-frequency noise is not expected to be an issue, the noise levels within the 63 and 125 Hz frequency bands should be monitored to ensure that they do not exceed 60 dB $L_{Aeq,15min}$ at the NSLs at any time.

If any of the planned noise limits are exceeded, Rowland Events Ltd the noise levels will be adjusted immediately (see section 6.5).

An acoustic consultant from ACT Acoustics shall be available as an advisor throughout the duration of the event should any queries arise about noise monitoring methods, noise reduction or dealing with complaints.

Rowland Events Ltd will implement a centrally controlled sound system for the event. This will ensure that they can reduce noise levels from stalls, bars and the ice-rink throughout the event.

6.3 Procedure: Complaints

In the event of a complaint a representative of Rowland Events Ltd will;

- Log the address of the complaint.

- Attend the location of the complaint to take noise measurements. Noise measurements shall be taken using the method described in section 6.4.

6.4 Procedure: Sound measurements

Noise measurement shall be taken in accordance with the following procedure:

- The engineers shall make a note of his/her subjective impressions of the noise at the complainant's address.

- A 15-minute L_{Aeq} noise measurement shall be taken at the complainant's address (or suitable proxy) using a Class 1 or Class 2 integrating, logging sound level meter.

- The sound level meter shall be mounted on a tripod to ensure consistency between measurements.

- The measurement shall include a simultaneous audio recording, ideally recorded by the sound level meter itself.

- Whilst taking the measurement, care should be taken to ensure that sounds not related to the event do not affect the result (for example, passing traffic or talking near the meter can create misleading results). This can be achieved by pausing the meter whilst non-event sound sources are affecting the measurement. The remaining sound shall only include sound from:

    - Generators

    - Patrons on rides at the event

    - The music system

- All the above data should be kept on file with the complaint should the data need to be assessed at a later date.

6.5 Procedure: Reducing the sound level from the event

If the collected data identifies that there has been an exceedance of the recommended noise level, immediate action shall be taken to reduce it. The actions will required will depend on the sound source:

- For generators it shall be checked that the generator is operating properly and any barriers around it are in the correct position. If these are found to be in satisfactory condition, then

the sound shall be reduced by resiting or rotating[§] the generator.

- For noise from patrons on rides at the event, it should be checked that rides are not operating at higher than normal speeds and that there are not too many patrons using each ride. If rides are operating as normal, but higher sound levels persist, the number of persons using each ride shall be reduced until the sound levels are abated.

- For music systems, the noise levels shall immediately be lowered using the events central control system.

All of the above data shall be sent via email to ACT Acoustics Ltd. as soon as is practical. We will then provide additional remedial advice should this be required.

§ Rotation may serve to reduce the noise level as generators generally do not transmit sound equally in all directions.

7 Noise management plan: General sound management

7.1 Management of other potential noise sources

The following steps will be taken to ensure that noise from stalls, bars and the ice-rink is minimised:

- Venue bar and food outlets will not be permitted PA systems.
- Contracts with sub-contractors will emphasise that there are strict noise levels imposed and that they must comply with any instructions to reduce noise.
- Any unauthorised PA systems will be impounded or access refused.
- Security services will we be on patrol during the event to ensure that any disturbances are minimised.
- No car movements will be permitted after 2300.
- The will be no mass egress when the site closes.

7.2 Management of noise from the public

The Event Management Plan produced by Rowland Events Ltd provides details on how the crowds will be managed on site. This includes marshalling, security presence, and communication protocols via radios and mobile phones. Security will also monitor entry and exit points and will enforce a zero-tolerance policy for anti-social behaviour. This will also include anybody making excessive noise, particularly near to residential locations near to the site.

7.3 Site design

If additional sound equipment is to be installed, or if the existing plans are to be changed in any way, then we recommended that Rowland Events Ltd liaise directly with ACT Acoustics to ensure that the changes do not adversely affect noise levels.

- Electrical generators: Any on site generation equipment shall be specified so that the noise generated is less than 65 dBA at 10 m (including the effect of noise barriers). The operator will ensure that equipment suppliers meet this requirement with the location of generator being approved by ACT Acoustics before installation.
- Site inspection after the event: At 2200 each day, an inspection of all equipment will be undertaken to ensure that the sound system is turned off.

7.4 Ability to control sound systems

To ensure that all sound systems are installed as agreed, Rowland Events Ltd will a centrally controlled sound system. The shall allow Rowland Events Ltd will have full control of the overall sound levels from music systems.

7.5 Pre-event information

Rowland Events Ltd will provide information about the event to local residents. The information provided will include the start and finish times of the event as well as information about the timing of sound-checks. The information will be provided by direct mail and will also include a phone number for residents to ring if they have any complaints about noise from the event.

A telephone complaints line will be set up and will be operational for the event's duration (phone number to be confirmed). If complaints are received during the event, then an a representative of Rowland Events Ltd will investigate the complaint using the procedure outlined in section 6.3. If it is found that the noise levels are in excess of the license conditions, then Rowland Events Ltd are to take immediate action to reduce the noise levels from the event as outlined in section 6.5.

7.6 Noise during load-in and load-out

It is sometimes necessary to load in or load out equipment outside normal working hours. If loading is undertaken outside working hours, then we suggest that the following advice is followed:

- vehicular access for the site is located as far away from noise sources as possible;
- operatives will refrain from shouting;
- operatives will not intentionally drop scaffold bars;
- the flooring of trucks will be lined with a damping material;
- the trucks' reversing alarms will use white noise rather than beepers; and
- the engines of parked vehicles will be switched off when the vehicle is parked.

7.7 Additional measures

In addition to the good practice noise management guidance given above, the production team and ACT Acoustics will undertaken the following actions:

- Before the event, ACT Acoustics will work with the production team to ensure best practice for the location of any sound systems to minimise sound egress from the site.

- ACT Acoustics and the production team will liaise closely with EHO to ensure good practice, before, during the after the event.

- Rowland Events Ltd or nominated deputy must have full control over all sources of recorded music on the site.

- Monitoring data will be included in a post-event sound report to Exeter City Council (if required), and will compare the measured data with the sound limits. All data recorded by the production team will be made available to ACT Acoustics who will analyse the data using a method to be agreed with the Licensing Authority. The report will be submitted to the Licensing Authority within six weeks of the event end date.

- Prominent clear notices must be displayed at all public exits requesting customers to respect the needs of local residents and leave the premises and area in a quiet manner.

8 Appendix

8.1 Typical noise levels

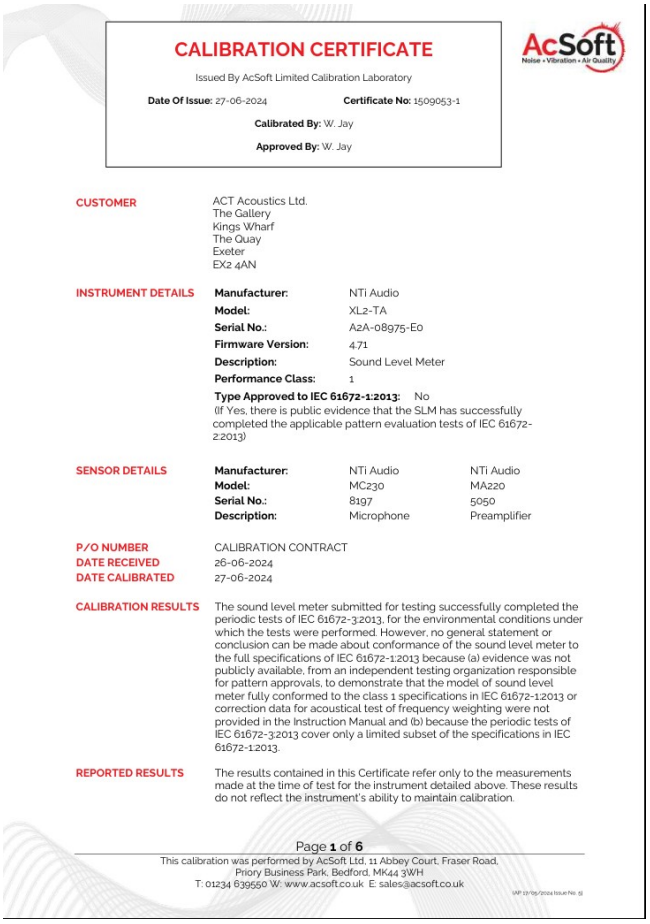
The below table shows typical noise levels for reference:

Source	dBA SPL
Jet aircraft at a 50m distance	140
Threshold of pain	130
Threshold of discomfort	120
Chainsaw at a 1m distance	110
Disco, 1m from speaker	100
Diesel truck at a 10m distance	90
Kerbside of busy road at a 5m distance	80
Vacuum cleaner at a 1m distance	70
Conversational speech at a 1m distance	60
Average home	50
Quiet library	40
Quiet bedroom at night	30
Background in TV studio	20
Rustling leaves in the distance	10
Threshold of human hearing	0

8.2 Sound survey equipment

Details of the survey equipment used for short-term survey described in this report is shown below:

Manufacturer	Name	Component Type	Serial Number	Calibration due
NTi Audio	XL2-TA	Sound level meter	A2A-08975-E0	27 June 2026
NTi Audio	MC230	Microphone	8197	27 June 2026
NTi Audio	MA220	Pre-amplifier	5050	27 June 2026
Bruel & Kjaer	B&K 4230	Calibrator	829693	17 March 2025



CALIBRATION CERTIFICATE

Issued By AcSoft Limited Calibration Laboratory

Date Of Issue: 27-06-2024 **Certificate No:** 1509053-1

Calibrated By: W. Jay

Approved By: W. Jay

CUSTOMER
ACT Acoustics Ltd.
The Gallery
Kings Wharf
The Quay
Exeter
EX2 4AN

INSTRUMENT DETAILS

Manufacturer:	NTi Audio
Model:	XL2-TA
Serial No.:	A2A-08975-E0
Firmware Version:	4.71
Description:	Sound Level Meter
Performance Class:	1

Type Approved to IEC 61672-1:2013: No
(If Yes, there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2013)

SENSOR DETAILS

Manufacturer:	NTi Audio	NTi Audio
Model:	MC230	MA220
Serial No.:	8197	5050
Description:	Microphone	Preamplifier

P/O NUMBER CALIBRATION CONTRACT
DATE RECEIVED 26-06-2024
DATE CALIBRATED 27-06-2024

CALIBRATION RESULTS The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of IEC 61672-1:2013 because (a) evidence was not publicly available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013 or correction data for acoustical test of frequency weighting were not provided in the Instruction Manual and (b) because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

REPORTED RESULTS The results contained in this Certificate refer only to the measurements made at the time of test for the instrument detailed above. These results do not reflect the instrument's ability to maintain calibration.

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This calibration was performed by AcSoft Ltd, 11 Abbey Court, Fraser Road, Priory Business Park, Bedford, MK44 3WH
T: 01234 639550 W: www.acsoft.co.uk E: sales@acsoft.co.uk

Figure 5: XL2 calibration certificate

8.3 Glossary

General acoustic terms

- **Sound**: The audible transmission of vibrations through air or water.
- **Noise**: Unwanted sound. Sound that causes disturbance.
- **Ground-borne Vibration**: Vibration transmitted through the ground. Has the potential cause disturbance, even damage at sufficient levels. Typically measured as Vibration Dose Values (VDVs).
- **Re-radiated Noise (or 'Ground-borne Noise')**: Ground-borne vibration can cause walls, floors and ceilings to radiate noise. This is often referred to as ground-borne noise. Mechanical plant may also generate noise by similar means.
- **Cross-talk**: Sound transmission between rooms via ventilation ducting.
- **Decibel (dB)**: The standard unit for defining sound pressure levels. The range of normal hearing is between 0 dB and 130 dB Where 130 dB is the upper threshold of pain. A change of 1dB in sound pressure levels is barely perceptible and 3dB is normally the minimum audible difference. A change of 5dB is clearly audible. A change of 10dB roughly corresponds to a halving or doubling of perceived loudness.
- **dBA (A-weighted decibel)**: A-weighted decibels use a frequency weighting to correspond to how the human ear hears sound.

Environmental sound terminology

- **$L_{Aeq,T}$ (equivalent continuous sound level)**: The A-weighted equivalent average sound level (L_{Aeq}) is commonly used to describe the average sound level in a given environment over the measurement period.
- **$L_{A10,T}$**: The A-weighted level of sound exceeded for 10% of the specified measurement period (T). It gives an indication of the upper limit of fluctuating sound and is commonly used in traffic sound measurements.
- **$L_{A90,T}$**: The A-weighted level of sound exceeded for 90% of the specified period (T). It is commonly used to define background sound level; the underlying level in the absence of intermittent sound.
- **L_{Amax} (maximum sound level)**: The highest A-weighted sound level recorded during the measurement period. It is measured using the fast sound level meter response.
- **Hz (Hertz)**: Hz is the unit of frequency, equal to one pressure fluctuation cycle per second. Frequency is related to the pitch of a sound.
- **Free-field**: A sound measurement taking in the absence of any reflecting objects. Generally measured outside and away from buildings.
- **Façade-level**: A measurement taken in close proximity (e.g.. 1 m) to a reflective surface other than ground, such as a building façade. This typically increases the measured level by around 3 dB.

- **NSL:** Noise-sensitive location. This is typically a dwelling, church, meditation space or other location likely to be significantly affected by sound.

Music noise terminology

- **MNL (Music noise level)**: The A-weighted equivalent average noise level averaged over a 15 minute period ($L_{Aeq,15min}$). This noise level does not include noise produced by patrons attending the event or other associated noise source.

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The findings and opinions expressed are relevant to the dates of the site works and should not be relied upon to represent conditions at substantially later dates. If additional information becomes available which may affect our comments, conclusions or recommendations, the author reserves the right to review the information, reassess any new potential concerns and modify our opinions accordingly.

All design advice given in this report should be checked with a suitably qualified structural engineer, fire safety engineer, chartered building surveyor, building services engineer and your local building control officer as required. Suitably qualified consultants can be found at the Institution of Structural Engineers, the Royal Institution of Chartered Surveyors and the Chartered Institution of Building Services Engineers. The manufacturer's guidance should be followed in full for all recommended products in this report.

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