
Dewsbury Market

Environmental Noise Assessment Report

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Contents

1. Introduction..... 1

1.1 Proposed development 1

1.2 Operating hours 1

1.3 Noise assessment scope 1

1.3.1 Noise sensitive receptors 1

2. Relevant guidance 3

2.1 National Planning Policy Framework (2023) 3

2.2 Noise Policy Statement for England (NPSE)..... 3

2.3 The Noise Council: ‘Code of Practice on Environmental Noise Control at Concerts’ 3

2.4 IOA Pubs and Clubs Guidelines..... 3

2.5 BS4142:2014+A1:2019 ‘Methods for Rating and Assessing Industrial and Commercial Sound’ 4

2.6 Local Planning Authority 4

3. Proposed noise criteria..... 5

3.1 Entertainment noise break-out from the Market Hall..... 5

3.1.1 Frequent events 5

3.1.2 Occasional events..... 6

3.2 External plant noise emissions..... 6

4. Environmental noise survey 7

4.1 Survey details 7

4.1.1 Daytime noise survey..... 7

4.1.2 Night-time noise survey..... 7

4.2 Description of Noise Climate 8

4.3 Survey Results Summary..... 9

5. Entertainment noise break-out assessment..... 10

5.1 Indicative entertainment noise break-out limits 10

5.2 3D noise modelling 10

5.2.1 Building envelope sound insulation performance..... 10

5.3 Indoor event noise limits 13

5.3.1 Entertainment noise break-out predictions..... 13

5.4 Outdoor event noise limits..... 14

6. Noise from building services plant 17

6.1 Proposed external plant noise emission limits 17

Appendix I – Glossary of Acoustic Terms 18



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1. Introduction

1.1 Proposed development

BDP Acoustics has been commissioned by Kirklees Council to undertake an environmental noise assessment report to support a planning application for the proposed redevelopment of Dewsbury Market.

The proposed scheme will include a new outdoor market area and re-development of the existing Market Hall and Semi-covered Market.

The proposed re-development of the Market Hall is considered in detail in this noise assessment due to the proposals to incorporate food and beverage facilities surrounding a large flexible seating / events area to accommodate pop-up kiosks, demonstrations, entertainment performances, etc., allowing flexibility in the future events programme. The Market Hall is to be fully enclosed with mostly glazed facades and will incorporate large folding doors and louvered fresh air openings on the Cloth Hall St elevation.

1.2 Operating hours

It is proposed that the Market Hall will host a range of entertainment events. For the purposes of this noise assessment, we have assumed the following example event schedule, as advised by Kirklees Council:

- Light entertainment and music related events occurring up to 6 days per week, ending no later than 23:00 hrs;
- Approximately one entertainment event per month which may incorporate higher entertainment noise levels than the regular event schedule above, ending no later than 23:00 hrs.

Note that the example event schedule above is indicative and is subject to change and is provided at this stage to allow assessment of potential event noise scenarios.

It is assumed that fixed mechanical plant may operate for 24 hours a day.

1.3 Noise assessment scope

The purpose of this report is to assess the following potential noise sources:

- Plant noise emissions from the development.
- Entertainment event noise break-out from the Market Hall to the external environment.
- Entertainment event noise emissions from events held in the outdoor market areas.

Noise from typical market activities associated with the redevelopment has not been assessed given the existing use of the Market Hall, Semi-covered Market, and Outdoor Market stalls at the site.

Following pre-application consultation with Kirklees Council, noise emissions from the proposed children's play area have been excluded from the scope of this assessment.

1.3.1 Noise sensitive receptors

Based on discussions with Kevin Moore at Kirklees Council Environmental Health Department in 2021, our assessment has considered the nearest existing noise sensitive premises to the site to be the existing residential properties that surround the site; these are outlined below and illustrated in Figure 1.

1. Machells Mill, Whitehall Way
2. Residential Accommodation above Station Hotel, Crackenedge Lane
3. Flats above 19 Foundry St

As these discussions took place some time ago, a recent review of nearest noise sensitive receptors has been undertaken via a site visit which confirmed the above receptor locations are still valid, with no additional new receptors identified.

2. Relevant guidance

The following documents have been considered in respect of the noise impact of the proposed development.

2.1 National Planning Policy Framework (2023)

The National Planning Policy Framework (NPPF), updated on 19 December 2023 specifies the Government's planning policies for England and how these are expected to be applied. It replaces a number of previous planning policy documents, including Planning Policy Guidance 24: Planning and Noise (PPG24). Unlike PPG24 which it replaced, NPPF does not contain any methodology for objective assessment. It provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

2.2 Noise Policy Statement for England (NPSE)

The NPSE provides guidance on the management of noise from sustainable development. The statement sets out three key aims in paragraph 1.7:

“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *Avoid significant adverse impact on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life.”*

2.3 The Noise Council: ‘Code of Practice on Environmental Noise Control at Concerts’

This document provides guidance on noise limits for large music events in various venue types, including open air sites and events within lightweight buildings. It gives guidance on how disturbance or annoyance from such events can be minimised.

The Code is designed to assist those planning a music event, those responsible for licensing such events and those responsible for enforcing the nuisance provisions of the Environmental Protection Act 1990 (England and Wales) and the Control of Pollution Act 1974 (Scotland).

The Code of Practice relates to music events ‘...held in sporting stadia, arena, open air sites and within lightweight buildings’, and defines a music event as ‘a concert or similar event where live or recorded music is performed by a solo or group of artists before an audience.’

2.4 IOA Pubs and Clubs Guidelines

In March 2003 the Institute of Acoustics (IOA) published its ‘Good Practice Guide on the Control of Noise from Pubs and Clubs’. The document provides guidance for the assessment and control of noise affecting noise-sensitive properties, from the public and private use of public houses, clubs, hotels, discotheques, restaurants, cafes, community or village halls and other similar premises.

The working group responsible for the Good Practice Guide also produced the ‘Working Draft Annex on Criteria, Measurements Guidelines and other Relevant Information’ (November 2003), which provides suggested criteria and associated measurement techniques in relation to the advice in the Good Practice Guide.

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

BS 4142:2014+A1:2019 (BS 4142) provides a method for rating industrial and commercial sound and a method for assessing resulting impacts upon people. The impact assessment procedure described in BS 4142 is based on the comparison of rating sound level with the background sound level prevailing at the assessment locations.

2.6 Local Planning Authority

Kirklees Council were consulted in 2021 in regard to suitable noise level criteria and assessment methodology for the Dewsbury Market development. The noise level criteria outlined in this report were presented to Kirklees Council's Environmental Health Group Leader, Kevin Moore in 2021, who confirmed that the proposed noise criteria were acceptable for the development.

3. Proposed noise criteria

The following subsections detail the proposed design criteria for noise from the entertainment events and fixed plant items associated with the development at the nearest noise sensitive receptors.

3.1 Entertainment noise break-out from the Market Hall

3.1.1 Frequent events

For frequent events incorporating entertainment noise, we propose to adopt the criteria presented in the ‘Working Draft Annex on Criteria, Measurement Guidelines and other relevant information’ published in 2002 by the Institute of Acoustics working group responsible for producing the 2003 ‘Good Practice Guide on the Control of Noise from Pubs and Clubs’.

The proposed noise criteria for event frequencies of more than 30 events per year is presented in the following table.

Table 1: Proposed external noise criteria for more than 30 events per year or events continuing beyond 23:00 hrs

Event frequency	Time Period	External Noise Criteria at Existing Noise Sensitive Receptors (refer to Figure 1)
More than 30 days per year, not more than once in a single week and ends by 23:00 hrs	09:00 – 23:00 hrs	The $L_{Aeq,1minute}$ of the entertainment noise should not exceed the representative background noise level L_{A90} (without entertainment noise) by more than 5 dB; and The $L_{10,1minute}$ of the entertainment noise should not exceed the representative background noise level L_{90} (without entertainment noise) by more than 5 dB in each third octave band between 40Hz and 160Hz
More than once per week or continues beyond 23:00 hrs*	At any time	The $L_{Aeq,1minute}$ of the entertainment noise should not exceed the representative background noise level L_{A90} (without entertainment noise); and The $L_{10,1minute}$ of the entertainment noise should not exceed the representative background noise level L_{90} (without entertainment noise) in each third octave band between 40Hz and 160Hz

* Note that the Institute of Acoustics working group guidance states that if the criteria relating to an event frequency of more than once per week or continuing beyond 23:00 hrs are met, entertainment noise will be ‘...virtually inaudible inside noise sensitive property’.

3.1.2 Occasional events

For occasional events incorporating entertainment noise, we propose to adopt the noise criteria presented in The Noise Council: ‘Code of Practice on Environmental Noise Control at Concerts’.

The proposed noise criteria for the event frequencies of up to 30 events per year with a music end time of 23:00 hrs are presented in the table below.

Table 2: Proposed external noise criteria for up to 30 events per year

Event frequency	Time Period	External Noise Criteria at Existing Noise Sensitive Receptors (refer to Figure 1)
Up to 3 days a year	09:00 – 23:00 hrs	The Music Noise Level* should not exceed 75 dB(A) over a fifteen-minute period.
Up to 12 days a year, not more than 3 consecutive days.	09:00 – 23:00 hrs	The Music Noise Level* should not exceed the background noise level** by more than 15 dB(A) over a fifteen-minute period.
Up to 30 days a year, not more than once in a single week	09:00 – 23:00 hrs	The Music Noise Level* should not exceed the background noise level** by more than 5 dB(A) over a fifteen-minute period.

* In this instance, the Music Noise Level is defined as the measured L_{Aeq} at 1 metre from the façade of any existing or known future residential premises resulting from music and vocals during a concert or sound checks and not affected by other local noise sources.

** In this instance, the background noise is defined as the arithmetic average of the hourly L_{A90} measured between 19:00 and 23:00 hours.

3.2 External plant noise emissions

Based on guidance from BS 4142:2014+A1:2019 ‘Methods for Rating and Assessing Industrial and Commercial Sound’ (BS4142), we propose the following noise limits for external plant noise at existing identified noise sensitive receptors:

The free-field equivalent plant noise rating level, $L_{A,T}$ (i.e. the specific sound level plus any adjustment for the characteristic features of the sound in accordance with BS 4142) when measured at the nearest residential noise sensitive receptor shall not exceed the existing background sound level, $L_{A90,T}$ when all plant/equipment (or any part of it) is in operation.

4. Environmental noise survey

4.1 Survey details

Daytime and night-time noise level surveys have been undertaken to determine the existing ambient (L_{eq}) and background (L_{90}) noise levels representative of the immediate surrounding area.

The sound level meter (SLM) monitoring locations were free-field, approximately 1.5 metres above local ground level.

The approximate locations of the measurements are presented in Figure 2. Note, positions that are labelled with the same number but different letters (e.g. 1a and 1b) indicate positions that were considered to have equivalent representative noise climates on-site under normal circumstances. Positions were adjusted during the survey in reaction to on-site circumstances.

Existing ambient (L_{eq}) and background (L_{90}) noise levels prevailing at these monitoring locations were representative of the immediate surrounding area, particularly in relation to existing sensitive premises that will overlook the proposed development.

At each position octave band and A-weighted fast response levels were recorded for a comprehensive suite of noise level metrics.

4.1.1 Daytime noise survey

The daytime noise survey was conducted by Dan Forbes AMIOA and Alex Taylor MIOA of BDP Acoustics between 14:30 hours and 23:45 hours on Wednesday 30th June 2021.

The instrumentation used for the survey was 1no. Rion NA28 SLM. The SLM was calibrated before and after the survey and no drifts in level were observed.

Weather conditions during the measurements were dry with low wind speeds (<2m/s) blowing west/south-west, temperatures varying around 19°C and cloud cover of approximately 40%.

4.1.2 Night-time noise survey

The night-time noise survey was conducted by Gavin Stevenson MIOA of BDP Acoustics between 02:00 hours and 03:05 hrs on Thursday 15th July 2021.

The instrumentation used for the survey was 1no. Bruel & Kjaer 2260 SLM. The SLM was calibrated before and after the survey and no drifts in level were observed.

Weather conditions during the measurements were dry with low wind speeds (<2m/s) blowing north-west, temperatures varying around 15°C and cloud cover of 0%.

Figure 2: Existing site plan indicating noise monitoring locations



4.2 Description of Noise Climate

A subjective description of the noise climate observed at the site is provided in the table below.

Table 3: Subjective description of noise climate during the survey

Position	Location and ambient noise climate description
1a & b (location representative of Machells Mill receptors)	Located outside the residential building to the north-west of the site, on the path of Whitehall Way. The ambient noise levels (L_{eq}) were generally controlled by activity from the road traffic noise along Whitehall Way and the A638 roads. The background noise levels (L_{90}) were controlled by general road traffic noise.
2a & b (location representative of Station Hotel receptors)	Located outside the Station Hotel pub on the path of Whitehall Way. The ambient noise levels (L_{eq}) were generally controlled by road traffic noise along Whitehall Way. The background noise levels (L_{90}) were controlled by general road traffic noise.
3a & b (location representative of 19 Foundry St receptors)	Located outside the Simply Mobile shop on the corner of Foundry Street and Corporation Street. The ambient noise levels (L_{eq}) were generally controlled by road traffic noise along Foundry Street and Corporation Street. During the daytime the background noise levels (L_{90}) were controlled by general road traffic noise. During the night-time the background noise levels (L_{90}) were generally controlled by mechanical plant noise from the back of the Pizza Gogo restaurant at Position 3a, and by general road traffic noise at Position 3b.

Other general noise contributions noted on-site at all positions included noise from daytime market activity, shoppers and passers-by, bird noise, and noise from the Town Hall bells.

4.3 Survey Results Summary

The following tables show a summary of the measured ambient and background noise levels.

Table 4: Summary of manned survey noise levels

Position	Start Time (hh:mm)	Period	L_{Aeq,5mins} Range (dB)	L_{AFmax,5mins} Range (dB)	L_{A90,5mins} Range (dB)	L_{A90,15min} Avg* (dB)
1a	14:44	2 x 5 min	60	70 - 77	55 - 56	56
1a	21:10	3 x 5 min	56 - 57	67 - 72	49 - 51	50
1a	22:14	3 x 5 min	55 - 56	66 - 72	46 - 50	48
1a	02:16	2 x 5 min	43 - 45	55 - 58	35 - 36	35
1b	15:45	2 x 5 min	61	76 - 77	55	55
2a	14:58	2 x 5 min	62	75 - 76	54	54
2a	15:58	2 x 5 min	61 - 64	75 - 83	54 - 55	55
2a	21:34	2 x 5 min	52 - 55	66 - 70	43 - 47	45
2a	22:33	3 x 5 min	51 - 60	65 - 78	41 - 45	43
2a	02:00	2 x 5 min	50 - 51	66 - 69	37 - 40	38
2b	21:29	1 x 5 min	53	70	46	46
3a	15:14	2 x 5 min	61 - 65	75 - 90	57	57
3a	16:11	2 x 5 min	60 - 62	71 - 73	55	55
3a	21:51	3 x 5 min	55 - 59	66 - 76	48 - 50	49
3a	22:53	1 x 5 min	56	72	46	46
3a	02:33	2 x 5 min	41 - 51	55 - 68	36 - 38	37
3b	22:56	3 x 5 min	59 - 63	74 - 85	43 - 45	44

* Arithmetic average of 5 min measurement periods

5. Entertainment noise break-out assessment

5.1 Indicative entertainment noise break-out limits

Indicative absolute noise limits at the façades of the identified noise sensitive receptors are provided below based on the example event schedule presented in section 1.2, the entertainment noise criteria proposed in 3.1, and the sample background noise levels measured on site during the evening periods (21:10 – 23:11 hrs). Note that the indicative absolute noise limits presented below are provided for guidance at this stage and do not represent definitive absolute noise limits due to the variable nature of the background noise levels over the course of a typical daytime/evening operating period.

Table 5: Indicative absolute entertainment noise limits for example event schedule based on the criteria presented in section 3.1

Event Frequency (Time period)	Music noise limit (MNL) at the façade of existing noise sensitive premises (refer to Figure 1)		
	Machells Mill	Station Hotel	19 Foundry St
Up to 12 days a year, not more than 3 consecutive days. (Up to 23:00 hrs)	The MNL should not exceed the following LAeq dB noise limit over a fifteen-minute period.		
	63 dB	58 dB	59 dB
More than once per week (Up to 23:00 hrs)	Entertainment noise should not exceed the following LAeq,1minute noise limit; and; The L10,1minute of the entertainment noise should not exceed the representative background noise level L90 (without entertainment noise) in each third octave band between 40Hz and 160Hz (refer to Table 6)		
	48 dB	43 dB	44 dB

Table 6: Indicative third octave band L10,1minute absolute entertainment noise limits (dB) at NSR facade for more than one event per week ending no later than 23:00

Third Octave Band Centre Frequency (Hz)	40	50	63	80	100	125	160
Machells Mill	46	50	48	47	46	47	43
The Station Hotel	43	45	44	42	42	40	39
19 Foundry St.	43	45	45	43	42	41	39

Note that the indicative limits presented in Table 5 and Table 6 are based on events finishing at 23:00hrs. Higher limits may be applicable if events finish earlier than 23:00hrs.

5.2 3D noise modelling

Noise break-out calculations and modelling utilising CadnaA 3D noise modelling software have been undertaken to evaluate the expected noise levels at the façades of the closest noise sensitive receptors due to entertainment noise break-out from the Market Hall building.

5.2.1 Building envelope sound insulation performance

The octave band sound insulation performance for the Market Hall building envelope elements have been estimated to inform the 3D noise model of the Market Hall. Table 7 summarises the sound insulation performance assumed for each of the building envelope elements, expressed using the single figure weighted sound reduction index (Rw + Ctr).

5.2.1.1 Non-glazed external walls

Non-glazed external walls are not expected to contribute significant levels of entertainment noise break-out compared to the glazed façade / roof elements and ventilation / door openings, and have therefore not been assigned as radiating area noise sources within the 3D noise model.

5.2.1.2 Ventilation openings

We understand that the Market Hall will be ventilated via a ducted extract fan and louvered air intake openings located on the Cloth Hall St. elevation as indicated by Figure 3 (combined louvre area of ~ 18 m²). For the purposes of this assessment, it has been assumed that the louvres are required to be fully open when entertainment events are taking place within the Market Hall, and consequently do not provide any significant sound insulation.

A suitably specified attenuator will be required to control entertainment noise break-out via the ducted extract fan outlet. The attenuation requirements for the extract fan should be reviewed in conjunction with the requirement to achieve the proposed external plant noise criteria detailed in section 6 of this report.

Figure 3: Cloth Hall St and Crackenedge Lane elevations with modelled ventilation louvres highlighted in green. glazed folding doors, sliding doors, openable shopfronts and manual doors in red, and lobbied/closed doors in yellow.

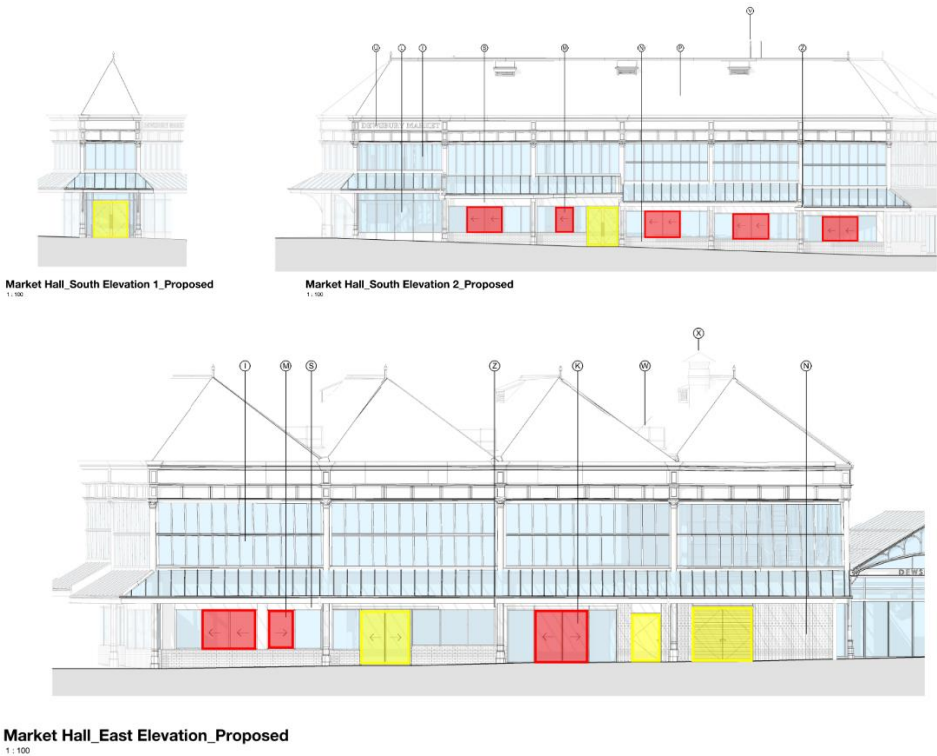


Table 7: Summary of Semi-covered Market building envelope estimated sound insulation performance, $R_w + C_{tr}$ (dB)

Building Element	Assumed build-up	$R_w + C_{tr}$ (dB)
Roof (slated)	Slates on battens underdrawn with timber boarding (no insulation), 90 mm overall depth	26
Rooflights	6 mm float glass	29

Building Element	Assumed build-up	$R_w + C_{tr}$ (dB)
New façade glazing	4 / 12 / 4 mm double glazing	27
Doors - glazed doorsets	4 / 12 / 4 mm double glazing	27
Bi-folding and sliding doors (Cloth Hall St and Crackenedge Lane)	Assumed to be fully open to full extent (0 dB attenuation) or fully closed with performance of 4 / 12 / 4 mm double glazing.	27

5.2.1.3 Noise break-out from the Semi-covered Market

For the purposes of this assessment, it has been assumed that noise break-through into the Semi-covered Market from the Market Hall will be limited by ensuring that the access between the two spaces is closed off along the yellow-coloured line in Figure 4 during events. Consequently, break-out of entertainment noise from the Semi-covered Market to the external noise sensitive receptors is expected to be negligible in comparison to noise break-out from the Market Hall and has therefore been excluded from this assessment.

5.2.1.4 Access to the Market Hall

When the folding/sliding doors, highlighted pink in Figure 4, are closed, ingress and egress to the Market Hall during entertainment events are expected to be provided via the doorsets highlighted green and red, where green denotes a lobbied doorset with only one doorset open at a time, and red denotes a standard manual single doorset.

To evaluate a worst-case scenario, doorsets have been modelled in their worst-case opening positions; the green-highlighted lobbied doorsets have been assumed to provide the sound insulation performance of a single doorset (representing a “one door open, one

door closed” scenario), while it has been assumed that the red-highlighted manual single doorset and pink-highlighted folding/sliding doors will remain open during an event. Blue-highlighted doors denote access-restricted doors, which are assumed to be closed at all times during events.

Figure 4: Assumed ingress and egress points to the Market Hall during events with lobbied doorsets highlighted in green, folding and sliding doorsets in pink, manual glazed doorset in red, and closed doorsets in blue.



5.3 Indoor event noise limits

5.3.1 Entertainment noise break-out predictions

The 3D noise modelling predictions of the entertainment noise break-out from the Market Hall have been used to calculate indicative internal entertainment noise limits within the Market Hall. Two scenarios have been evaluated for each set of example event schedule criteria as described below:

- **Closed scenario:** The folding doors on the Cloth Hall St elevation, sliding door on Crackenedge Lane elevation, and shopfronts on the Crackenedge Lane elevation remain closed, while access doorsets on the Cloth Hall St, Corporation St., and Crackenedge Lane elevations remain open as described in section 5.2.1.4 (combined open area approx. 16 m²). Louvered vent openings fully open (combined open area approx. 18 m²).
- **Open scenario:** The folding doors on the Cloth Hall St elevation, sliding door on Crackenedge Lane elevation, and shopfronts on the Crackenedge Lane elevation remain fully open, while access doorsets on the Cloth Hall St and Crackenedge Lane elevations remain open as described in Section 2 (combined open area approx. 55 m²). Louvered vent openings fully open (combined open area approx. 18 m²).

5.3.1.1 Indicative noise limits required for up to 12 events per year ending before 23:00 hrs

5.3.1.1.1 Closed scenario

In the closed scenario, as described above, it is expected that the proposed entertainment noise criteria for up to up to 12 event days per year could be achieved with an internal amplified entertainment event noise level of around 89 dBA.

The indicative limits above would allow for high levels of entertainment noise within the Market Hall, however the limits are below the lower end of the range of entertainment noise levels present at professional music concerts.

5.3.1.1.2 Open scenario

In the open scenario described above, it is expected that the proposed entertainment noise criteria for up to up to 12 event days per year could be achieved with a reduced internal amplified entertainment event noise level of around 85 dBA.

5.3.1.2 Indicative noise limits required for more than one event per week ending before 23:00 hrs

Table 8 summarises indicative internal entertainment noise limits within the Market Hall required to achieve the proposed noise criteria at the most affected noise sensitive receptor at 19 Foundry St for frequent entertainment events, i.e. more than one entertainment event taking place per week ending before 23:00 hrs.

A nominal 3 dB difference between the L₁₀ and L_{eq} has been allowed for at the lower frequencies in order to derive indicative limits for the 63 Hz and 125 Hz octave bands, however it should be noted that there is no fixed relationship between L₁₀ and the L_{eq} for entertainment noise sources and the actual difference between the two descriptors will depend on the type of entertainment taking place.

Table 8: Indicative provisional Market Hall indoor entertainment noise limits ($L_{eq,1minute}$, dB) for more than one event per week ending before 23:00 hrs, L_{eq} (dB)

Octave Band Centre Frequency (Hz)	63	125	250	500	1k	2k	4k	A
Closed scenario*	75	72	72	70	70	64	56	73
Open scenario*	72	78	68	65	65	59	52	69

* Internal entertainment noise limit at perimeter of Market Hall building envelope

The indicative noise limits for more than one event per week presented in Table 8 above are significantly lower than those that could be expected at professional concerts.

Note that the indicative noise limits above represent the worst-case scenario as they are based on the background noise levels measured during the quietest period of the example event schedule, i.e. 22:00 – 23:00 hrs.

Increased indoor entertainment noise levels within the Market Hall would be permissible when background noise levels around the site are higher, e.g. based on the sample background noise level measurements it is expected that an increase in the region of 6 dBA could be permissible for entertainment events ending before 22:00, and 11 dBA could be permissible during the daytime for entertainment events ending before 16:00 hrs.

5.3.1.3 Options for increasing internal entertainment noise levels

The dominant sources of entertainment noise break-out that are expected to limit the internal noise levels within the Market Hall are the access door openings and the fresh air intake louvres.

If required, it is expected that it would be possible to increase the internal entertainment noise level limit within the Market Hall by incorporating the following:

- Improving the sound insulation performance of the ventilation elements e.g. by incorporating attenuators/acoustic louvres to ventilation openings within the building envelope.
- Utilising lobbied doorsets to access the Market Hall and ensuring that all external doors and internal doors to the Market Hall remain closed other than for access (e.g. through the use of door supervisors and / or automatic door closers).
- Reducing the frequency of the regular entertainment events to allow higher external entertainment noise limits as per the criteria proposed in section 3, e.g. limiting the entertainment event schedule to not more than one event in a single week that ends by 23:00 hrs would allow for an increase of 5 dB above the indicative internal noise limits presented in Table 6.
- Consideration of the sound system speaker layouts and internal finishes to allow noise levels at the extremities of the internal areas of the development to be lower than the main audience areas.
- Consideration of the PA sound system speaker layouts and internal finishes to allow noise levels at the extremities of the internal areas of the development to be lower than the main audience areas.

5.4 Outdoor event noise limits

Table 9 presents a summary of the proposed noise limits for occasional outdoor events incorporating entertainment noise based on the noise criteria presented in The Noise Council: ‘Code of Practice on Environmental Noise Control at Concerts’.

3D noise modelling predictions of the entertainment noise propagation resulting from an indicative outdoor stage area and basic PA sound system arrangement incorporating loudspeakers either side of the stage as illustrated in Figure 5 are presented alongside the

proposed entertainment noise limits to estimate the entertainment noise levels that could be expected in the audience area at a distance of ~20m in front of the loudspeakers.

Table 9: Indicative entertainment noise limits for occasional outdoor event schedule based on the criteria presented in section 3

Event Frequency (Time period)	Music noise limit (MNL) at the façade of existing noise sensitive premises (refer to Figure 1)			Indicative L_{Aeq} in audience area*
	Machells Mill	Station Hotel	19 Foundry Street	
Up to 3 days a year (09:00 – 23:00 hrs)	The MNL should not exceed L_{Aeq} 75 dBA over a 15-minute period.			91 dBA
Up to 12 days a year, not more than 3 consecutive days. (09:00 – 23:00 hrs)	64 dBA	59 dBA	62 dBA	78 dBA
Up to 30 days a year, not more than once in a single week (09:00 – 23:00 hrs)	54 dBA	49 dBA	52 dBA	68 dBA
*Predicted indicative entertainment noise level in the audience area at approx. 20m from the loudspeakers.				

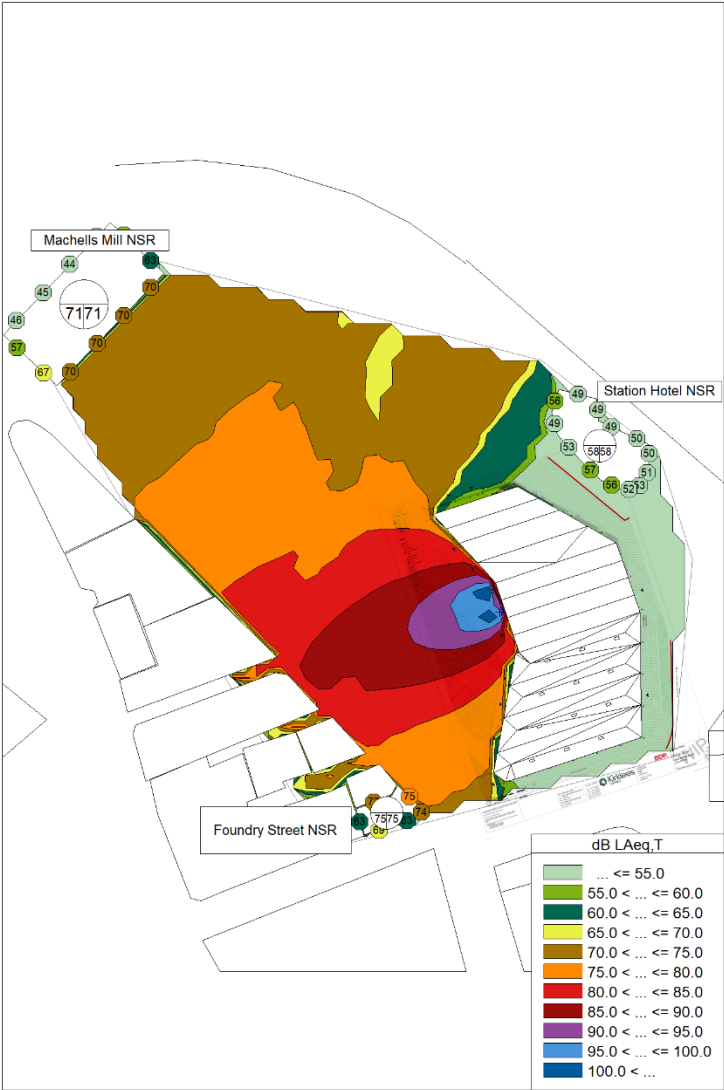
The proposed entertainment noise limits above would allow for high levels of entertainment noise within the centre of the assumed maximum audience area (i.e. approx. 20m in front of the PA system) for an outdoor event frequency of up to 3 events per year, however the audience predicted music noise level of 91 dBA is below the lower end of the range of entertainment noise levels present at professional music concerts.

The indicative audience entertainment noise levels predicted for more frequent events are significantly lower than those that could be expected at professional concerts. For context, the audience predicted music noise level of 78 dBA associated with an outdoor event frequency of up to 12 events per year is comparable with noise levels that would be expected in a busy bar/restaurant environment playing background music.

It is important to note that the 3D noise modelling predictions for outdoor entertainment events are based on a basic PA sound system arrangement incorporating simplified loudspeaker point sources either side of an assumed stage location. Whilst this modelling arrangement may be suitable for a small-scale outdoor event and for providing indicative entertainment noise level predictions, it is expected that larger scale entertainment events would require larger PA sound systems incorporating greater numbers of loudspeakers with defined dispersion characteristics. Detailed noise modelling based on the layout and dispersion characteristics of the proposed event PA sound system would therefore be required to provide a more accurate assessment of the entertainment noise levels that could be allowable in the main audience areas.

In the absence of identified stage/speaker locations, an assumption has been made for the location of the sources within the model. While the indicative limits given in Table 9 are correct for this modelled scenario, movement of the assumed speaker source positions and directivity can alter the resultant limits substantially. Once identified speaker locations are available, a further modelled scenario can be produced to gain updated indicative source limits. The lawned area located between the Market Hall and the Machells Mill NSR is understood to be a potential audience area and for the purposes of this assessment it has been assumed that speakers will not be located within this area.

Figure 5: Screenshot of CadnaA modelled entertainment noise propagation from indicative outdoor stage arrangement incorporating a basic PA system



6. Noise from building services plant

Note that the above plant noise limits relate to the cumulative noise level from all external plant associated with the Market re-development.

6.1 Proposed external plant noise emission limits

Based on the proposed plant noise external noise emission criteria presented in section 3.2 and the lowest measured sample 5 minute L_{A90} background noise levels, we recommend that the cumulative noise resulting from all external plant associated with the development under normal operating conditions is designed to achieve the indicative external noise emission limits presented in Table 10.

Appropriate building services equipment can be specified and sized at the appropriate design stage in order to ensure that these criteria is met.

Table 10: Indicative noise limits for external plant

Noise Sensitive Receiver (refer to Figure 1)	Applicable time period	Proposed Plant Noise BS4142:2014-A1:2019 rating level, dB *
Machells Mill	Daytime (07:00 to 23:00 hours)	46 dB
	Night-time (23:00 to 07:00 hours)	35 dB
Station Hotel	Daytime (07:00 to 23:00 hours)	41 dB
	Night-time (23:00 to 07:00 hours)	37 dB
19 Foundry St	Daytime (07:00 to 23:00 hours)	43 dB
	Night-time (23:00 to 07:00 hours)	36 dB

*Free-field equivalent noise level at 1 metre from the nearest noise sensitive [habitable] window of any identified residential premises (refer to Figure 1)

Appendix I – Glossary of Acoustic Terms

A-Weighting

Normal hearing covers the frequency range from about 20Hz to 20kHz, but sensitivity is greatest between about 500Hz and 8kHz. The 'A-Weighting' is an electronic filters network incorporated in sound level meters which approximately corresponds to the frequency response of the ear. The unit of measurement of A-weighted sound level is dBA.

Decibel, dB

This is the unit to measure sound. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro-Pascals to 100 Pascals). We therefore use a logarithmic scale to describe sound pressure level, intensities and sound power levels. Subjectively, an increase of 10 dB corresponds to a doubling in the perceived loudness of sound.

Equivalent Continuous Sound Level L_{eq} or L_{Aeq}

The continuous equivalent sound level, L_{Aeq} is a notional sound level. It is the sound level, which, if maintained for a given length of time, would produce the same acoustic energy as a fluctuating noise over the same time period. The A-weighted L_{eq} is widely used to measure any environmental noise which varies considerably with time and is denoted as the L_{Aeq} .

Octave and Third Octave Bands

The human ear is sensitive to sound over a range of approximately 20Hz to 20kHz, and is generally more sensitive to medium and high frequencies than to low frequencies. In order to define the frequency content of a noise, the spectrum is divided into frequency bands, and the sound pressure level is measured in each band. The most commonly used frequency bands are octave bands, in which the mid frequency of each band is twice that of the band below it. (For instance, the octave bands above and below the 500Hz octave band are 1kHz and 250Hz respectively). For finer analysis, each octave band may be split into three one-third octave bands or in some cases, fine frequency bands.

Statistical Level: L_{10}

Sound pressure level that is exceeded for 10% of the measurement time.

Statistical Level: L_{90}

Sound pressure level that is exceeded for 90% of the measurement time. Consequently, it is indicative of the general background noise level in the absence of any higher-level short duration events that occur during the period.