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KIRKLEES CULTURAL HEART

NOISE ASSESSMENT: FOOD HALL

IR430321-ARP-XX-XX-RP-YA-000004

ARUP

Issue date : 30.09.22

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Kirklees Council

Kirklees Cultural Heart

Noise assessment report – Food Hall

Reference: IR430321-ARP-XX-XX-RP-YA-000004

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1. Introduction

This report presents an assessment of potential noise impacts associated with the food hall that will form part of the Kirklees Cultural Heart development.

1.1 Description of the development

Application for 'Demolition of the existing Piazza shopping centre, part removal of elements of Queensgate Market, and demolition/retention of service tunnels; with redevelopment of the site to form new public realm space (including public park and gardens, play areas, public square/outdoor event space); refurbishment and change of use of existing Queensgate Market Hall into new food hall (Use Class E (b) Sale of food and drink for consumption, mostly, on the premises); refurbishment and extension of existing library and art gallery building to form a new museum (Use Class F.1); change of use of part existing market hall building and extension to form a new public library (Use Class F.1); construction of new indoor event venue incorporating multi-storey car park below (Sui-Generis); erection of new public gallery building (Class F.1); and associated infrastructure on land and buildings at Queensgate Market, Huddersfield Library and Art Gallery, and Piazza (and The Shambles) Shopping Centre, Huddersfield.'

1.2 Context

The food hall will be situated in Kirklees Cultural Heart, in the south-east corner of Huddersfield town centre. The site is bordered by the proposed museum to the north, Queensgate to the east, the proposed venue and car park and Ramsden Street to the west.

The food hall sits within the Cultural Heart development, which includes the renovation and construction of several other buildings/areas, namely the indoor venue space, museum, art gallery, outdoor venue space, library, and public realm spaces.

1.3 Operation

The food hall consists of numerous food stalls and a bar area. It is our understanding that the food hall will operate between 10:00 – 00:00 Monday to Saturday and 10:00 – 23:00 on Sundays. Plant equipment will be operational as required. Some music may be played in the food hall.

1.4 Noise sensitive receptors

The nearest noise sensitive receptors are:

- The Stay Hotel – a three storey hotel opposite located on Alfred Street
- Buxton House – an 11-storey residential tower block on Albion Street comprising 57 residences.

As the nearest receptors, these are considered representative of the worst case. Any other receptors that are further away will be exposed to lower noise levels than those listed here and so will experience a lesser impact.

1.5 Planning conditions

Noise criteria for planning permission, as advised by Kirklees Council, is as follows:

- Plant noise from the food hall will not exceed 5dB below background noise level at the nearest noise sensitive receivers.
- The envelope of the food hall will be designed to ensure noise breaking into Buxton House residences and the Stay Hotel will not exceed the indoor ambient noise level criteria given in BS:8233.

2. Criteria

2.1 Plant noise

Kirklees Council's requirements state that the rating noise level needs to be at least 5dB lower than the background noise level at the nearest noise sensitive receivers.

2.2 Noise break-in to residential properties – BS8233

BS8233:2014 states that the noise level in dwellings does not exceed the levels stated in Table 1.

Location	07:00 – 23:00	23:00 – 07:00
Living room	35dB$L_{Aeq,16hr}$	-
Dining room / area	40dB$L_{Aeq,16hr}$	-
Bedroom	35dB$L_{Aeq,16hr}$	30dB$L_{Aeq,8hr}$

Table 1: BS8233 indoor ambient noise levels for dwellings

2.3 Noise break-in to hotel rooms – BS8233

BS8233:2014 states that the noise level in any hotel bedroom, with windows closed, from all external sources, including road, rail and air traffic and noise from activities outside the hotel and any adjacent premises, are to be within the range of average noise levels given in Table 2.

Period	Noise level
Daytime (07:00 – 23:00 hrs)	30 - 40 dB $L_{Aeq,1hour}$
Night-time (23:00 – 07:00 hrs)	25 - 35 dB $L_{Aeq,1hour}$

Table 2: BS8233 ambient noise level criteria for hotel rooms

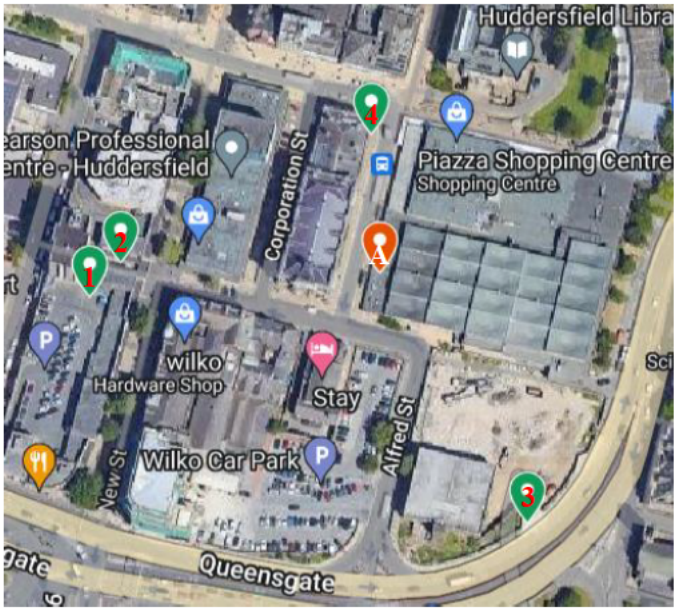
3. Baseline noise survey results

3.1 Introduction

An environmental baseline noise survey has been undertaken to determine the existing noise climate and character in and around the site. Attended measurements were made at four locations in the city, and one unattended logger was placed on the market hall rooftop.

The noise survey was carried out by Marios Filippoupolitis and Holly Cowperthwaite of Arup, with attended measurements taken on 5 May 2022 and unattended measurements taken between 5 May and 6 May 2022.

A full noise survey report is included in Appendix B. The measurement locations are shown in Figure 1.



1 – Buxton House

2 – Buxton House 1st floor car park

3 – Queensgate

4 – Peel Street

A – Market roof

Figure 1: Noise survey locations, four attended measurement points (green), one unattended measurement point (orange)

3.2 Buxton House background noise level

Evaluation of the measured L_{A90} data at the measurement position, and data from the unattended logger results, give typical background noise levels summarised in Table 3.

Period	Noise level
Daytime (07:00 – 23:00 hrs)	42 dB L_{A90}
Night-time (23:00 – 07:00 hrs)	40 dB L_{A90}

Table 3: Typical background noise levels at Buxton House

4. Noise limits

4.1 Plant equipment

Kirklees Council require that the noise from mechanical services plant be designed to a level of 5dB below the typical measured background noise level during the proposed period of operation, as measured at the nearest noise sensitive receivers.

From the results of the noise survey, the required daytime rating noise level for the combined plant associated with the proposed development at Buxton House and the Stay Hotel are given in Table 4.

Period	Noise rating level
Daytime (07:00 – 23:00 hrs)	37 dB$L_{Ar,Tr}$
Night-time (23:00 – 07:00 hrs)	35 dB$L_{Ar,Tr}$

Table 4: Plant noise rating levels

4.2 Event noise

Noise limits for events held within the food hall will need to meet the noise limits at the nearest noise sensitive receivers given in Tables 1 and 2 of this report. The internal sound levels will need to be limited to ensure that limits are met. The allowable internal sound levels will be calculated once the design of the food hall has been finalised.

5. Compliance

The food hall's external envelope and ventilation systems will be designed to comply with the noise limits stated in this report.

Any music will be limited to meet external noise limits at the nearest noise sensitive receivers and the internal noise limit within the library, museum and gallery.

Noise modelling will be used to define 'in situ' sound insulation performances for each envelope component (e.g. section of wall and roof) and 'in service' sound insertion losses for the ventilation system attenuators to ensure compliance with the noise limits.

Based on the proposed patterns of usage of duties, the noise limits should be met using standard attenuation methods. Therefore, there will not be an impact on the nearest noise sensitive receptors.

Appendix A

Acoustic Terminology

Decibel (dB)

The ratio of sound pressures which we can hear is a ratio of 106:1 (one million: one). For convenience, therefore, a logarithmic measurement scale is used. The resulting parameter is called the 'sound pressure level' (Lp) and the associated measurement unit is the decibel (dB). As the decibel is a logarithmic ratio, the laws of logarithmic addition and subtraction apply.

dB(A)

The unit used to define a weighted sound pressure level, which correlates well with the subjective response to sound. The 'A' weighting follows the frequency response of the human ear, which is less sensitive to low and very high frequencies than it is to those in the range 500Hz to 4kHz.

In some statistical descriptors the 'A' weighting forms part of a subscript, such as LA10, LA90, and LAeq for the 'A' weighted equivalent continuous noise level.

Equivalent Continuous Sound Level

An index for assessment for overall noise exposure is the equivalent continuous sound level, Leq. This is a notional steady level which would, over a given period of time, deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating levels can be described in terms of a single figure level.

Frequency

Frequency is the rate of repetition of a sound wave. The subjective equivalent in music is pitch. The unit of frequency is the hertz (Hz), which is identical to cycles per second. A 1000Hz is often denoted as 1kHz, e.g. 2kHz = 2000Hz. Human hearing ranges approximately from 20Hz to 20kHz. For design purposes the octave bands between 63Hz to 8kHz are generally used. 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 more detailed analysis, each octave band may be split into three one-third octave bands or in some cases, narrow frequency bands

Maximum Noise Level

The maximum noise level identified during a measurement period. Experimental data has shown that the human ear does not generally register the full loudness of transient sound events of less than 125ms duration and fast time weighting (F) has an exponential time constant of 125ms which reflects the ear's response. Slow time weighting (S) has an exponential time constant of 1s and is used to allow more accurate estimation of the average sound level on a visual display.

Appendix B

Baseline noise survey

B.1 Introduction

An environmental baseline noise survey has been undertaken to determine the existing noise climate and character in and around the site. This appendix details the baseline noise survey and results.

The noise survey was carried out by Marios Filippoupolitis and Holly Cowperthwaite of Arup, with attended measurements taken on 5 May 2022 and unattended measurements taken between 5 May and 6 May 2022.

B.1.1 Site Description

The site comprises of the cultural quarter of Huddersfield, to the south of the city centre. Attended measurements were made at four locations in the city, and one unattended logger was placed on the market hall rooftop. The attended measurement positions were representative of the closest noise sensitive receivers, and proposed indoor venue façade, to establish current baseline noise levels.

Figure 2: Attended locations (green) and unattended location (red)

B.1.2 Instrumentation

The sound level meters (SLMs), microphones and sound pressure level calibrators used by Arup are Class 1 instruments, conforming to BS EN 61672-1:2013. All Arup instrumentation is calibrated annually and has full traceable calibration to national and international standards, which are undertaken by an accredited calibration laboratory. Calibration certificates can be provided upon request.

The SLMs were checked for correct calibration before and after each series of measurements. No significant fluctuation in level was noted throughout each survey period.

All of the SLMs and other related noise monitoring instrumentation used to undertake the survey is described in Table A1 below.

Description	Serial Number	Item Type
Nor 1251	33555	Calibrator
Nor 140	1405203	Sound level meter
Norsonic 1209 Preamp	15390	Microphone
Norsonic 1225	151246	Microphone
RION NL-52	00120480	Sound level meter
RION NH-25 Preamplifier	10479	Microphone
Microphone RION UC-59	03152	Microphone
Calibrator RION NC-74	35015346	Calibrator

Table 5: Measurement instrumentation

B.1.3 Measurement Methodology

At each location, the L_{Aeq}, L_{A90}, L_{A10} and L_{Amax} metric parameters were measured and recorded. All broadband measurements were A-weighted, Lmax used a fast time constant, with Lps were taken every second.

At each measurement location, the SLM was mounted on a tripod with the microphone set between 1.2m to 1.5m above local ground level. All measurements were taken under acoustically free-field conditions, except where otherwise stated. The appropriate windshield for the SLM was fitted to the microphone throughout to minimise wind-induced noise.

Attended measurements of 5 minutes duration were made at each location, dependent upon conditions at the measurement location. Unattended measurements of 5 minutes duration were made at each location. In each case, the time period was appropriate to provide a good representation of the typical noise climate at each measurement location.

B.2 Measurement Results

B.2.1 Attended Measurements

The summary tables for each measurement location provide an arithmetic average of the individual measurements during each time period for L_{A90} and L_{A10}, a logarithmic average for L_{Aeq} and a range of the values for L_{Amax}.

B.2.2 Location 1 – Buxton House (New Street)

Location Description:
Buxton House ground level, near the retail units on New Street, with Albion Street to the rear

Measurement Duration:
Thursday 05/05/2022 15:10
to
Thursday 05/05/2022 16:10

Weather Conditions:
Wind Speed: <<5m/s
Summary: Humid and overcast. No rain, very still. 13 degrees

Personnel:
Marios Filippoupolitis and Holly Cowperthwaite

Additional Comments:
The buzzer from the pedestrian entrance to the apartments was heard as residents entered and exited.

Environment and Observations:
Quiet pedestrianised street, dominant noise source was patrons of the retail area. Infrequent traffic on Peel/Princess/Albion Streets & Queensgate audible.

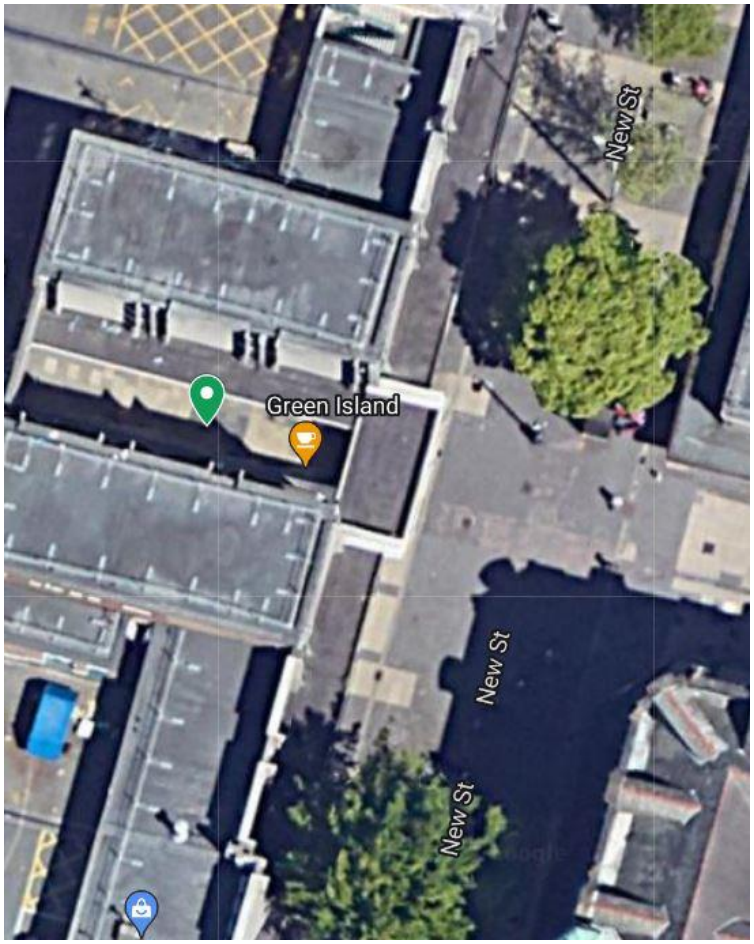


Figure B3: Location 1: Buxton House (New Street)

Date	Time		Sound Pressure Level, dB(A) (re 20 µPa)				Comments
	Start [hh:mm]	Duration [hh:mm:ss]	L_{90}	L_{eq}	L_{10}	L_{max}	
Day							
05/05/2022	15:10	00:05:00	49.7	53.2	55.3	65.6	
05/05/2022	15:16	00:05:00	51	55	57.2	69.6	Siren at 15:20
05/05/2022	15:21	00:05:00	49.5	52.6	54.3	67.8	Argument/ shouting
05/05/2022	15:55	00:05:00	51.4	54.7	56.8	66	
05/05/2022	16:00	00:05:00	52.7	58	60.9	71.9	
05/05/2022	16:05	00:05:00	51	55.5	58.2	71.7	

Table B6: Measured sound pressure levels at Location 1 – Buxton House (New Street)

B.2.2.1 Location 2 – Buxton House first floor (car park)

Location Description:
Buxton House first floor level, Albion Street rooftop car park

Measurement Duration:
Thursday 05/05/2022 15:35
to
Thursday 05/05/2022 20:00

Weather Conditions:
Wind Speed: <<5m/s
Summary: Humid and overcast. No rain, very still. 13 degrees

Personnel:
Marios Filippoupolitis and Holly Cowperthwaite

Additional Comments:
The buzzer & door slamming from the pedestrian entrance to the apartments was heard as residents entered and exited. The car park had a 1.5m high parapet screening the traffic noise

Environment and Observations:
Road traffic noise from Queensgate constant and dominant. Occasional passbys from carpark users. Sirens from adjacent police station occurred infrequently.

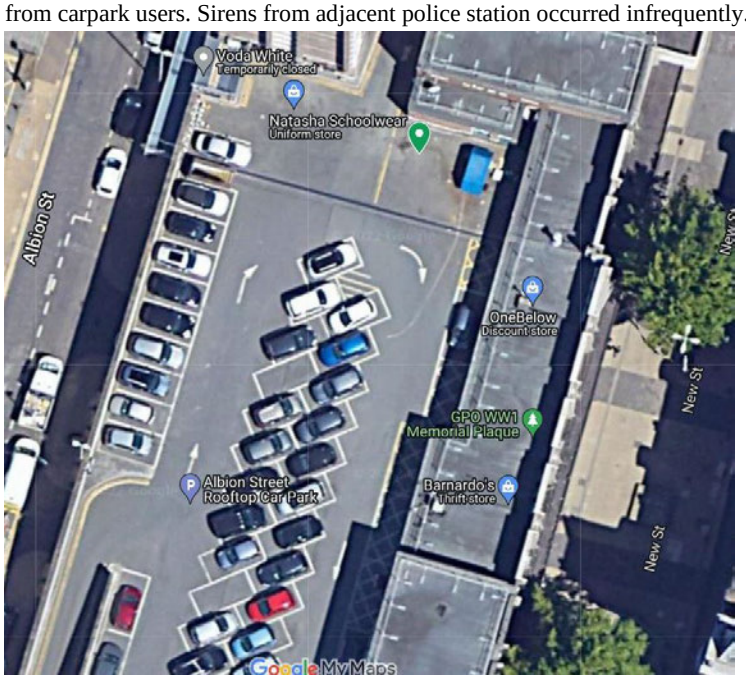


Figure B4: Location 2: Buxton House first floor (car park)

Date	Time		Sound Pressure Level, dB(A) (re 20 µPa)				Comments
	Start [hh:mm]	Duration [hh:mm:ss]	L_{90}	L_{eq}	L_{10}	L_{max}	
Day							
05/05/2022	15:35	00:05:00	48.7	54.5	58	65.3	Siren, talking
05/05/2022	15:40	00:05:00	48	52.2	54.4	62.7	
05/05/2022	15:45	00:05:00	49.6	52.2	53.9	62.8	Motorbike, car horn
05/05/2022	16:15	00:05:00	50.3	53.2	54.8	68.1	Alarm, aeroplane
05/05/2022	16:20	00:05:00	50	52.7	54.2	59.9	
05/05/2022	16:25	00:05:00	48.6	52.7	54.7	64.3	Door slams
Evening							
05/05/2022	19:10	00:05:00	46.4	51.1	54.1	60.7	
05/05/2022	19:15	00:05:00	46.6	51.6	53.6	71.4	Siren from police stn
05/05/2022	19:20	00:05:00	47.9	52.4	53.8	72.1	Resident exits appts
05/05/2022	19:50	00:05:00	45.2	50.4	53.4	59.1	
05/05/2022	19:55	00:05:00	44.7	50.3	52.9	59.7	
05/05/2022	20:00	00:05:00	45.6	51	53.5	65.2	

Table B7: Measured sound pressure levels at Location 2 – Buxton House first floor

B.2.2.2 Location 3 - Queensgate

Location Description:
Queensgate, near the southern site boundary

Measurement Duration:
Thursday 05/05/2022 16:55
to
Thursday 05/05/2022 17:55

Weather Conditions:
Wind Speed: <<5m/s
Summary: Humid and overcast. No rain, very still. 13 degrees

Personnel:
Marios Filippoupolitis and Holly Cowperthwaite

Additional Comments:
2 meters from the edge of the pavement.

Environment and Observations:
Traffic noise very dominant. Maximum levels come from car horns, lorries and motorbikes.

Figure B5: Location 3: Queensgate

Date	Time		Sound Pressure Level, dB(A) (re 20 µPa)				Comments
	Start [hh:mm]	Duration [hh:mm:ss]	L_{90}	L_{eq}	L_{10}	L_{max}	
Day							
05/05/2022	16:55	00:05:00	62.8	75.1	79.2	85.8	
05/05/2022	17:00	00:05:00	63.2	75.1	79.2	82.3	
05/05/2022	17:05	00:05:00	63.2	75.4	79.3	82.9	
05/05/2022	17:45	00:05:00	60.4	74.7	79.2	82.9	
05/05/2022	17:50	00:05:00	61.3	74.2	78.5	85.6	
05/05/2022	17:55	00:05:00	57.5	73.9	78.5	83.9	

Table B8: Measured sound pressure levels at Location 3 – Queensgate

B.2.2.3 Location 4 – Peel Street

Location Description:
Adjacent to the Town hall on Peel Street, opposite the market hall and logger (unattended measurements)

Measurement Duration:
Thursday 05/05/2022 17:20
to
Thursday 05/05/2022 19:45

Weather Conditions:
Wind Speed: <<5m/s
Summary: Humid and overcast. No rain, very still. 13 degrees

Personnel:
Marios Filippoupolitis and Holly Cowperthwaite

Additional Comments:
Piazza speakers play music over the square until 17:30, plant extract from Town hall loud.

Environment and Observations:
Very busy bus route through the town. Piazza retail area and library very well used/ busy until 6pm and then sharp decline in pedestrian traffic. Traffic/ buses on peel street dominant, traffic from Queensgate audible. Plant extract from Town hall at street level constant and loud.

Figure B6: Location 4: Peel Street

Date	Time		Sound Pressure Level, dB(A) (re 20 µPa)				Comments
	Start [hh:mm]	Duration [hh:mm:ss]	L_{90}	L_{eq}	L_{10}	L_{max}	
Day							
05/05/2022	17:20	00:05:00	51.2	63.2	64	80.6	
05/05/2022	17:25	00:05:00	52.7	69.3	71.8	85.7	
05/05/2022	17:30	00:05:00	51.5	65	67.2	81.6	Piazza music finishes
05/05/2022	18:45	00:05:00	49.2	67.7	65.3	87	Car parked on corner
05/05/2022	18:50	00:05:00	49	59	58.6	78.7	Chatting at bus stop
05/05/2022	18:55	00:05:00	49.3	55.4	58.4	69.1	
05/05/2022	19:30	00:05:00	49.4	55	55.1	72.5	
05/05/2022	19:35	00:05:00	49.3	57	55.6	75.1	Car drives away
05/05/2022	19:45	00:05:00	49.8	64.3	59.3	81.7	Luggage wheels

Table B9: Measured sound pressure levels at Location 4 – Peel Street

B.2.3 Unattended

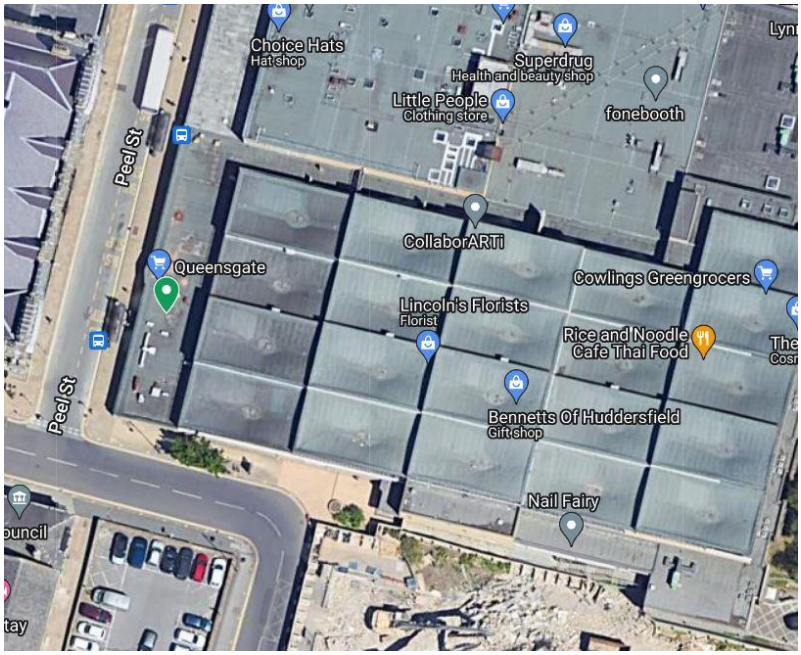
B.2.3.1 Market hall roof (Peel Street)

Location Description:
On top of markets roof, Peel Street

Measurement Duration:
Thursday 05/05/2022 14:30
to
Friday 06/05/2022 09:37

Logging Interval:
00:05:00

Weather Conditions:
Humid, dry



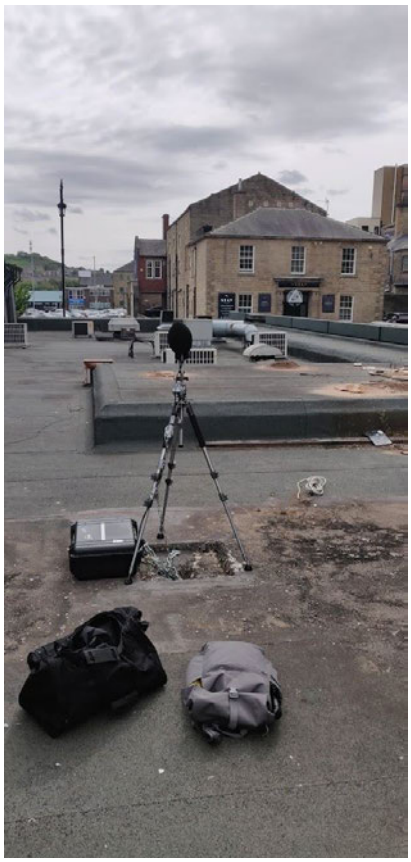


Figure B7: Market hall roof logger position

Figure B10: Time history for unattended measurement at Market hall roof