

Sheffield City Council Capital Delivery Service

Stocksbridge Towns Fund Community Hub

Noise Assessment Report

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P01 | 13 December 2023

This report takes into account the particular instructions and requirements of our client. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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Ove Arup & Partners Limited

Admiral House Rose Wharf

78 East Street

Leeds

LS9 8EE

United Kingdom

arup.com

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	Prepared by	Checked by	Approved by
Name	Josh Heenan	Lee Kirby	David Hiller
Signature	[Redacted]		

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1. Introduction

This report presents an assessment of potential noise impacts associated with the proposed development of the Stocksbridge Towns Fund Community Hub.

A noise survey has been conducted to determine the existing noise levels around the building during both daytime and at night.

The results from the noise survey have been used to establish plant noise limits for new plant to protect nearby noise sensitive receptors.

The following information is presented in the appendices to this report:

A glossary of acoustic terminology in Appendix A;

The baseline noise survey results in Appendix B.

1.1 Site Description and Context

Stocksbridge Library was built in 1968 and has undergone several refurbishments over the course of its lifetime. It is a key location for the town and still has frequent visitors.

The site is located in Stocksbridge and is surrounded by commercial and residential buildings beyond the immediate site boundary. It is bounded by Manchester Road to the north, which features commercial and residential buildings, and The Friendship Hotel. To the south is Button Row which features residential buildings situated across the road. To the east is a pharmacy and additional commercial buildings. To the west is St Luke's charity shop.

The Stocksbridge Towns Fund Community Hub will require demolition of the existing library and community spaces, as well as the neighbouring St Luke's accommodation. The new four storey building (excluding the upper roof) will house a mixture of tenanted spaces including the new library, commercial office space, a café with outdoor seating area and an area on the second floor for commercial use.

Figure 1 shows the proposed site boundary.

1.2 Operation

The Stocksbridge Towns Community Hub is proposed to operate during the day and evening. Mechanical heating systems are proposed to be in place to heat the building including during night-time hours.

1.3 Proposals

The main sources of building services sound emissions would be:

Air handling units

Variable Refrigerant Flow units

Condenser units

1.4 Noise sensitive receptors

The nearest noise sensitive receptors to the proposed development are:

Residential receptors on Button Row and Manchester Road

The Friendship Hotel on Manchester Road.

Assessment of impacts at these nearest receptors will be representative of the worst case. Any other receptors that are further away will be exposed to lower sound levels.



Figure 1 Proposed site boundary

2. Criteria

2.1 Plant noise

Plant noise will be limited to 5dB below the typically lowest background noise level at the nearest sensitive receivers as per guidance in the Sheffield Unitary Development plan and experience from previous projects within Sheffield.

3. Existing sound environment

3.1 Baseline sound survey

An environmental baseline sound level survey has been undertaken to determine the existing climate and character in and around the site. Attended measurements were made at two locations around the site and one unattended logger was placed on the roof of St Luke's Charity shop.

The survey was carried out by Katie Salter, Owain Squire, and Josh Heenan of Arup, with attended measurements taken on 21/09/2023, 27/09/2023 and 11/10/2023. Unattended measurements were taken between 11/10/2023 and 19/10/2023.

A full survey report is included in Appendix B. The measurement locations are shown in Figure 2.



Figure 2 Measurement locations shown as circles (black circles show attended short-term measurement locations and the white circle shows unattended long-term measurement location); nearest noise sensitive receptors highlighted in blue; existing library highlighted in yellow.

3.2 Results

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} .

3.3 Existing sound levels

Table 1 presents a summary of the range of measured background (L_{A90}) sound levels at each location.

Evaluation of the measured L_{A90} data at the attended measurement positions, and data from the unattended logger results, gives the typical lowest background sound levels summarised in Table 2. A full survey report is included in Appendix B.

Night-time emission limits at the site boundary and residential receptors to the north and south of the site have been assessed using data from location L1.

Measurement location	Sound pressure level range, $dBL_{A90,5 \text{ mins}}$		Representative noise sensitive receptor
	Daytime (07:00-23:00)	Night-time (23:00-07:00)	
1	43-49	-	Residential receptors on Button Row
2	54-60	-	Residential receptors and The Friendship Hotel on Manchester Road
L1	36-59	34-42	Residential receptors on Button Row, Manchester Road and The Friendship Hotel.

Table 1 Summary of measured sound levels.

Table 2 [Table 2](#) presents the typical lowest background levels, based on the time history data measured at L1 and analysed using the approach described in BS4142:2014+A1:2019 Section 8.

Receptor location	Assumed typical lowest background noise level, $dBL_{A90,5 \text{ mins}}$	
	Day (07:00-23:00)	Night (23:00-07:00)
Residential receptors on Button Row	40	37
Residential receptors on Manchester Road and Friendship Hotel	40	37

Table 2 Summary of assumed typical lowest background noise Levels, $dBL_{A90, 5 \text{ mins}}$

4. Limits for plant equipment

From the results of the baseline sound survey, the required daytime rating levels for the combined plant emissions, at each noise sensitive receptor, are displayed in Table 3. These are being used in the design of the building.

Receptor location	Rating level limit, $dBL_{A_r,Tr}$	
	Day (07:00-23:00)	Night (23:00-07:00)
Residential receptors on Button Row	35	32
Residential receptors on Manchester Road and Friendship Hotel	35	32

Table 3 Plant rating levels

5. Compliance

Calculations will be undertaken to assess noise impacts from proposed plant at the identified nearest noise sensitive receptors.

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

Calculations 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.

Appendix A

Acoustic Terminology

Decibel (dB)

The ratio of sound pressures which we can hear is a ratio of $10^6:1$ (one million: one). For convenience, therefore, a logarithmic measurement scale is used. The resulting parameter is called the 'sound pressure level' (L_p) 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 L_{A10} , L_{A90} , and L_{Aeq} 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, L_{eq} . 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 sound survey

B.1 Introduction

An environmental baseline sound survey was undertaken to determine the existing climate and character in and around the site. Attended measurements were made at two locations around the site and one unattended logger was placed on the roof of St Luke's Charity shop.

The survey was carried out by Katie Salter, Owain Squire, and Josh Heenan of Arup, with attended measurements taken on 21/09/2023, 27/09/2023 and 11/10/2023. Unattended measurements were taken between 11/10/2023 and 19/10/2023.

B.1.1 Site Description

The site is located in Stocksbridge and is surrounded by commercial and residential buildings beyond the immediate site boundary. It is bounded by Manchester Road to the north, which features commercial and residential buildings, and The Friendship Hotel. To the south is Button Row which features residential buildings situated across the road. To the east is a pharmacy and additional commercial buildings. To the west is St Luke's charity shop.



Figure B2.1 Image of site location with current library highlighted in yellow and the nearest noise sensitive receptors highlighted in blue. Measurement locations shown as circles (black circles show attended short-term measurement locations and the white circle shows unattended long-term measurement location).

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 SLM was 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 B2. 1 and Table B2. 2 below.

Date	Equipment description	Manufacturer	Model number	Serial number
	Sound level analyser	Norsonic	140	1403429
	Microphone	Norsonic	1225	98521
	Calibrator	Rion	NC-74	35173564
	Preamplifier	Norsonic	1209	12625

Table B2. 1 Equipment used for unattended measurements.

Date	Equipment description	Manufacturer	Model number	Serial number
11 th Oct -19 th Oct Rion NL-32 Kit F	Sound level analyser	Rion	NL-32	00493038
	Microphone	Rion	UC-53A	315944
	Calibrator	Rion	NC-74	35173566
	Preamplifier	Rion	NH-21	29980

Table B2. 2 Equipment used for unattended measurements.

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 and used a fast time constant (0.125s).

At each attended 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.

Attended measurements of 5 minutes duration were made at location, dependent upon conditions at the measurement location. Unattended measurements of 5 minutes duration were made at the logger location. In each case, the time period was appropriate to provide a good representation of the typical noise climate at each measurement location. The appropriate windshield for the SLM was fitted to the microphone throughout to minimise wind-induced noise.

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.2.1.1 Location 1

Location description:

Measurements taken on Button Row at rear Library entrance. Residential homes bound the street on the opposing side.

Environment and Observations:

Manchester Road to the north and Johnstone Street to the west main noise sources. Idling cars and engines starting observed intermittently. Low vehicle usage on Button Row itself.

Measurement Duration:

Thursday 21/09/2023 13:20 to Thursday 21/09/2023 14:28

Wednesday 27/09/2023 13:08 to Wednesday 27/09/2023 13:27

Weather Conditions:

21/09/2023 Average Wind speed: 1.2 m/s

27/09/2023 Average Wind speed: 0.2 m/s

Personnel:

Josh Heenan, Owain Squire, Katie Salter

Additional Comments:

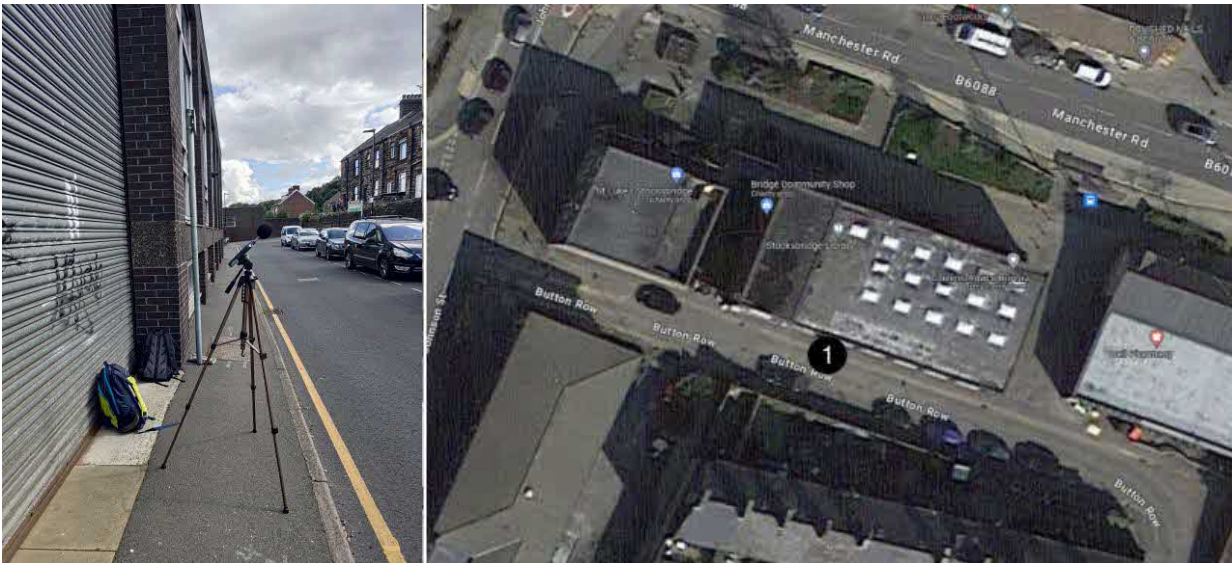


Figure B2. 2 Sound level meter at location 1

Date	Time		Sound Pressure Level, dB(A) (re 20 μ Pa)				Comments
	Start [hh:mm]	Duration [hh:mm:ss]	L ₉₀	L _{eq}	L ₁₀	L _{max}	
21/09/2023	13:20	00:05:00	38.4	46.2	49.1	61.8	Road traffic from Manchester Road and Johnstone Street dominant.
21/09/2023	13:27	00:05:00	38.9	54.1	68.5	51.1	As above

21/09/2023	13:32	00:05:00	38.0	47.4	47.3	66.5	As above, idling car engine approx. 30 seconds.
21/09/2023	14:18	00:05:00	40.1	55.7	56.6	80.9	As above, few cars pulling away from roadside parking.
21/09/2023	14:23	00:05:00	38.4	49.6	52.2	67.3	As above
21/09/2023	14:28	00:05:00	41.0	52.0	54.1	70.6	As above
27/09/2023	13:08	00:05:00	45.7	54.2	56.1	72.2	As above, car door slam and passing pedestrians.
27/09/2023	13:15	00:05:00	45.0	52.5	55.4	70.2	As above, idling car engine and door slam.
27/09/2023	13:27	00:05:00	44.1	57.3	60.7	72.9	As above, distant motorbike heard.
11/10/2023	12:37	00:05:00	47.8	56.6	60.0	73.1	Alarm in distance
11/10/2023	12:43	00:05:00	49.1	54.8	56.4	73.1	Car idling, library lift in use.
11/10/2023	12:50	00:05:00	47.6	57.5	56.7	77.2	As above

Table B2. 3 Measured sound pressure levels at Location 1

B.2.1.2 Location 2

Location description:

In front of Stocksbridge Library main entrance, bounded by Manchester Road to the north and the library to the south.

Environment and Observations:

Noise from Manchester Road is the dominant noise source, cars travelling along the road some occasional activity from bus and HGV vehicles.

Measurement Duration:

Thursday 21/09/2023 12:11 to Thursday 21/09/2023 13:51

Wednesday 27/09/2023 12:18 to Wednesday 27/09/2023 12:37

Weather Conditions:

21/09/2023 Average Wind speed: 0.7 m/s

27/09/2023 Average Wind speed: 1.2 m/s

Personnel:

Josh Heenan, Owain Squire, Katie Salter

Additional Comments:



Figure B2. 3 Sounds level meter at location 2.

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}	
21/09/2023	12:11	00:05:00	51.6	63.1	66.9	75.5	Manchester Road traffic dominant, busy street with mainly private cars, distant siren
21/09/2023	12:17	00:05:00	50.7	62.0	65.9	72.8	Road traffic dominates again, occasional beep from pedestrian crossing
21/09/2023	12:22	00:05:00	49.8	63.0	66.3	77.6	As above, one bus.
21/09/2023	13:40	00:05:00	50.9	63.5	67.0	77.3	Fewer cars than first three measurement, 3 buses passed, distant siren
21/09/2023	13:46	00:05:00	56.4	64.8	68.3	77.2	Increased traffic flow again, motorbike passed
21/09/2023	13:51	00:05:00	49.1	62.5	66.6	74.5	As previous, road traffic mainly cars
27/09/2023	12:18	00:05:00	58.1	68.3	72.2	81.7	Vehicle noise from Manchester Road the most dominant.
27/09/2023	12:24	00:05:00	56.6	67.5	71.5	79.2	As above.
27/09/2023	12:37	00:05:00	55.8	67.8	72.0	80.4	As above.
11/10/2023	11:58	00:05:00	59.1	68.4	71.9	80.0	Manchester Road noise dominant.
11/10/2023	12:03	00:05:00	57.1	69.0	72.9	81.1	As above
11/10/2023	12:09	00:05:00	58.0	68.3	71.9	81.0	As above

Table B2. 4 Measured sound pressure levels at Location 2

B.2.2 Unattended Measurements

B.2.2.1 Location L1

Location Description:

External measurement from neighbouring balcony above St Luke's charity shop. Positioned on Button Row side of the balcony.

Environment and Observations:

Main noise source is Manchester Road and Johnstone Street due to low levels of traffic on Button Row.

Measurement Duration:

Wednesday 11/10/2023 11:32 to Thursday 19/10/2023 15:32

Logging Interval:

00:05:00

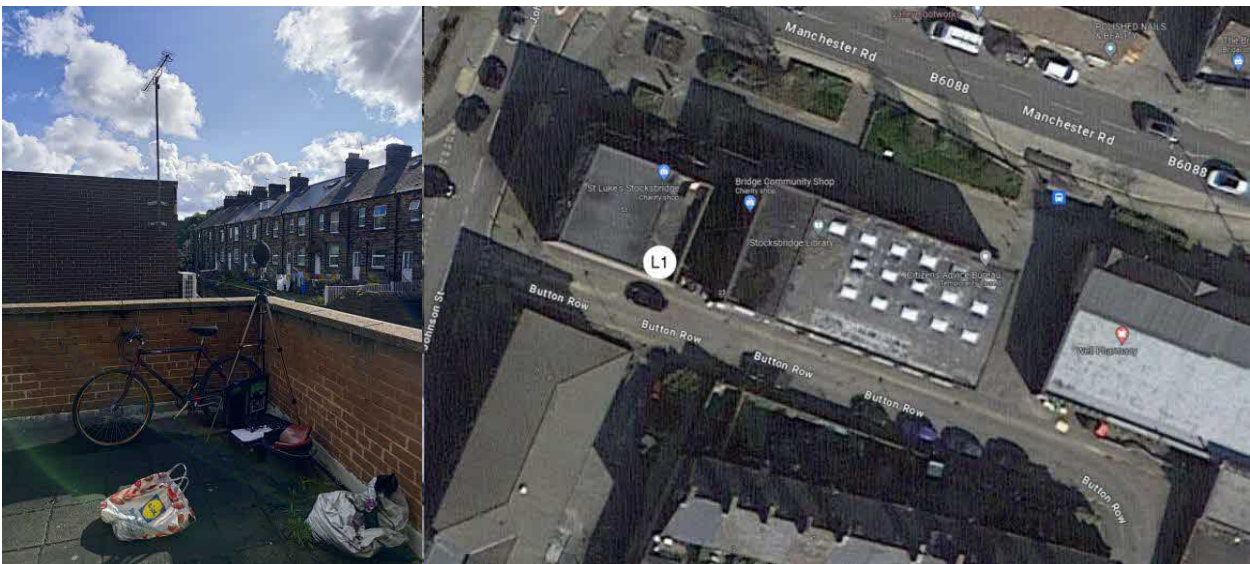


Figure B2. 4 Noise logger at location L1

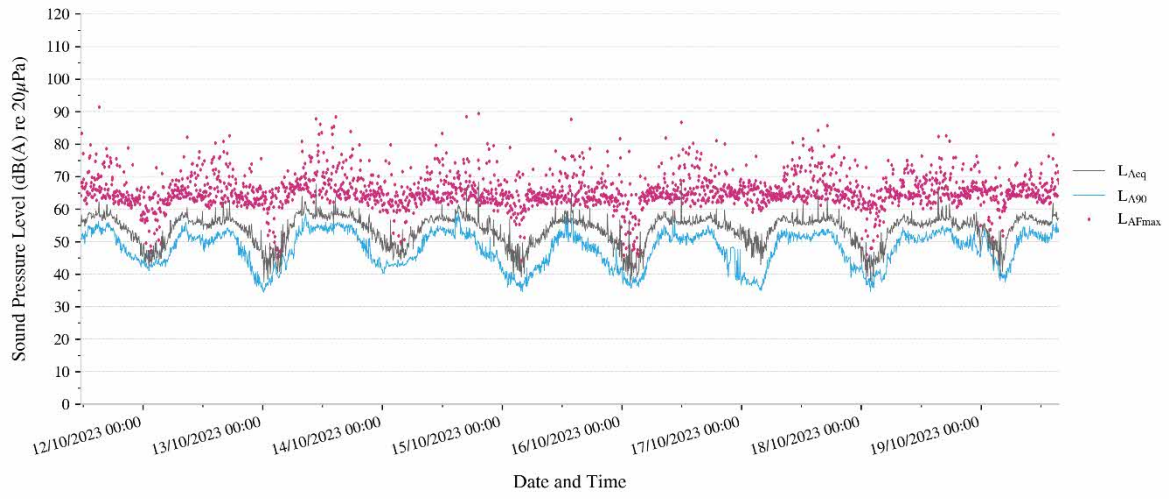


Figure B2. 5 Time History for the unattended measurements at location L1