

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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Electric Park, Pollard Street

Acoustic planning report

London, Manchester, Edinburgh, Birmingham, Belfast, Leeds

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Summary

Sandy Brown has been commissioned by General Projects Limited to provide acoustic advice in relation to the proposed Electric Park development at Pollard Street, Manchester. The applicants for the planning submission are AG GP Manchester Pollard B.V.

An environmental noise survey has been carried out to determine the existing sound levels in the area, and vibration levels from the Metrolink tram line that passes through the site. The daytime noise survey and vibration survey were carried out during 11 March 2020 and an additional night-time noise survey was carried out between 16 and 17 March 2020.

Manchester City Council require normally operating plant noise egress to be limited to be 5 dB below the background noise level at each receptor. Based on this and the background noise levels measured, limits have been set on this basis. The normally operating plant noise limits are presented in Table 1 below.

Table 1 Normally operating plant noise limits at 1 m from the nearest noise sensitive premises

Noise sensitive premises	Maximum sound pressure level at 1 m from noise sensitive premises, $L_{Aeq,15min}$ (dB)	
	Daytime (07:00-23:00)	Night-time (07:00-23:00)
Albion Works	51	42
Vulcan Mills	50	39
Milliners Wharf, the Hat Box, Chips, Bowlers Yard	50	43
Spindle Mews, One Vesta Street	51	41
Islington Wharf	52	41
Chapeltown street apartment building	56	44

The results of the noise survey will be used to inform the acoustic strategy as the design progresses.

Amplified sound egress limits have been set for the commercial areas with guidance given on initial internal noise levels.

Outline guidance on controlling noise egress from the multi-use games area is provided within the report.

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1 Introduction

Sandy Brown has been commissioned by General Projects Limited to provide acoustic advice in relation to the proposed Electric Park development at Pollard Street, Manchester. The applicants for the planning submission are AG GP Manchester Pollard B.V. This report sets out an update for the Phase 1 element (Buildings A, B and C). Sandy Brown report 20101-R02-D was included for the planning permission of the entire scheme.

Environmental noise surveys have been carried out to establish:

- Background sound levels around the site and by nearby noise sensitive premises
- Ambient and maximum noise levels at the site
- Vibration levels affecting the site.

The background sound levels measured during the survey are used as the basis for setting limits for noise emission from proposed building services plant. These limits are set in accordance with the requirements of the Manchester City Council.

Ambient and maximum noise levels will be used to develop a sound insulation strategy to control environmental noise ingress to the development.

This report provides details of the noise survey, including measurement results, and provides recommendations.

2 Site description

2.1 The site and its surroundings

The site proposal is shown in Figure 1 and the site location in relation to its surroundings is shown in Figure 2.

The scheme is divided into phases as set out below:

- Phase 1
 - Building A
 - Building B
 - Building C
- Phase 2
 - Building D
 - Building E.

This report presents an update for the Phase 1 element only. A full description of the site is included below.

Full Planning Permission for the erection of five office buildings and new public realm comprising: 3 no. eight storey mixed use buildings (Buildings A, D and E) comprising workspace (Use Class E) with flexible uses at ground floor (Use Class E); and / or Sui Generis (theatre /

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bar), with rooftop multi use amenity area proposed on Building A, and 2 no. five storey mixed use buildings (Buildings B and C) comprising workspace (Use Class E) with flexible uses at ground floor (Use Class E); and / or Sui Generis (bar / theatre); together with cycle parking, waste storage, back of house, rooftop plant and external amenity spaces, new public realm, highways' works, pedestrian and cycle routes, engineering and infrastructure works; and other associated works.



Figure 1 Site proposal – Phase 1 (Hawkins Brown drawing PLS-HBA-SW-00-DR-A-00-0110_Phasing Plan - Phase 1)



Figure 2 Aerial view of site (courtesy of Google Earth Pro)

2.2 Adjacent premises

The following premises are adjacent to the site as shown in Figure 2:

- Albion Works apartment building highlighted in green to the south of the site
- Vulcan Mills apartment building highlighted in red to the south of the site
- Milliners Wharf apartments, Chips apartments and the Hat Box highlighted in yellow to the northeast
- Spindle Mews and One Vesta Street residential premises highlighted in orange to the northwest of the site
- Islington Wharf apartment building highlighted in purple to the northwest of the site
- Chapeltown Street apartment building highlighted in light blue to the west of the site across Great Ancoats Street
- A planning application for Bowlers Yard, location highlighted in pink to the north east of the site, has been included.

2.3 Potential noise sources

The potential noise sources associated with the scheme can be broadly divided into the following categories:

- Building services plant
- Noise breakout from activities within the commercial units
- Activity noise egress associated with multi-use area
- External public realm areas.

The potential impact of these sources has been assessed and mitigation measures have been proposed to minimise impact on existing noise sensitive premises around the development.

3 Assessment criteria

3.1 Plant noise egress

3.1.1 *Standard guidance*

BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound* (BS 4142) provides a method for assessing noise from items such as building services plant against the existing background sound levels at the nearest noise sensitive premises.

BS 4142 suggests that if the noise level is 10 dB or more higher than the existing background sound level, it is likely to be an indication of a significant adverse impact. If the level is 5 dB above the existing background sound level, it is likely to be an indication of an adverse impact. If the level does not exceed the background level, it is an indication of having a low impact.

If the noise contains 'attention catching features' such as tones, bangs etc, a penalty, based on the type and impact of those features, is applied.

3.1.2 Local authority

Manchester City Council (MCC) provides guidance in relation to plant noise emissions in *Planning and Noise Technical Guidance* document dated December 2015 states the following in relation to plant noise egress:

‘Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5 dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location.’

3.2 Amplified sound egress

MCC typical stipulates the following in relation to amplified music associated with a new development,

‘Entertainment noise (L_{Aeq}) should be controlled to 10 dB below the background noise level (L_{A90}) without the entertainment noise present, in each octave band at the nearest noise sensitive location.’

3.3 Amplified sound transfer from commercial to rentable spaces

MCC requires an assessment of noise transfer through the building. If the upper levels of the development are to be offices/other rentable spaces (and not residential) there are no specific criteria. However, in relation to amplified sound transfer to residential premises MCC states the following:

‘Music noise levels in the 63Hz and 125Hz octave centre frequency bands (L_{eq}) should be controlled so as not to exceed (in habitable rooms) 47 dB and 41 dB (L_{eq}), respectively’.

To reduce the risk of disturbances to occupants of the offices/other rentable spaces, it is recommended that amplified sound transfer be controlled to be 10 dB below the ambient noise level within the offices, limited to the levels at the 63 Hz and 125 Hz octave centre frequency bands as described above.

3.4 Multi-use area noise egress

Sport England’s Design Guidance for artificial grass pitch provides guidance on mitigation for noise egress from sports pitches.

4 Survey method

4.1 Noise survey

Attended sample measurements were taken during the daytime by Kane Mitchell and Christian Clark at 12 locations around the site on 11 March 2020, and during the night by Jose M. Gonzalez and Christian Clark on 16 March 2020.

Night-time measurements were carried out between 16 and 17 March 2020 by Jose M. Gonzalez and Christian Clark.

These positions are indicated in Figure 2 as P1 to P12. The attended measurements at positions 'P1'-'P6' were carried out over 15 minute periods and the measurements at position 'P7'-'P12' were carried out over 5 minute periods.

The microphone was mounted on a tripod approximately 1.5 m above the ground level and at least 1 m from any other reflective surface. Details of the equipment used and the noise indices measured are provided in Appendix A. Dominant noise sources occurring during the measurements were noted.

4.2 Weather conditions

Weather conditions during the survey are described in Appendix A.

5 Measurement results

5.1 Observations

The dominant noise source occurring during the measurements were noted to be traffic noise from Great Ancoats Street and Pollard Street. Tram pass-bys were also regular but less significant than the road traffic. Less significant noise sources included construction noise, geese honks, bird song and passing pedestrians.

5.2 Noise measurement results

5.2.1 *Attended measurement results – daytime*

Daytime noise levels and key sources recorded during the attended measurements are summarised in Table 2. These measurements are considered to be free field.

For all measurement locations, there was frequently noise from passing trams as well as occasional distant noise from construction works taking place to the west of the site as well as constant traffic noise from Great Ancoats Street.

Table 2 Daytime noise levels and key noise sources from attended measurements

Position	Start time	Sound pressure levels (dB)			Noise sources
		L_{Aeq}	L_{A1}	L_{A90}	
1	15:35	70	81	55	Occasional vehicles along Pollard Street.
2	15:50	68	77	56	Occasional vehicles along Pollard Street.
3	15:10	70	77	61	Constant traffic noise from Great Ancoats Street.
4	14:50	60	64	57	Constant traffic noise from Great Ancoats Street.
5	15:30	61	69	56	Occasional vehicles along Pollard Street.
6	15:45	57	63	55	Constant traffic noise from Great Ancoats Street.
7	13:40	57	66	54	Occasional vehicles along Pollard Street. Pedestrian noise and loud geese.
7	13:45	56	62	53	
7	13:50	57	62	54	
8	14:00	61	72	54	Occasional vehicles along Pollard Street. Loud geese present. Max levels due to loud motorbike
8	14:05	60	68	55	
8	14:10	62	72	56	
9	14:15	59	67	56	Construction noise audible from the west.
9	14:20	58	63	56	
9	14:25	57	62	54	
10	15:15	57	64	52	Occasional vehicles along Pollard Street. Occasional passing pedestrians.
10	15:20	57	64	52	
10	15:25	61	72	54	

Position	Start time	Sound pressure levels (dB)			Noise sources
		L_{Aeq}	L_{A1}	L_{A90}	
11	15:00	62	75	55	Occasional vehicles along Pollard Street.
11	15:05	62	73	56	
11	15:10	62	73	56	
12	14:35	61	68	56	Occasional vehicles along Pollard Street. Max caused by loud motorbike.
12	14:40	62	67	57	
12	14:45	63	68	58	

5.2.2 Attended measurement results – Night-time

Night-time noise levels and key sources recorded during the attended measurements are summarised in Table 2. These measurements are considered to be free field. For all measurement locations, there was frequently noise from passing trams until 00:30. There was also constant traffic noise from Great Ancoats Street and occasional vehicles along Pollard Street.

Table 3 Night-time noise levels and key noise sources from attended measurements

Position	Start time	Sound pressure levels (dB)			Noise sources
		L_{Aeq}	L_{A1}	L_{A90}	
1	23:15	62	75	45	No other noise sources other than those previously mentioned
1	00:20	63	77	44	
2	23:45	62	73	48	No other noise sources other than those previously mentioned
2	00:40	59	72	47	
3	00:05	66	79	52	No other noise sources other than those previously mentioned
3	01:00	62	73	49	
4	23:45	54	63	48	Geese honking overhead
4	01:05	51	63	46	
5	23:30	52	67	47	No other noise sources other than those previously mentioned
5	00:45	50	58	46	

Position	Start time	Sound pressure levels (dB)			Noise sources
		L_{Aeq}	L_{A1}	L_{A90}	
6	23:10	52	61	49	No other noise sources other than those previously mentioned
6	00:25	51	57	48	
7	23:10	52	60	57	Announcement from tram platform and pedestrians disembarking.
7	23:15	50	56	46	
7	23:20	49	54	46	Distant loud geese.
7	00:25	49	56	45	
7	00:30	48	54	45	
7	00:35	48	53	45	
8	23:35	57	66	46	Distant ambulance siren.
8	23:40	59	73	48	
8	23:45	51	57	47	
8	00:40	52	64	47	
8	00:45	50	57	46	
8	00:50	50	54	46	No other noise sources other than those previously mentioned
9	23:55	58	66	50	
9	00:00	57	65	49	
9	00:05	58	63	51	
9	01:00	54	61	48	
9	01:05	54	64	47	
9	01:10	53	64	46	Distant plant noise.
10	23:10	52	62	45	
10	23:15	52	62	44	
10	23:20	49	57	45	
10	00:20	52	63	44	
10	00:25	53	62	44	
10	00:30	52	63	44	
11	00:00	59	72	46	

Position	Start time	Sound pressure levels (dB)			Noise sources
		L_{Aeq}	L_{A1}	L_{A90}	
11	00:05	52	63	45	No other noise sources other than those previously mentioned
11	00:10	55	67	46	
11	01:00	50	60	43	
11	01:05	48	58	43	
11	01:10	47	56	43	
12	23:45	56	65	48	No other noise sources other than those previously mentioned
12	23:50	55	62	48	
12	23:55	56	65	48	
12	00:35	53	63	46	
12	00:45	55	63	46	
12	00:50	52	59	46	

5.2.3 Background noise levels

Based on the daytime and night-time noise survey results, the representative background noise levels for the surrounding noise sensitive receptors are summarised in Table 4.

Table 4 Background noise levels for noise sensitive receptors

Noise sensitive premises	Representative background noise levels $L_{A90,15min}$ (dB)	
	Daytime (07:00-23:00)	Night-time (07:00-23:00)
Albion Works	56	47
Vulcan Mills	55	44
Milliners Wharf, the Hat Box, Chips, Bowlers Yard	55	48
Spindle Mews, One Vesta Street	56	46
Islington Wharf	57	46
Chapeltown street apartment building	61	49

6 Plant noise egress

6.1 Criteria

6.1.1 *Standard guidance*

BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound* (BS 4142) provides a method for assessing noise from items such as building services plant against the existing background sound levels at the nearest noise sensitive premises.

BS 4142 suggests that if the noise level is 10 dB or more higher than the existing background sound level, it is likely to be an indication of a significant adverse impact. If the level is 5 dB above the existing background sound level, it is likely to be an indication of an adverse impact. If the level does not exceed the background level, it is an indication of having a low impact.

If the noise contains 'attention catching features' such as tones, bangs etc, a penalty, based on the type and impact of those features, is applied.

6.1.2 *Local Authority criteria*

Manchester City Council (MCC) provides guidance in relation to plant noise emissions in *Planning and Noise Technical Guidance* document dated December 2015 states the following in relation to plant noise egress:

'Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5 dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location.'

6.2 Plant noise limits

6.2.1 Normally operating plant noise egress limits

Based on the above criteria and the background measurement results as per Table 4, the cumulative noise level from the operation of all new plant should not exceed the limits set out in Table 5.

The limits apply at 1 m from the worst affected windows of the nearest noise sensitive premises and are presented as facade levels.

Table 5 Normally operating plant noise limits at 1 m from the nearest noise sensitive premises

Noise sensitive premises	Maximum sound pressure level at 1 m from noise sensitive premises, $L_{Aeq,15min}$ (dB)	
	Daytime (07:00-23:00)	Night-time (07:00-23:00)
Albion Works	51	42
Vulcan Mills	50	39
Milliners Wharf, the Hat Box, Chips, Bowlers Yard	50	43
Spindle Mews, One Vesta Street	51	41
Islington Wharf	52	41
Chapeltown street apartment building	56	44

Corrections for attenuation catching characteristics will also need to be assessed in line with BS4142.

6.2.2 Emergency plant noise egress limits

For emergency plant items, Manchester City Council (MCC) typically allow for noise egress limits to be set at 10 dB above the typical background levels at the nearest noise sensitive premises. On the basis that this criterion is adopted, the emergency plant noise limits applicable at 1 m from the worst affected windows of the nearest noise sensitive are set out in Table 6.

Table 6 Emergency plant noise limits at 1 m from the nearest noise sensitive premises

Noise sensitive premises	Maximum sound pressure level at 1 m from noise sensitive premises, $L_{Aeq,15min}$ (dB)	
	Daytime (07:00-23:00)	Night-time (07:00-23:00)
Albion Works	66	57
Vulcan Mills	65	54
Milliners Wharf, the Hat Box, Chips, Bowlers Yard	65	58
Spindle Mews, One Vesta Street	66	56
Islington Wharf	67	56
Chapeltown street apartment building	71	59

6.3 Tenant and phasing plant noise limits

Tenant plant noise limits will be set as the design progresses. In addition, the allocation of plant noise limitations to the future phases of development will be considered as the design progresses. These shall be adhered to by the end occupiers of the scheme to ultimately ensure that the overall limits set in Table 5 are met.

6.4 Assessment

From current layouts received on 25 March 2022, there are plant rooms proposed to the ground floor of each of the buildings. It is understood that there is rooftop plant proposed to Buildings A, B and C such as AHUs, VRFs, emergency generators, heat pumps, toilet and smoke extract fans and other terminations. It is understood that Buildings B and C are to be naturally ventilated so will generally require less plant items than Building A. There is provision for a kitchen extract fan for Building B. There will also be tenant plant areas. It is noted that some plant will be installed as part of the tenant fit-out.

Careful consideration will be required in relation to noise breakout from proposed external plant at the rear of the building taking into account the close proximity of nearby noise sensitive premises. This will be assessed as the design progresses.

The following mitigation measures may need to be considered to control noise egress to meet with the external noise criteria:

- Double skinned AHUs
- In-duct attenuators to AHUs
- Low noise plant selections
- Solid screening/acoustic louvres/enclosures.

7 Operational noise egress

7.1 Multi-use area

A multi-use games area is proposed to the roof of building A. This area may be used for different games and outdoors events at times during the year.

The use of the multi-use games area for sports has the potential to cause noise disturbance to the residents of Islington Wharf.

Use of the multi-use area is limited to 9:00 to 21:00 Monday to Saturday and is further limited to 10:00 to 20:00 on Sundays to help reduce the risk of noise disturbance, as per planning condition 46.

Best practice mitigation measures shall be implemented to help reduce the noise egress levels as far as practically possible:

- The metal mesh fencing proposed around the multi-use game area should be installed with resilient fixings and should be well-damped to minimise rattling from ball impacts
- Fabric nets should be provided instead of chain metal nets to the basketball hoops
- Use of fabric netting to the inside of the metal fencing to prevent ball impacts on the fence
- Damped/heavy backing boards to basketball hoops to reduce drumming from ball impacts
- Use of a rubberised multi-use game area floor finish rather than hard finish such as timber/ tarmac/concrete etc
- Informing the users of the games area of the sensitivity to noise so that they can avoid excessively loud or disruptive activities
- Installing signage around the area asking users and spectators to keep noise to a minimum
- Avoiding whistles and/or shouting

Noise and vibration transfer from the multi-use area to the development itself will be considered and mitigated as the design progresses.

7.2 Amenity areas

It is noted that rooftop amenity area is proposed to Building B, however, no sports usage is proposed for this area.

No amplified music/sound on the roof terraces at any time (as stipulated within planning condition 43 and 46).

7.3 Amplified sound

7.3.1 *Limits for amplified sound egress*

The cumulative noise level resulting from any amplified sound egress from the commercial units at 1 m from the most affected windows of the nearest noise sensitive premises shall be controlled to ensure the limits are set out in Table 7 are met. The limits have been set to not exceed 10 dB below the existing representative background sound level in octave bands in line with the requirements of Manchester City Council.

Table 7 Octave band amplified sound limits, 1 m from the nearest noise sensitive premises

Noise sensitive premises	Time of day	Maximum sound pressure level at 1 m from noise sensitive premises, $L_{eq,15min}$ (dB)						
		Octave-band centre frequency (Hz)						
		63	125	250	500	1000	2000	4000
Albion Works	Day (07:00-23:00)	54	48	44	42	43	37	27
	Night (23:00-07:00)	46	43	36	33	34	28	20
Vulcan Mills	Day (07:00-23:00)	52	46	43	41	41	34	24
	Night (23:00-07:00)	42	37	32	31	31	23	12
Milliners Wharf, the Hat Box, Chips, Bowlers Yard	Day (07:00-23:00)	53	46	41	40	42	34	22
	Night (23:00-07:00)	43	39	36	36	35	27	16
Spindle Mews, One Vesta Street	Day (07:00-23:00)	55	48	44	41	43	36	26
	Night (23:00-07:00)	45	41	34	32	33	26	17
Islington Wharf	Day (07:00-23:00)	54	48	45	42	44	39	32
	Night (23:00-07:00)	42	39	35	32	33	27	19
Chapeltown street apartment building	Day (07:00-23:00)	59	54	50	46	47	41	35
	Night (23:00-07:00)	45	44	41	35	35	29	22

7.3.2 Amplified sound breakout from commercial units internally and to NSPs

Initial guidance on internal amplified sound limits in the commercial units are based on the following:

- The Manchester City Council requirements for entertainment noise outside of noise sensitive premises as set out in Table 7.
- The facade to commercial units will be provided with a facade sound insulation performance of R_w+C_{tr} 28 dB as a minimum (typically achieved with standard thermal double glazing 6/16/6)
- Minimising the risk of disturbance to the offices above based on a floor sound insulation performance of $D_{nT,w}$ 50 dB and be limited be no higher than L_{Aeq} 25 dB with low frequency limits of 47 dB and 41 dB at the 63 Hz and 125 Hz octave bands respectively.

The commercial units internally noise level should be limited to around L_{Aeq} 70 dB with low frequency limits of 75 dB and 70 dB at 63 Hz and 125 Hz during the day with more onerous low frequency limits of 64 dB at 63 Hz and 125 Hz during the night. The above would typically allow for background music only and would not be suitable for high music levels such as DJs/live bands. The limits will be reviewed and refined as the design progresses.

If retail tenants wish to have levels higher than the limits set out above, they will be required to carry out enhancement works to ensure the following:

- Noise egress to the nearby noise sensitive premises meet the limits set out in Table 7.
- The level of noise transfer to the rentable spaces above meet the internal ambient noise levels with limits of 47 dB at 63 Hz and 41 dB at 125 Hz.

Enhancements may include the following:

- Linings to the facade
- Sound insulating ceilings
- Boxing to common structure eg columns
- Treatment to common services
- Lobbied door arrangements
- Electronic limiters to PA systems.

8 Conclusion

An environmental noise and vibration survey has been carried out to determine the existing sound levels in the area and vibration levels from the Metrolink tram line that passes through the site.

The daytime noise survey and vibration survey were carried out during 11 March 2020 and an additional night-time noise survey was carried out between 16 and 17 March 2020.

Plant noise egress limits have been set for normally operating and emergency plant items in line with the requirements of Manchester City Council at each noise sensitive receptor.

The normally operating plant noise limits are presented in Table 8.

Table 8 Normally operating plant noise limits at 1 m from the nearest noise sensitive premises

Noise sensitive premises	Maximum sound pressure level at 1 m from noise sensitive premises, $L_{Aeq,15min}$ (dB)	
	Daytime (07:00-23:00)	Night-time (07:00-23:00)
Albion Works	51	42
Vulcan Mills	50	39
Milliners Wharf, the Hat Box, Chips, Bowlers Yard	50	43
Spindle Mews, One Vesta Street	51	41
Islington Wharf	52	41
Chapelton street apartment building	56	44

Amplified sound egress limits have been set for the commercial areas. Initial guidance on internal noise levels to the commercial units have been given which will be developed as the design progresses.

Guidance on controlling noise egress from the multi-use games area has been set out.

Appendix A

Survey details

Equipment

The noise measurements were taken using Rion NL-52 sound level meters, a Norsonic 118 sound level meter and a B&K 2250 sound level meter.

Calibration details for the equipment used during the survey are provided in Table A1.

Table A1 Equipment calibration data

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
Sound level meter	NL-52/00264531	Rion	25 Jun 20	TCRT18/1553
Microphone	UC-59/09678	Rion	25 Jun 20	TCRT18/1553
Pre-amp	NH-25/64656	Rion	25 Jun 20	TCRT18/1553
Calibrator	NC-74/34367630	Rion	25 Jun 20	TCRT18/1551
Sound level meter	NL-52/00242702	Rion	30 Jan 21	TCRT19/1091
Microphone	UC-59/06185	Rion	30 Jan 21	TCRT19/1091
Pre-amp	NH-25/32730	Rion	30 Jan 21	TCRT19/1091
Calibrator	CAL200/4499	Larson Davis	30 Jan 21	TCRT19/1090
Sound level meter	2250/3009283	Brüel & Kjær	12 Jun 20	UCRT18/1602
Microphone	4189/3005042	Brüel & Kjær	12 Jun 20	UCRT18/1602
Pre-amp	ZC0032/23792	Brüel & Kjær	12 Jun 20	UCRT18/1602
Calibrator	4231/3016124	Brüel & Kjær	12 Jun 20	UCRT18/1598
Sound level meter	Nor118/31754	Norsonic	14 Feb 21	UCRT19/1201
Microphone	40AF/62396	Gras	14 Feb 21	UCRT19/1200
Pre-amp	1206/30873	Norsonic	14 Feb 21	UCRT19/1200
Calibrator	1251/31322	Norsonic	14 Feb 21	UCRT19/1199

Calibration of the meters used for the measurements is traceable to national standards. Calibration certificates for the sound level meters used in this survey are available upon request.

Calibration checks were carried out on the meters and their measurement chains at the beginning and end of the survey. No significant calibration deviation occurred.

Noise indices

Noise indices recorded included the following:

- $L_{Aeq,T}$ The A-weighted equivalent continuous sound pressure level over a period of time, T.
- $L_{AFmax,T}$ The A-weighted maximum sound pressure level that occurred during a given period, T, with a fast time weighting.
- $L_{ASmax,T}$ The A-weighted maximum sound pressure level that occurred during a given period, T, with a slow time weighting.
- $L_{A90,T}$ The A-weighted sound pressure level exceeded for 90% of the measurement period. Indicative of the background sound level.

Sound pressure level measurements are normally taken with an A-weighting (denoted by a subscript 'A', eg L_{A90}) to approximate the frequency response of the human ear.

A more detailed explanation of these quantities can be found in BS7445: Part 1: 2003 *Description and measurement of environmental noise, Part 1. Guide to quantities and procedures*.

Weather conditions

During the attended noise measurements, the weather was generally clear and dry and no rain occurred. The wind speed was less than 5 m/s.

These weather conditions are considered suitable for obtaining representative measurements.

Appendix B

BS 4142 corrections for attention catching features

The following applies where plant noise is assessed in accordance with BS 4142:2014+A1:2019.

If the proposed plant noise contains attention catching features (such as tonal elements, whines, whistles, bangs etc), penalty corrections should be applied based on the type and impact of the features.

If appropriate, a subjective assessment of the plant features can be adopted. Where the plant noise contains tonal elements, the following corrections can be made depending on how perceptible the tone is at the noise receptor:

- 0 dB where the tone is not perceptible
- 2 dB where the tone is just perceptible
- 4 dB where the tone is clearly perceptible
- 6 dB where the tone is highly perceptible.

Where the plant noise is impulsive, the following corrections can be made depending on how perceptible the impulsivity is at the noise receptor:

- 0 dB where the impulse is not perceptible
- 3 dB where the impulse is just perceptible
- 6 dB where the impulse is clearly perceptible
- 9 dB where the impulse is highly perceptible.

For noise which is equally both impulsive and tonal, then both features can be accounted for by linearly summing the corrections for both characteristics.

If the plant has other distinctive characteristics, such as intermittency, then a 3 dB correction can be made.

If a subjective assessment of tonality is not appropriate, an objective assessment can be made by analysis of time-averaged, third-octave band sound pressure levels. A noise source is deemed to be tonal if the level in a third-octave band exceeds the level in adjacent third-octave bands by the level differences given below:

- 15 dB in the low frequency third-octave bands (25 Hz to 125 Hz)
- 8 dB in the mid frequency third-octave bands (160 Hz to 400 Hz)
- 5 dB in the high frequency third-octave bands (500 Hz to 10000 Hz).

If an objective assessment identifies the plant noise to be tonal then a 6 dB correction must be made.