sharps acoustics

Wren, Stansted

Addendum submission in relation to noise assessment

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1.0 Introduction

1.1 Sharps Acoustics LLP ('SAL') has been commissioned by Wren Kitchens to undertake noise assessment work in relation to a proposal at a site in Tilekiln Green, Stansted. SAL has previously provided a report, dated 21 January 2021, setting out our findings in relation to potential noise emission levels and consequent noise impact from the site; a second note, dated 21 January 2022 updating the assessment to respond to comments from and discussions with the Council's noise expert at that time, a third note dated 10th November 2022, which provided an update taking account of two new premises (The Old Stables and Willow House) which had been introduced after the earlier submission (in 2022) and then a further addendum note dated 7th March 2023 which provided a consolidation of the initial report and the latter two notes and was intended to be read in conjunction with the 21 January 2021 report (which was attached to that note as Appendix A).

1.2 The content of the 2021 report was discussed with the noise expert at Uttlesford District Council ('UDC'). As a result of these discussions, it was agreed that the assessment should aim to ensure that noise levels would be below background noise levels at all times and that, so far as possible, levels should be reduced to UDC's desired target of 5dB below background.

1.3 Our latest assessment work (summarised in the March 2023 report) showed that, with the latest site layout and the proposed mitigation in place, the predicted noise levels would be below the LOAEL at all times and so there would be no observed adverse effects.

1.4 The standard used to assess noise from commercial and industrial sources of the type proposed suggests that a significant adverse effect would occur when the predicted rating level is 10dB above the background level and that an adverse level would occur at a level which is 5dB above the background noise level, so it is worth noting that achieving a level which is 5dB below that defined as an adverse level (ie. 0dB above background level) is already more onerous that is strictly required by paragraph 185 of the National Planning Policy Statement, which requires that significant adverse effects should be avoided and that levels should be reduced, so far as can reasonably achieved where they are adverse. Where levels are below "adverse", National Planning Policy requires no further actions to be taken to control noise.

1.5 It should be noted that the Addendum Note submitted with this application simply encapsulated the information submitted as part of the previous application process into one document. Together that information was accepted by UDC's Environmental Health Department and no objection was made subject to conditions. Following the refusal by the Committee UDC EHO had belatedly raised further comments, to which a response is given below. However, SAL stands by its previous assessment, which is further substantiated by this report.

1.6 The Council's noise team has now requested some additional information and raised additional queries. This note aims to respond to these requests and queries.

2.0 Council's comments and responses

Reliability of survey data

2.1 UDC EHO comments that:

"It noted that Brookside monitoring appears to be on the site itself adjacent to the existing pumping station which may not accurately reflect noise levels at Brookside, particularly to the rear of the property which is more shielded from the B1256 and there may also be a higher level on pumping station noise than Brookside experience."

2.2 This seems to suggest that UDC are concerned that the levels measured near to the pumping station may not be reliable as they may have been affected by noise from that source. SAL can confirm that no noise was apparent from the pumping station at the time of the survey. The main background noise source throughout was the M11 and the distances from the survey locations at Brookside and Gerald Villa to the M11 are very similar. This means that the measured levels at Brookside and Gerald Villa would also be expected to be very similar; the survey data shows that this is the case. Levels are no higher at Brookside, close to the pumping station; had levels here been higher this would be evident from the survey data.

2.3 SAL consider that survey data from all three locations where measurements were made are representative of the noise climate in the area.

Character correction / penalty

2.4 BS4142 requires that consideration should be given to adding a character correction (or "penalty") to the specific sound from a source to account for its more intrusive nature, when circumstances suggest that this is appropriate. The specific sound level is converted to a rating level by adding penalties on a sliding scale to account for potentially tonal, impulsive or intermittent elements. The standard suggests that if the sound is not tonal, impulsive or intermittent, but may otherwise be readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied.

2.5 The predicted worst case noise levels would all be below the background noise level throughout the operational period so any impulsivity or intermittency is very likely to be effectively masked by other sounds present. The UDC EHO suggests that reversing alarms at the site would be tonal. However, SAL can confirm that tonal reversing alarms would not be used on site. (This could be conditioned, if desired).

2.6 On this basis, there would be no perceptible sound characteristic falling within the descriptions in BS4142 requiring additional of a correction or penalty. However, when the background noise level is at its lowest, it is possible that the sounds from the site may be noticeable against the residual acoustic environment. On a precautionary basis, therefore, SAL have added a 3dB penalty to account for this.

Reliability of noise level predictions

2.7 UDC EHO comments that:

"Predicted noise levels are not given for Building E and New A1 and new A2 which appear to be the worse affected properties based on the predicted noise contours shown in figure D1 (day) and Figure D2 (night) and are also directly opposite the site entrance road where there will be a gap in the noise barrier for vehicles to enter and depart. I am not sure if the entrance gates to the site are intended to act as noise barriers but in any event they will be open to allow access and egress. Noise sensitive receptors Building E and new A1 in Figure D2 (nighttime site noise) both appear to be in the 45 to 50 dBA noise contour at First floor level, yet a figure of 39.5 dBA is shown on the SoundPLAN model for NSR E which is lower, presumably this is the predicted noise level at the

north façade rather than the east façade of the property which directly faces the site entrance. There is no justification given for why the north façade has been selected."

2.8 SAL have reported noise levels at the facades of all nearby noise sensitive receptors in Tables in Appendix C of the note of 7th March 2023. Noise contours have also been shown in Appendix D. Unfortunately, the last sentence of paragraph 2.22 of our March 2023 note incorrectly states:

"(Note that The Old Stables and Willow House are referred to as "New B1" and "New B2" in these figures)."

2.9 This should have stated:

"(Note that The Old Stables and Willow House are referred to as "New A1 / New A2" and "New B1 / B2" respectively in these figures)."

2.10 SAL have produced the same contours in this note (as Figures A1 and A2 in Appendix A) with New A1/A2 relabelled as The Old Stables A and B and New B1/B2 relabelled as Willow House A and B to help to clarify this point.

2.11 We have also added the hourly breakdown of noise levels at "Building E" (name unknown) to the Tables which we previously produced at Appendix C in our note of 7th March 2023. In this note the Tables are contained in Appendix B.

2.12 The reason that the receptor at Building E is on the northern façade is that this is the location of the window at that receptor; there are no windows on the western façade at that premises.

2.13 SAL can confirm that the noise model assumes that the gates to the site are open and that no noise reduction has been assumed as a result of their presence.

2.14 In relation to the EHO's concerns about the discrepancy between the noise contours and the predicted levels at specific windows, SAL can confirm that the window at Building E in the night time noise contour plot (Figure D2 of our note of 7th March or Figure A2 of this note) would be exposed to a level of 39.5dB and would fall at the lowest edge of the 40-45dB noise contour. When rounded, 39.5dB becomes 40dB, so there is no discrepancy at this location. The noise level at the receptor at "New A1" / "The Old Stables" is shown as 44.8dB (which rounds to 45dB) and falls within the lowest edge of the 45dB – 50dB contour, so again, there is no discrepancy.

Assumptions

2.15 The EHO criticises SAL for not providing, "… full details of the noise sources relied upon …" in the report and for not providing a "… description of each of the noise sources, hours of operation, mode of operation, and location." The EHO goes on to state:

"There is no information on how the source data used in the model was derived. Was it measured at the existing site? What plant and equipment were measured? How long was the noise source operating for? Is there any repair, cleaning, and maintenance of vehicles at the site? Will there be reversing bleepers? In the car parking area has noise from car doors slamming, vehicle charging,

and people noise been included? It is therefore not clear how the report author has obtained the noise rating levels stated."

2.16 The requested additional data is shown in Appendix C of this note.

2.17 SAL can confirm that all anticipated activities on site have been included in the model. It has been assumed that there would be no repair cleaning or maintenance at night time. As mentioned above, there would be no tonal reversing alarms used on site. Car park noise assumes all normal activities within a car park, such as vehicle movements and door slams.

2.18 The number of movements predicted by transport consultants (based on another similar site) varied over the week dependant on the day. In order to provide a robust assessment of the worst case for each hour, the maximum flows occurring at any time of the week for each hour were used. For reference, the raw data provided is shown in Tables C1 to C7 in Appendix C. The values used in the model are shown in Table C8 in Appendix C. This means that the predicted levels represent a worst case for each hour, rather than typical levels over a week.

2.19 Had typical hourly movements been used, SAL estimate that this would have resulted in predicted levels at nearby receptors which would have been 2dB lower than those reported.

Free field / façade comparisons

2.20 Predicted levels are shown as façade levels. This means that the levels have been increased from those which would occur in a free field location to account for the reflections from the building facades. These have been compared with background noise levels which were measured in free field locations. It is normal to compare free field rating levels with free field background levels and façade rating levels with background levels measured in a façade location. In this case, the comparison of façade rating levels with free field background levels is likely to have resulted in a 1-3dB increase in level difference. This means that level differences reported are likely to be -3dB higher (worse than) those which will actually occur, when assessed in strict accordance with BS4142.

2.21 Our calculations therefore err on the side of caution by 3-5dB, due to:

- Use of upper levels of activity, rather than typical hourly activity described in 2.18 and 2.19 above; and
- Use of façade levels when considering the level difference, as described in 2.20.

Section 12 of BS4142

2.22 Section 12 of BS4142 advises that a BS4142 assessment report should, *"Report the following, as appropriate:"* and provides a comprehensive list of all information which may be relevant to an assessment. In SAL view, failure to report the listed data does not invalidate the assessment, and key data was provided within the January 2021 report. However, for the sake of completeness, each of the specific pieces of information listed within Section 12 has been provided in Table D1 in Appendix D. This includes a detailed consideration of uncertainty.

Consideration of the L_{Amax} parameter

2.23 The EHO points out that the noise assessment does not consider peak levels from the site, as described using the L_{Amax} parameter and states that, *"... it is not clear if the proposed noise mitigation will achieve appropriate internal LAmax noise levels at night at the existing properties (with windows open)."*

2.24 The reason that the L_{Amax} parameter was not considered is because the assessment methodology in BS4142 does not require this. The approach in BS4142 considers the predicted $L_{Aeq,T}$, modified to account for the source's sound characteristics and reports this as a rating level (as discussed in our reports, notes and above). This approach is the standard procedure for the assessment of the potential impact of noise from industrial or commercial noise on nearby dwellings. There is simply no need to consider the L_{Amax} parameter, according to the relevant standard and guidance.

2.25 Added to this, it is clear from survey data (reported in Table 2 of our report of 21st January 2021, and reproduced as Table 2.1 below) that the existing L_{Amax} levels (arising principally from the operation of Stansted Airport) are already sufficiently high that anyone sleeping with windows open would experience sleep disturbance from aircraft.

Table 2.1: Summary of survey data (from our January 2021 report)

Location	Period	L_{Aeq}, dB	L_{A90}, dB	L_{Amax}, dB
The Old Elm	Day time (0700 – 2300)	64	58	-
	Night-time (2300 – 0700)	60	47	85
	Development Peak (0600 – 0700)	67	57	87
Brookside	Day time (0700 – 2300)	65	54	-
	Night-time (2300 – 0700)	62	46	87
	Development Peak (0600 – 0700)	69	53	87
Gerald Villa	Day time (0700 – 2300)	65	51	-
	Night-time (2300 – 0700)	62	45	86
	Development Peak (0600 – 0700)	69	53	87

2.26 Guidance which deals with L_{Amax} levels (where appropriate) suggests that these should not exceed 60dB outside a bedroom window, if sleep disturbance is to be avoided. Clearly, in this case, with L_{Amax} levels from aircraft routinely being 27dB above this level at night, windows can be assumed to be kept closed.

2.27 Nevertheless, SAL have re-run the model to predict L_{Amax} levels from the site during a worst case busiest night. The predicted L_{Amax} levels at the window which experiences the highest levels at each receptor would be as shown in Table 2.2 below.

Table 2.2: Predicted L_{Amax} levels from Wren site operation, façade levels

Location	Predicted L_{Amax}, dB
The Old Elm	69
Building E	69
The Old Stables	68
Willow House	66
Brookside	66
Rivendell	53
Gerald Terrace	54
Gerald Villa	53

2.28 These levels would be considerably below the existing noise levels in the vicinity and so would have no additional impact on sleep.

2.29 There is no policy or guidance basis for considering the L_{Amax} value and, even if there were, existing L_{Amax} levels are considerably above those which would mean that people could sleep undisturbed with open windows. Existing levels (from aircraft) are also considerably above the levels which would arise from the site.

Comments relating to traffic noise

2.30 In relation to road traffic noise, the EHO comments:

> *"I note that there is some discussion of a possible condition ensuring that site traffic would not be allowed to turn right exiting the site or to travel to the site through the village. It is not clear whether the noise modelling has taken this possibility into account or if impacts might be greater than predicted for properties between the site and the roundabout."*

and

> *"I would also suggest that the road traffic noise impacts from no right turn exit and no site traffic through the village (no left turn entrance) are also considered and modelled."*

2.31 SAL can confirm that our modelling of road traffic noise impacts assumes that all traffic for the site turns left out of the site an right into the site. We have considered the road traffic noise in the way requested already. This is reported in Table 7 of our report of 21st January 2021, which is reproduced in Table 2.3 below. Table 2.3 also includes predicted level changes at the new noise sensitive dwellings (The Old Stables and Willow House) for completeness.

Table 2.3: Predicted changes in road traffic noise

Receptor	Without development $L_{A10,18h}$, dB	With Development $L_{A10,18h}$, dB	Change in level (negative value indicates a reduction in level), dB
The Old Elm	65.8	61.5	-4.3
Brookside	60.5	60.7	0.2
The Old Stables	64.7	64.9	0.2
Willow House	64.9	65.0	0.1

2.32 These changes in level demonstrate that changes in road traffic flow would result in either a minor beneficial or a negligible adverse effect.

3.0 Summary

3.1 This note provides a correction to a typo in the note of 7th March 2023 and revisions to Figures showing predicted noise contours, to help to identify the locations of the newly introduced noise sensitive receptors (in Appendix A). The Tables from our note of 7th March 2023 have also been reproduced in Appendix B, with the addition a further table showing predicted levels at "Building E".

3.2 Additional data requested by the EHO has provided with source data in Appendix C, "Section 12 data" in Appendix D and calibration certificates in Appendix E.

3.3 SAL have confirmed that the assumptions in our calculation of the potential effects of changes in road traffic flow are as suggested by the EHO and that there would result in either a minor beneficial or a negligible adverse effect, as originally reported.

3.4 The conclusions of our initial noise assessment remain unchanged. These are that:

- Site layout and boundary treatment have been designed to provide necessary noise mitigation.
- Robust assumptions have been used throughout and predicted noise levels are likely to err on the side of caution (by between 3 and 5dB).
- Predicted noise levels indicate that there would be a low (less than adverse) impact, according to BS4142.

3.5 Noise arising from the operation of the site would be below the lowest observed adverse effect level and therefore no adverse effect from the site as a result of noise.

Appendix A: Noise contours with updated labelling

Figure A1: Daytime noise contours

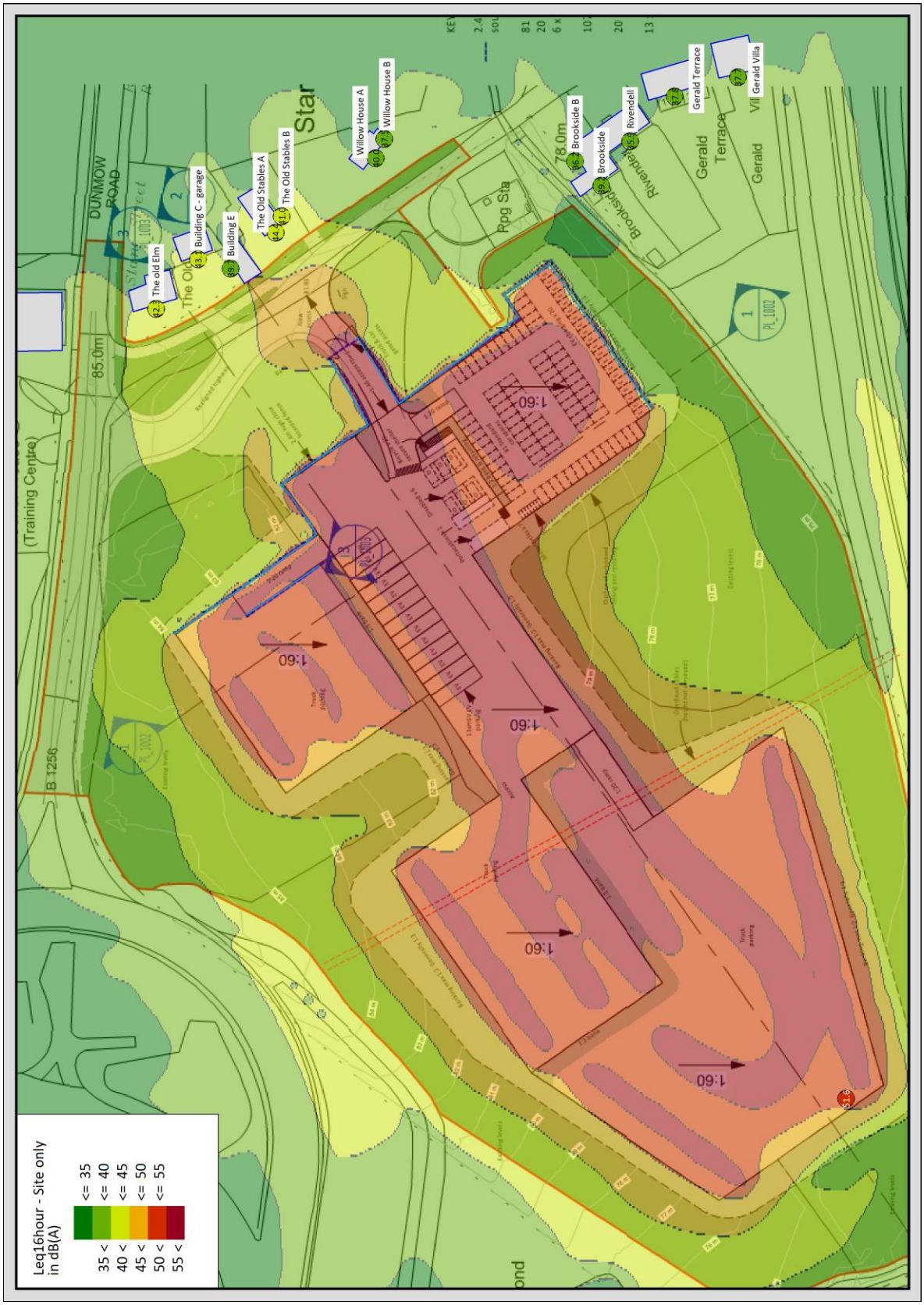
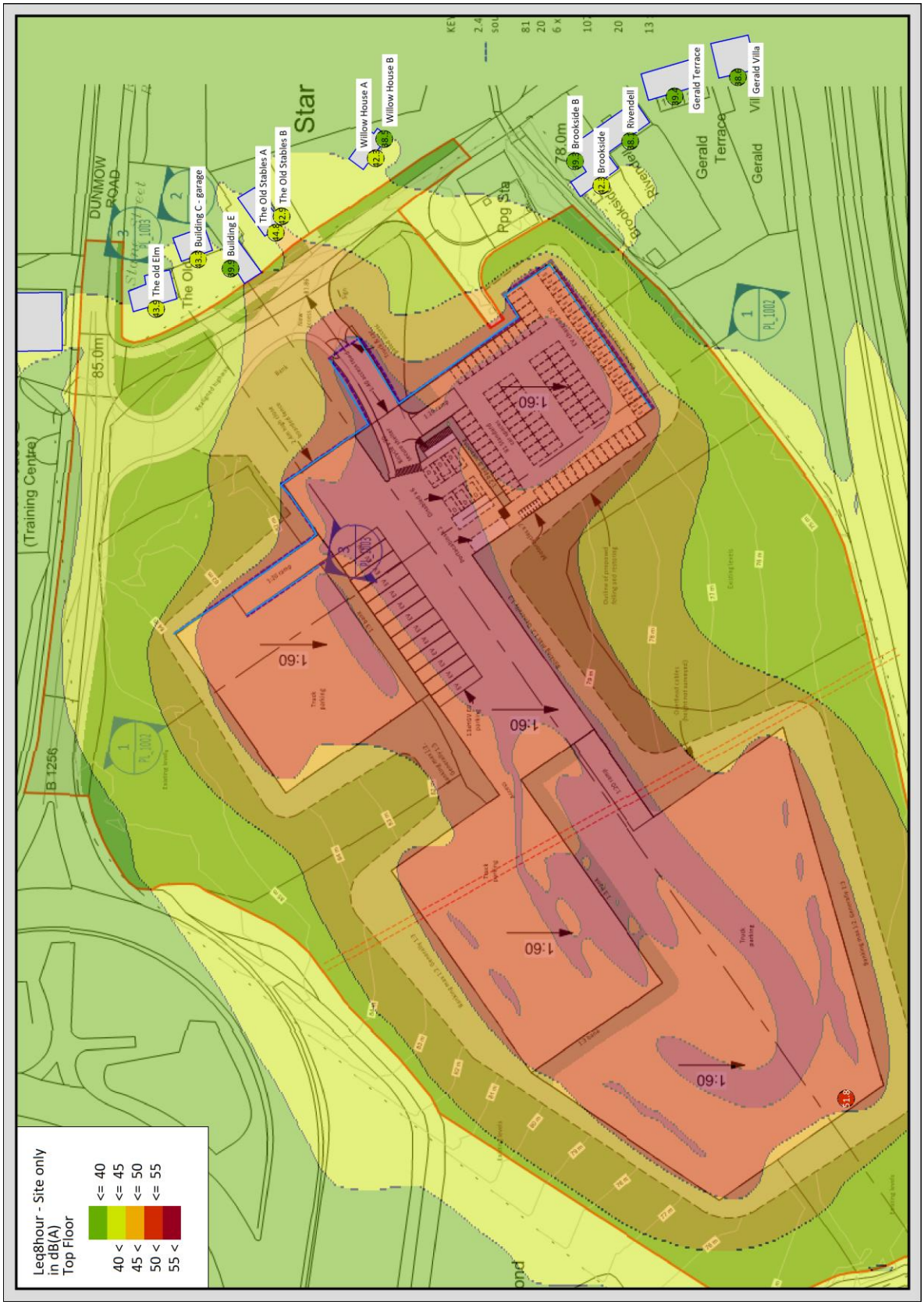


Figure A2: Night time noise contours



Appendix B: Noise level prediction tables

Table B1: Predicted noise levels in each hour at Brookside

Hour beginning	23	00	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Calculated $L_{Aeq,1h}$, dB	39	37	36	30	32	42	47	47	33	29	33	38	43	42	43	42	41	39	37	35	39	38	38	37
Corrected Rating level	42	40	39	33	35	45	50	50	36	32	36	41	46	45	46	45	44	42	40	38	42	41	41	40
Background	48	46	46	45	46	47	51	53	57	56	54	55	55	55	55	54	54	54	55	55	55	54	52	50
Difference	-6	-7	-7	-12	-11	-2	-1	-3	-21	-24	-18	-14	-9	-10	-9	-9	-10	-12	-15	-17	-13	-13	-11	-10

Table B2: Predicted noise levels in each hour at Gerald Villa

Hour beginning	23	00	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Calculated $L_{Aeq,1h}$, dB	36	33	33	28	26	38	43	44	28	31	27	31	37	41	41	42	41	40	38	35	33	37	37	37
Corrected Rating level	39	36	36	31	29	41	46	47	31	34	30	34	40	44	44	45	44	43	41	38	36	40	40	40
Background	45	45	42	42	42	46	50	53	52	52	52	52	52	51	52	51	51	51	52	54	53	53	51	49
Difference	-6	-9	-6	-11	-13	-5	-4	-6	-21	-18	-23	-18	-12	-7	-8	-6	-8	-8	-11	-16	-17	-13	-11	-9

Table B3: Predicted noise levels in each hour at The Old Elm

Hour beginning	23	00	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Calculated $L_{Aeq,1h}$, dB	42	39	39	34	29	42	48	49	28	36	27	34	42	46	46	47	45	44	42	39	37	42	42	42
Corrected Rating level	45	42	42	37	32	45	51	52	31	39	30	37	45	49	49	50	48	47	45	42	40	45	45	45
Background	50	50	47	47	47	49	54	57	58	59	58	57	56	57	57	58	57	58	59	59	58	57	55	53
Difference	-5	-8	-5	-10	-15	-4	-3	-5	-27	-20	-28	-20	-11	-8	-9	-9	-9	-11	-14	-17	-18	-12	-10	-8

Table B4: Predicted rating levels and background levels and level differences at The Old Stables

Hour beginning	23	00	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Calculated $L_{Aeq,1h}$, dB	43	40	40	35	29	43	49	50	29	38	28	36	44	48	48	49	47	46	44	41	39	44	44	44
Corrected Rating level	46	43	43	38	32	46	52	53	32	41	31	39	47	51	51	52	50	49	47	44	42	47	47	47
Background	50	50	47	47	47	49	54	57	58	59	58	57	56	57	57	58	57	58	59	59	58	57	55	53
Difference	-5	-7	-5	-9	-15	-3	-2	-4	-26	-18	-27	-18	-9	-6	-6	-6	-7	-9	-12	-15	-16	-10	-8	-6

Table B5: Predicted rating levels and background levels and level differences at Willow House

Hour beginning	23	00	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Calculated $L_{Aeq,1h}$, dB	40	37	37	32	30	41	46	48	29	34	28	33	39	43	43	44	43	42	40	37	35	40	39	39
Corrected Rating level	43	40	40	35	33	44	49	51	32	37	31	36	42	46	46	47	46	45	43	40	38	43	42	42
Background	50	50	47	47	47	49	54	57	58	59	58	57	56	57	57	58	57	58	59	59	58	57	55	53
Difference	-8	-10	-8	-13	-14	-5	-5	-6	-26	-22	-27	-21	-14	-11	-11	-11	-12	-13	-16	-19	-20	-14	-13	-11

Table B6: Predicted rating levels and background levels and level differences at Building E

Hour beginning	23	00	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Calculated $L_{Aeq,1h}$, dB	38	35	35	30	19	38	44	45	19	33	18	31	39	43	43	44	42	41	40	36	33	40	39	40
Corrected Rating level	41	38	38	33	22	41	47	48	22	36	21	34	42	46	46	47	45	44	43	39	36	43	42	43
Background	50	50	47	47	47	49	54	57	58	59	58	57	56	57	57	58	57	58	59	59	58	57	55	53
Difference	-9	-12	-9	-14	-25	-8	-7	-9	-36	-23	-37	-24	-14	-11	-11	-11	-12	-14	-16	-20	-22	-14	-13	-10

Appendix C: Source noise data and assumptions used

Table C1: Predicted vehicle flows on a Sunday

Time	7.5t		3.5t		18t		45ft		Cars	
	In	Out	In	Out	In	Out	In	Out	In	Out
00:00-01:00										
01:00-02:00										
02:00-03:00										
03:00-04:00										
04:00-05:00										
05:00-06:00									6	
06:00-07:00			2			1		2		
07:00-08:00										
08:00-09:00										
09:00-10:00										
10:00-11:00										
11:00-12:00										
12:00-13:00										
13:00-14:00										
14:00-15:00										
15:00-16:00					1		2			6
16:00-17:00										
17:00-18:00										
18:00-19:00										
19:00-20:00										
20:00-21:00										
21:00-22:00									3	
22:00-23:00										
23:00-00:00							1	1		

Table C2: Predicted vehicle flows on a Monday

Time	7.5t		3.5t		18t		45ft		Cars	
	In	Out	In	Out	In	Out	In	Out	In	Out
00:00-01:00										
01:00-02:00										
02:00-03:00										
03:00-04:00									2	
04:00-05:00									11	1
05:00-06:00		5				5			45	2
06:00-07:00		12		1		16			24	
07:00-08:00										
08:00-09:00										
09:00-10:00										
10:00-11:00			1							2
11:00-12:00					2					5
12:00-13:00	3				6					22
13:00-14:00	2				5			1		10
14:00-15:00	3				5			3		18
15:00-16:00	4				2		1	1		3
16:00-17:00	3				1		1	2		7
17:00-18:00	1				1					7
18:00-19:00	1									2
19:00-20:00									2	2
20:00-21:00									1	3
21:00-22:00							4			2
22:00-23:00							3	4		1
23:00-00:00							2	3		2

Table C3: Predicted vehicle flows on a Tuesday

Time	7.5t		3.5t		18t		45ft		Cars	
	In	Out	In	Out	In	Out	In	Out	In	Out
00:00-01:00					1		2			3
01:00-02:00							1			
02:00-03:00								1		
03:00-04:00									1	
04:00-05:00									20	
05:00-06:00									37	
06:00-07:00									18	3
07:00-08:00									1	
08:00-09:00										
09:00-10:00									3	
10:00-11:00									1	
11:00-12:00					1	2			1	5
12:00-13:00	1	3			3	6			2	4
13:00-14:00	3	2			2	5				6
14:00-15:00	4	3			6	5				8
15:00-16:00	4	2			4	2				22
16:00-17:00	2	2			3	1				16
17:00-18:00	1	1			3	1				9
18:00-19:00		1								7
19:00-20:00									3	
20:00-21:00							2		1	3
21:00-22:00							3	2		2
22:00-23:00							2	3		1
23:00-00:00							2	2		2

Table C4: Predicted vehicle flows on a Wednesday

Time	7.5t		3.5t		18t		45ft		Cars	
	In	Out	In	Out	In	Out	In	Out	In	Out
00:00-01:00					1		2			3
01:00-02:00							1	1		
02:00-03:00										
03:00-04:00									2	
04:00-05:00						2			25	
05:00-06:00		11		1		9			42	2
06:00-07:00		3				10			4	2
07:00-08:00									1	
08:00-09:00										
09:00-10:00										
10:00-11:00										
11:00-12:00	2				3					
12:00-13:00	2				2		1			
13:00-14:00	3		1		3		2			
14:00-15:00	3				3					
15:00-16:00	3				4					
16:00-17:00	1				2					
17:00-18:00					2					
18:00-19:00					1					
19:00-20:00									3	4
20:00-21:00									1	2
21:00-22:00							4	4		
22:00-23:00							5	3		
23:00-00:00							3	2		2

Table C5: Predicted vehicle flows on a Thursday

Time	7.5t		3.5t		18t		45ft		Cars	
	In	Out	In	Out	In	Out	In	Out	In	Out
00:00-01:00										
01:00-02:00							1			1
02:00-03:00										
03:00-04:00									2	
04:00-05:00		2				2			25	2
05:00-06:00		8				11			2	2
06:00-07:00		6		1		8			45	
07:00-08:00									4	
08:00-09:00		2							2	
09:00-10:00										
10:00-11:00										2
11:00-12:00					4					1
12:00-13:00	2				2					20
13:00-14:00	3				2					9
14:00-15:00	5				4					11
15:00-16:00	2				4			1		16
16:00-17:00	1				2			1		5
17:00-18:00	1							2		5
18:00-19:00										7
19:00-20:00					1	1			3	1
20:00-21:00	1						4	4	1	4
21:00-22:00							2	2		2
22:00-23:00							1	1		
23:00-00:00							1			1

Table C6: Predicted vehicle flows on a Friday

Time	7.5t		3.5t		18t		45ft		Cars	
	In	Out	In	Out	In	Out	In	Out	In	Out
00:00-01:00							2			2
01:00-02:00							2			2
02:00-03:00										
03:00-04:00									4	
04:00-05:00		2				3			24	
05:00-06:00		9				10			48	
06:00-07:00		7				8			5	
07:00-08:00									1	
08:00-09:00										
09:00-10:00										
10:00-11:00									3	
11:00-12:00					1				1	4
12:00-13:00	1				5				1	10
13:00-14:00	3				3		2			14
14:00-15:00	4				6		2			17
15:00-16:00	3				4		2			12
16:00-17:00	4									10
17:00-18:00	2									4
18:00-19:00	2									1
19:00-20:00					1					1
20:00-21:00										4
21:00-22:00							2	2		
22:00-23:00							2	2		
23:00-00:00							3			3

Table C7 Predicted vehicle flows on a Saturday

Time	7.5t		3.5t		18t		45ft		Cars	
	In	Out	In	Out	In	Out	In	Out	In	Out
00:00-01:00							2			2
01:00-02:00										
02:00-03:00										
03:00-04:00										
04:00-05:00										3
05:00-06:00										
06:00-07:00										
07:00-08:00										
08:00-09:00										
09:00-10:00										
10:00-11:00										
11:00-12:00										
12:00-13:00										
13:00-14:00										
14:00-15:00										
15:00-16:00										
16:00-17:00										
17:00-18:00										
18:00-19:00										
19:00-20:00										
20:00-21:00										
21:00-22:00										
22:00-23:00										
23:00-00:00										

Table C8: Predicted flows used in noise model, based on maximum flows for each hour from Tables C1 to C7 above

Time	7.5t		3.5t		18t		45ft		Cars	
	In	Out	In	Out	In	Out	In	Out	In	Out
00:00-01:00	0	0	0	0	1	0	2	0	0	3
01:00-02:00	0	0	0	0	0	0	2	1	0	2
02:00-03:00	0	0	0	0	0	0	0	1	0	0
03:00-04:00	0	0	0	0	0	0	0	0	4	0
04:00-05:00	0	2	0	0	0	3	0	0	25	3
05:00-06:00	0	11	0	1	0	11	0	0	48	2
06:00-07:00	0	12	2	1	0	16	0	2	45	3
07:00-08:00	0	0	0	0	0	0	0	0	4	0
08:00-09:00	0	2	0	0	0	0	0	0	2	0
09:00-10:00	0	0	0	0	0	0	0	0	3	0
10:00-11:00	0	0	1	0	0	0	0	0	3	2
11:00-12:00	2	0	0	0	4	2	0	0	1	5
12:00-13:00	3	3	0	0	6	6	1	0	2	22
13:00-14:00	3	2	1	0	5	5	2	1	0	14
14:00-15:00	5	3	0	0	6	5	2	3	0	18
15:00-16:00	4	2	0	0	4	2	2	1	0	22
16:00-17:00	4	2	0	0	3	1	1	2	0	16
17:00-18:00	2	1	0	0	3	1	0	2	0	9
18:00-19:00	2	1	0	0	1	0	0	0	0	7
19:00-20:00	0	0	0	0	1	1	0	0	3	4
20:00-21:00	1	0	0	0	0	0	4	4	1	4
21:00-22:00	0	0	0	0	0	0	4	4	3	2
22:00-23:00	0	0	0	0	0	0	5	4	0	1
23:00-00:00	0	0	0	0	0	0	3	3	0	3

Table C9: Measured source noise levels (from Wren Avonmouth)

Date and time	Duration (seconds)	Event	Distance (metres)	L_{Aeq}, dB	L_{AFmax}, dB	L_{AE}, dB	Typical L_{AE}, dB
(2021/12/02 15:33:54.00)	9	Lorry forward at 5 metres	5	71	73	81	82
(2021/12/02 15:34:09.00)	13	Lorry forward at 5 metres	5	72	76	83	
(2021/12/02 15:35:04.00)	12	Lorry forward at 5 metres	5	72	77	83	
(2021/12/02 15:35:54.00)	11	Lorry forward at 5 metres	5	72	76	82	
(2021/12/02 15:36:44.00)	16	Lorry forward at 5 metres	5	72	77	84	
(2021/12/02 16:27:16.00)	9	Forward (acceleration) at 5 metres	5	74	78	84	84
(2021/12/02 16:28:09.00)	8	Forward (acceleration) at 5 metres	5	74	79	84	
(2021/12/02 16:16:54.00)	16	forward at 5 metres with trailer	5	72	77	84	84
(2021/12/02 16:17:51.00)	16	forward at 5 metres with trailer	5	72	77	84	
(2021/12/02 16:18:47.00)	15	forward at 5 metres with trailer	5	71	79	83	
(2021/12/02 16:26:32.00)	35	Reversing alarms only at 5 metres	5	70	76	85	86
(2021/12/02 16:27:35.00)	26	Reversing alarms only at 5 metres	5	72	76	86	
(2021/12/02 16:28:26.00)	23	Reversing alarms only at 5 metres	5	72	75	85	
(2021/12/02 15:38:04.00)	26	reverse at 5 metre broadband	5	67	70	82	82
(2021/12/02 16:20:59.00)	44	Reversing with trailer - trailer broad band truck alarms (low level)	10	64	69	80	
(2021/12/02 16:21:51.00)	39	Reversing with trailer - trailer broad band truck alarms (low level)	10	69	75	85	
(2021/12/02 15:40:06.00)	238	Unloading of bed on truck - unload and pull away	5	72	91	94	94
(2021/12/02 15:49:46.00)	258	Unloading of bed on truck - unload and pull away	5	71	91	93	

Date and time	Duration (seconds)	Event	Distance (metres)	L_{Aeq}, dB	L_{AFmax}, dB	L_{AE}, dB	Typical L_{AE}, dB
(2021/12/02 15:45:07.00)	257	Loading of bed on truck - reversing on and loading and pulling away	5	71	92	93	94
(2021/12/02 15:52:57.00)	267	Loading of bed on truck - reversing on and loading and pulling away	5	73	95	95	
(2021/12/02 15:58:01.00)	240	Trailer hook up reversing on and pulling away	5	72	95	94	94

Ambient noise at the measurement location was recorded as 57dB, L_{Aeq} and 64dB, L_{Amax}.

Although not reported above, all measurements included third octave data and source data in the model used the frequency information as well as the levels. Tables of third octave band data can be provided, if required.

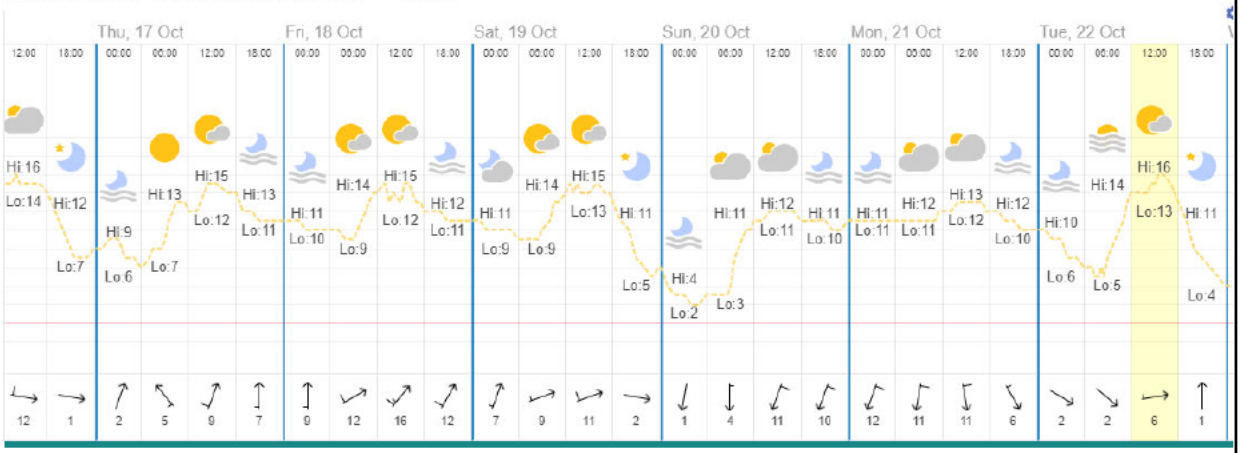
Appendix D: BS4142 Section 12 data

Table D1: Information to be reported according to Section 12 of BS4142

Section 12 clause	Requirement	Response
a)	Statement of qualifications, competency, professional memberships and experience directly relevant to the application of this British Standard of all personnel contributing to the assessment.	All contributors (Clive Bentley, Ian Sharps, Doug Sharps) are either Members or Fellows of the Institute of Acoustics.
b)	Source being assessed as follows: 1) description of the main sound sources and of the specific sound; 2) hours of operation; 3) mode of operation (e.g. continuous, twice a day, only in hot weather); 4) statement of operational rates of the main sound sources (e.g. maximum load setting, 50% max rate, low load setting); and 5) description of premises in which the main sound sources are situated (if applicable).	1. Noise from the operation of the proposed Wren Kitchens site, comprising: • HGV movements, including trailers • Hitching and unhitching of trailers • Removal of container from flat bed - stilts swinging down and the suspension of vehicle lowering. 2. 24 hours a day 3. Continuous assumed. 4. Noise is from vehicle movements and activities. Predicted numbers of vehicles was provided by scheme transport consultants based on activity rates at a similar site. On site flows vary for each hour dependant on the day of the week. The noise assessment used the highest flows in any hour of the day from that week, so represented a worst case for each hour. 5. Open air trailer and vehicle park.

Section 12 clause	Requirement	Response
c)	Subjective impressions, including: 1) dominance or audibility of the specific sound; and 2) main sources contributing to the residual sound.	1. Source data was measured at another similar site, at 5 -10 metres away from the activities of interest. Principal noise source was the vehicle engine whilst manoeuvring. There was also some clanking and banging as the stilts were swung down and hitching up. 2. Nearby road during the measurement of the specific noise, however this did not influence the measurements of the specific noise, as the residual level was greater than 10dB below the specific sound level.
d)	The existing context (see Clause 4 and Clause 11), including an assessment of the sensitivity of the receptor	Receptors are dwellings, which are considered to be noise sensitive receptors. There would be some screening between source and receptor which would affect levels and this is taken into account in the calculations of predicted levels at receptors. Existing noise at the receptors is from road traffic on both Tilekiln Road and the M11 and from aircraft landing and taking off and ground running of aircraft engines at Stansted Airport.
e)	Measurement locations, their distance from the specific sound source, the topography of the intervening ground and any reflecting surface other than the ground, including a photograph, or a dimensioned sketch with a north marker. A justification for the choice of measurement locations should also be included.	The survey locations were considered representative of noise sensitive receptors in the vicinity. A plan showing their location was produced in Appendix A of the SAL report of 21st January 2021.

Section 12 clause	Requirement	Response
f)	Sound measuring systems, including calibrator or pistonphone used: 1) type and/or model; 2) manufacturer; 3) serial number; and 4) details of the latest verification test including dates.	1, 2, 3. Meters used were Class 1 sound level meters: Sound level meter manufacturer: Norsonic. Model: 140. Pistonphone: Norsonic. Model: 1251. Serial numbers of each meter are shown on attached calibration certificates. 4. Attached calibration certificates (Appendix C) provide evidence of up to date calibration testing.
g)	Operational test: 1) reference level(s) of calibrator, multi-function calibrator or pistonphone; and 2) meter reading(s) before and after measurements with calibrator, multi-function calibrator or pistonphone applied.	1. Reference levels of pistonphones are shown on the attached certificates (in Appendix C). 2. A calibration check was performed before and after use and no drift was noted.

Section 12 clause	Requirement	Response
h)	Weather conditions, including: 1) wind speed(s) and direction(s); 2) presence of conditions likely to lead to temperature inversion (e.g. calm nights with little cloud cover); 3) precipitation; 4) fog; 5) wet ground; 6) frozen ground or snow coverage 7) temperature; and 8) cloud cover.	Weather during the measurement of source data at Wren Avonmouth: Clear, cool and dry with no discernible wind, no rain, no fog, dry ground, no frozen ground and no snow. Weather during survey was obtained from: https://www.timeanddate.com/weather/@2637053/historic?month=10&year=2019, as follows: **October 2019 Weather in Stansted — Graph**  Wind speeds are shown in mph and temperatures are in degrees centigrade.
i)	Date(s) and time(s) of measurements.	Source data measurements undertaken during the afternoon of 2nd December 2021. Measurements at Stansted made between 17th October 2019 and 22nd October 2019.

Section 12 clause	Requirement	Response
j)	Measurement time intervals.	Source data measurements were variable, dependant on source being measured. Durations lasted for the duration of the activity of interest, as shown in Appendix C. Measurements at Stansted were recorded every 15 minutes, as shown in detailed table of results in Appendix A of the SAL report of 21st January 2021.
k)	Reference time interval(s).	Reference time intervals are, as stated in the report: 1 hour for day time and 15 minutes for night time.
l)	Measured sound level(s): 1) residual sound level(s) and method of determination; 2) ambient sound level(s) and method of determination; 3) specific sound level(s) and method of determination; 4) justification of methods; and 5) details of any corrections applied.	1. and 2. All measurements of residual and ambient sound levels at the site are provided in detail and in summary in the SAL report of 21st January 2021. Additionally, measured source sound levels at the Wren site in Avonmouth are provided in Appendix C of this report. 3. and 4. The specific sound levels at nearby noise sensitive receptors have been calculated as set out in the SAL report of 21st January 2021 (and subsequent notes). The sound propagation calculations have been carried out using 3D noise modelling using ISO 9613 as the basis of the calculation. These take account of local topography, all reflecting and screening surfaces, moderate downwind weather conditions and equipment on times. Activity levels have been assumed to be as high as may occur in each hour during the day and night. 4. No corrections have been applied.

Section 12 clause	Requirement	Response
m)	Background sound level(s) and measurement time interval(s) and in the case of measurements taken at an equivalent location, the reasons for presuming it to be equivalent.	Details and summary of measured background noise levels at three locations around the site were provided in the SAL report of 21st January 2021. These locations were close to existing receptors and measured levels therefore represent background levels experienced at these locations.
n)	Rating level(s): 1) specific sound level(s); 2) any acoustic features of the specific sound; and 3) rating level(s).	1. Specific sound levels (as previously reported) at each nearby receptor have been provided again in Appendix B of this report. 2. Corrections for sound character are discussed in paragraphs 2.4 to 2.6 of this note. 3. Rating levels are (as previously reported) at each nearby receptor have been provided again in Appendix B of this report.
o)	Excess of the rating level(s) over the measured background sound level(s) and the initial estimate of the impacts.	These are reported at each nearby receptor have been provided again in Appendix B of this report.
p)	Conclusions of the assessment after taking context into account.	The assessment concludes that, taking context into account, there would be no adverse effects due to noise as a result of the operation of proposed development.

Section 12 clause	Requirement	Response	
q)	The potential impact of uncertainty (see Clause 10).	**Uncertainty**	**Reasoning**
		The complexity of the sound source and the level of variability in sound emission from the source	Movements and other activities at site vary over time and with distance from receptors. All such activity modelled using worst case assumptions for both number of activities and source levels. As a result, the predicted levels are at the upper end of the range of possible values. Therefore, applying a range of uncertainty in results (which is likely to be plus or minus 3dB about a mean value) would reduce predicted levels rather than introduce a variation around a mean.
		The complexity and level of variability of the residual acoustic environment	Residual acoustic environment detailed in report and affected by a limited number of sources which have been accounted for.
		The level of residual sound in the presence of the specific sound at the measurement location	Residual sound levels well below measured sound levels and therefore had negligible effect.
		The location(s) selected for taking measurements	The location(s) selected considered representative of the closest noise-sensitive receptor(s)
		The distance between sources of sound and the measurement location and intervening ground conditions	The location(s) selected considered representative of the closest noise-sensitive receptor(s) therefore the distance between the sources of sound and the measurement location and intervening ground conditions should not adversely impact the uncertainty
		The number of measurements taken	Continuous measurements conducted over a number of days

Section 12 clause	Requirement	Response	
		The measurement time intervals	Measurements taken over 15-minute periods and in line with the BS4142 night-time assessment period
		The range of times when the measurements have been taken	Continuous measurements conducted over a number of days and nights
		The range of suitable weather condition during which measurements have been taken	Weather conditions considered suitable for noise measurements
		The measurement method and variability between different practitioners in the way the method is applied	Measurement and assessment conducted in line with BS4142:2014
		The level of rounding of each measurement recorded	Measurements rounded to 1dB
		The instrumentation used	All instrumentation used Class 1

<table>
<tr><th>Section 12 clause</th><th>Requirement</th><th>Response</th></tr>
<tr><td></td><td></td><td>
Estimate of Combined uncertainty

Survey uncertainty

Standard equipment uncertainties have been considered by applying allowable tolerances minus the maximum allowable test laboratory uncertainties given in IEC 61672-1, as defined by Narang and Bell (Narang, P. and Bell, T., 2008. New IEC standards and periodic testing of sound level meters. Proceedings of the Internoise, Shanghai, China, pp.26-29).

The individual components of the measurement system would result in uncertainties and a combined uncertainty for measurements using a Class 1 sound level meter as shown below:

<table>
<tr><th>SLM Class</th><th>Frequency Weighting</th><th>Directional Response</th><th>Level Linearity</th><th>Toneburst Response</th><th>Calibrator (IEC 61672)</th><th>Supply Voltage</th><th>Combined Standard Uncertainty +/- dB</th></tr>
<tr><td>Class 1</td><td>0.5</td><td>0.5</td><td>0.4</td><td>0.25</td><td>0.125</td><td>0.05</td><td>0.9</td></tr>
</table>

Modelling uncertainty

SoundPLAN noise modelling software has been utilised to ascertain how noise propagates throughout the proposed development and the area surrounding it. The software uses the ISO 9613 calculation procedure which has an uncertainty rating of +/- 3dB.

Combined Uncertainty

Based on the information provided above, the combined Root Sum Squared (RSS) uncertainty for the assessment has been calculated as +/- 3.1dB.

Note: since the source level assumptions are skewed towards the upper end of likely operations, the actual variation around the true mean of typical levels would also be skewed such that true levels are more likely to be more than 3.1dB lower and less than 3.1dB higher than those presented.
</td></tr>
</table>

Appendix E: Calibration Certificates

Campbell Associates Ltd
5b Chelmsford Road Industrial Estate
GREAT DUNMOW, Essex, GB, CM6 1HD
[redacted]

CALIBRATION

0789

Certificate of Calibration and Conformance

Certificate number: U32318

Test object:	**Sound Level Meter, BS EN IEC 61672-1:2003 Class 1 (Precision)**
Producer :	**Norsonic**
Type :	**140**
Serial No.:	**1404138**
Customer:	**Sharps Gayler LLP**
Address:	**38 Habitat Way, Wallingford, Oxford. OX10 9FT.**
Contact Person:	[redacted]

Method :
Calibration has been performed as set out in CA Technical Procedures TP01 & 02 as appropriate. These are based on the procedures for periodic verification of sound level meters as set out in BS EN IEC 61672-3:2006. Results and conformance statement are overleaf and detailed results are in the attached Test Report.

Tested

	Producer:	Type:	Serial No:	Certificate number
Microphone	Norsonic	1225	118549	32317
Calibrator*	Norsonic	1251	29149	U32316
Preamplifier	Norsonic	1209	13548	Included

Additional items that also have been submitted for verification

Wind shield	Norsonic	Nor1434 (ø 90mm)
Attenuator	-	
Extension cable	-	

These items have been taken into account wherever appropriate.

Instruction manual: Im140_1Ed6R3En Firmware version: 2.1.670 The test object is a single channel instrument.

Conditions	Pressure	Temperature	Humidity
Reference conditions:	101.325 kPa	23.0 °C	50 %RH
Measurement conditions:	101.60 ±0.05 kPa	22.4 ±0.4 °C	42.4 ±0.7 %RH

Date received for calibration: 05/07/2019
Date of calibration: 15/07/2019
Date of issue: 15/07/2019
Engineer [redacted]

Supervisor

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.
* The calibrator was complete with any required coupler for the microphone specified.

Certificate of Calibration and Conformance

UKAS Laboratory Number 0789

Certificate number: U32318

Conformance

From markings on the sound level meter or by reference to the manufacturer's published literature it has been determined that the instrument submitted for verification was originally manufactured to BS EN IEC 61672-1:2002 and similarly that the associated sound calibrator conforms to BS EN IEC 60942.

Statement of conformance

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of BS EN IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available[1], from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with BS EN IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in BS EN IEC 61672-1:2002, and that the sound level meter submitted for testing conforms to the class 1 requirements of BS EN IEC 61672-1:2003.

[1] This evidence is held on file at the calibration laboratory

Summary of Measurement Results

Indication at the calibration check frequency - IEC61672-3 Ed.1 Clause 9	Passed
Self-generated noise - IEC 61672-3 Ed.1 Clause 10.2	Passed
Acoustical signal tests of a frequency weighting - IEC 61672-3 Ed.1 Clause 11	Passed
Electrical signal tests of frequency weightings - IEC 61672-3 Ed.1 Clause 12	Passed
Frequency weightings: A Network - IEC 61672-3 Ed.1 Clause 12.3	Passed
Frequency weightings: C Network - IEC 61672-3 Ed.1 Clause 12.3	Passed
Frequency weightings: Z Network - IEC 61672-3 Ed.1 Clause 12.3	Passed
Frequency and time weightings at 1 kHz IEC 61672-3 Ed.1 Clause 13	Passed
Level linearity on the reference level range - IEC 61672-3 Ed.1 Clause 14	Passed
Toneburst response - IEC 61672-3 Ed.1 Clause 16	Passed
Peak C sound level - IEC 61672-3 Ed.1 Clause 17	Passed
Overload indication - IEC 61672-3 Ed.1 Clause 18	Passed

Comment

Correct level with associated calibrator is 113.8dB(A).

Observations

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2, providing a coverage probability of approximately 95 %. The uncertainty evaluation has been carried out in accordance with UKAS requirements. Details of the uncertainty for each measurement are available from the Calibration Laboratory upon request. Details of the sources of corrections and their associated uncertainties that relate to this verification are contained within the test report accompanying this certificate.

Campbell Associates Ltd
5b Chelmsford Road Industrial Estate
GREAT DUNMOW, CM6 1HD, England
[redacted]

CALIBRATION

0789

Certificate number: U32316

Certificate of Calibration and Conformance

Test object:	**Sound Calibrator**
Manufacturer:	**Norsonic**
Type:	**1251**
Serial no:	**29149**

Customer:	Sharps Gayler LLP
Address:	38 Habitat Way, Wallingford, Oxford. OX10 9FT.
Contact Person:	[redacted]

Measurement Results:	Level	Level Stability	Frequency	Frequency Stability	Distortion
1:	113.96 dB	0.01 dB	1000.43 Hz	0.00 %	<0.3 %
2:	113.96 dB	0.01 dB	1000.43 Hz	0.00 %	<0.3 %
3:	113.97 dB	0.01 dB	1000.43 Hz	0.00 %	<0.3 %
Result (Average):	**113.96 dB**	**0.01 dB**	**1000.43 Hz**	**0.00 %**	**<0.3 %**
Expanded Uncertainty:	0.10 dB	0.02 dB	1.00 Hz	0.01 %	0.10 %
Degree of Freedom:	>100	>100	>100	>100	>100
Coverage Factor:	2.00	2.00	2.00	2.00	2.00

The stated level is relative to 20µPa. The level is traceable to National Standards.
The stated level is valid at reference conditions. The following correction factors have been applied during the measurement: Pressure: 0.0005 dB/kPa Temperature: 0.003 dB/°C Relative humidity: 0.000 dB/%RH Load volume : 0.0003 dB/mm3
The reported expanded uncertainty of measurements is based on a standard uncertainty multiplied by the coverage factor of k=2, providing a level of confidence of approximately 95%. Where the degrees of freedom are insufficient to maintain this confidence level, the coverage factor is increased to maintain this confidence level. The uncertainty has been determined in accordance with UKAS requirements.
Records: K:\C A\Calibration\Nor-1504\Nor-1018 CalCal\2019\NOR1251_29149_M1.nmf

Environmental conditions:	Pressure:	Temperature:	Relative humidity:
Reference conditions:	101.325 kPa	23.0 °C	50 %RH
Measurement conditions:	101.622 ± 0.041 kPa	22.5 ± 0.1 °C	42.2 ± 1.4 %RH

Date received for calibration:	05/07/2019
Date of calibration:	15/07/2019
Date of issue:	15/07/2019
Engineer	
Supervisor	[redacted]

Certificate number: U32316

Preconditioning
The equipment was preconditioned for more than 4 hours in the specified calibration environment.

Measurements
The calibrator has been tested as described in the following annexes to BS EN IEC60942:2003 Sound Calibrators; B3.4 for sound pressure level, B3.5 for frequency, B3.6 for total distortion and A4.4 for short term stability of the pressure level.

Method
Calibration has been performed as set out in the current version of CA Technical procedure TP01

Instruments and program
A complete list of equipment, hardware and software that has been used in this calibration is available from the calibration laboratory on request.

Traceability
The measured values are traceable to an accredited national physical laboratory within the EU or EFTA.

Comment
Calibrated as received, no adjustments made.

Statement of conformance
As public evidence was available[1], from a testing organisation responsible for approving the results of pattern evaluation tests, to demonstrate that the model of sound calibrator fully conformed to the requirements for pattern evaluation described in annex A of BS EN IEC 60942:2003, the sound calibrator tested is considered to conform to all the class 1 requirements of that BS EN IEC 60942:2003.

[1] This evidence is held on file at the calibration laboratory.

Notes:
The sound pressure level generated by the calibrator in its ½ inch configuration was measured five times and averaged by a WS2P working standard microphone for class 1 or 2 devices or a LS2P reference microphone for class 0 or LS devices as specified in the International Standard BS EN 61094-4. The results of three replications and the mean of the measurements obtained are given in the measurement results table of this certificate. The frequency and distortion were measured in a similar manner. The figures in **BOLD** are the final results; a small correction factor may need to be added to the sound pressure level quoted here if the device is used to calibrate a sound level meter that is fitted with a free field response microphone. See manufacturer's handbooks for full details of this and other corrections that may be applicable.

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[redacted]

CALIBRATION

0789

Certificate of Calibration and Conformance

Certificate number: U32161

Test object:	**Sound Level Meter, BS EN IEC 61672-1:2003 Class 1 (Precision)**
Producer :	**Norsonic**
Type :	**140**
Serial No.:	**1402899**
Customer:	**Sharps Gayler LLP**
Address:	**38 Habitat Way, Wallingford, Oxford. OX10 9FT.**
Contact Person:	[redacted]

Method :
Calibration has been performed as set out in CA Technical Procedures TP01 & 02 as appropriate. These are based on the procedures for periodic verification of sound level meters as set out in BS EN IEC 61672-3:2006. Results and conformance statement are overleaf and detailed results are in the attached Test Report.

Tested

	Producer:	Type:	Serial No:	Certificate number
Microphone	Norsonic	1225	91754	32160
Calibrator*	Norsonic	1251	32476	U32159
Preamplifier	Norsonic	1209	13228	Included

Additional items that also have been submitted for verification
Wind shield -
Attenuator -
Extension cable -
These items have been taken into account wherever appropriate.

Instruction manual: Im140_1Ed6R3En Firmware version: 2.1.670 The test object is a single channel instrument.

Conditions	Pressure	Temperature	Humidity
Reference conditions:	101.325 kPa	23.0 °C	50 %RH
Measurement conditions:	101.16 ±0.06 kPa	22.3 ±0.2 °C	45.0 ±0.7 %RH

Date received for calibration: 21/06/2019
Date of calibration: 25/06/2019
Date of issue: 25/06/2019
Engineer [redacted]

Supervisor

* The calibrator was complete with any required coupler for the microphone specified.

Certificate of Calibration and Conformance

UKAS Laboratory Number 0789

Certificate number: U32161

Conformance

From markings on the sound level meter or by reference to the manufacturer's published literature it has been determined that the instrument submitted for verification was originally manufactured to BS EN IEC 61672-1:2002 and similarly that the associated sound calibrator conforms to BS EN IEC 60942.

Statement of conformance

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of BS EN IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available[1], from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with BS EN IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in BS EN IEC 61672-1:2002, and that the sound level meter submitted for testing conforms to the class 1 requirements of BS EN IEC 61672-1:2003.

[1] This evidence is held on file at the calibration laboratory

Summary of Measurement Results

Indication at the calibration check frequency - IEC61672-3 Ed.1 Clause 9	Passed
Self-generated noise - IEC 61672-3 Ed.1 Clause 10.2	Passed
Acoustical signal tests of a frequency weighting - IEC 61672-3 Ed.2.0 Clause 12	Passed
Electrical signal tests of frequency weightings - IEC 61672-3 Ed.1 Clause 12	Passed
Frequency weightings: A Network - IEC 61672-3 Ed.1 Clause 12.3	Passed
Frequency weightings: C Network - IEC 61672-3 Ed.1 Clause 12.3	Passed
Frequency weightings: Z Network - IEC 61672-3 Ed.1 Clause 12.3	Passed
Frequency and time weightings at 1 kHz IEC 61672-3 Ed.1 Clause 13	Passed
Level linearity on the reference level range - IEC 61672-3 Ed.1 Clause 14	Passed
Toneburst response - IEC 61672-3 Ed.1 Clause 16	Passed
Peak C sound level - IEC 61672-3 Ed.1 Clause 17	Passed
Overload indication - IEC 61672-3 Ed.1 Clause 18	Passed

Comment

Correct level with associated calibrator is 114.0dB(A). The correct level with Nor-1284/202 dehumidifier installed is 113.9dB(A).

Observations

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2, providing a coverage probability of approximately 95 %. The uncertainty evaluation has been carried out in accordance with UKAS requirements. Details of the uncertainty for each measurement are available from the Calibration Laboratory upon request. Details of the sources of corrections and their associated uncertainties that relate to this verification are contained within the test report accompanying this certificate.

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[redacted]

CALIBRATION

0789

Certificate of Calibration and Conformance

Certificate number: **U32432**

Test object:	**Sound Level Meter, BS EN IEC 61672-1:2003 Class 1 (Precision)**
Producer :	**Norsonic**
Type :	**140**
Serial No.:	**1403706**
Customer:	**Sharps Gayler LLP**
Address:	**Maltings House, Bentley, Ipswich. IP9 2LT.**
Contact Person:	[redacted]

Method :
Calibration has been performed as set out in CA Technical Procedures TP01 & 02 as appropriate. These are based on the procedures for periodic verification of sound level meters as set out in BS EN IEC 61672-3:2006. Results and conformance statement are overleaf and detailed results are in the attached Test Report.

Tested

	Producer:	Type:	Serial No:	Certificate number
Microphone	Norsonic	1225	106887	32431
Calibrator*	Norsonic	1251	34485	U32430
Preamplifier	Norsonic	1209	12188	Included

Additional items that also have been submitted for verification

Wind shield	Norsonic	Nor1451 (ø 60mm)
Attenuator	-	
Extension cable	-	

These items have been taken into account wherever appropriate.

Instruction manual: Im140_1Ed6R3En Firmware version: V2.1.670 The test object is a single channel instrument.

Conditions	Pressure	Temperature	Humidity
Reference conditions:	101.325 kPa	23.0 °C	50 %RH
Measurement conditions:	100.01 ±0.06 kPa	21.8 ±0.4 °C	45.4 ±0.7 %RH

Date received for calibration: 19/07/2019
Date of calibration: 30/07/2019
Date of issue: 30/07/2019
Engineer

[redacted]

Supervisor

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.
* The calibrator was complete with any required coupler for the microphone specified.

Certificate of Calibration and Conformance

UKAS Laboratory Number 0789

Certificate number: U32432

Conformance

From markings on the sound level meter or by reference to the manufacturer's published literature it has been determined that the instrument submitted for verification was originally manufactured to BS EN IEC 61672-1:2002 and similarly that the associated sound calibrator conforms to BS EN IEC 60942.

Statement of conformance

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of BS EN IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available[1], from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with BS EN IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in BS EN IEC 61672-1:2002, and that the sound level meter submitted for testing conforms to the class 1 requirements of BS EN IEC 61672-1:2003.

[1] This evidence is held on file at the calibration laboratory

Summary of Measurement Results

Indication at the calibration check frequency - IEC61672-3 Ed.1 Clause 9	Passed
Self-generated noise - IEC 61672-3 Ed.1 Clause 10.2	Passed
Acoustical signal tests of a frequency weighting - IEC 61672-3 Ed.1 Clause 11	Passed
Electrical signal tests of frequency weightings - IEC 61672-3 Ed.1 Clause 12	Passed
Frequency weightings: A Network - IEC 61672-3 Ed.1 Clause 12.3	Passed
Frequency weightings: C Network - IEC 61672-3 Ed.1 Clause 12.3	Passed
Frequency weightings: Z Network - IEC 61672-3 Ed.1 Clause 12.3	Passed
Frequency and time weightings at 1 kHz IEC 61672-3 Ed.1 Clause 13	Passed
Level linearity on the reference level range - IEC 61672-3 Ed.1 Clause 14	Passed
Toneburst response - IEC 61672-3 Ed.1 Clause 16	Passed
Peak C sound level - IEC 61672-3 Ed.1 Clause 17	Passed
Overload indication - IEC 61672-3 Ed.1 Clause 18	Passed

Comment

Correct level with associated calibrator is 114.0dB(A).

Observations

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2, providing a coverage probability of approximately 95 %. The uncertainty evaluation has been carried out in accordance with UKAS requirements. Details of the uncertainty for each measurement are available from the Calibration Laboratory upon request. Details of the sources of corrections and their associated uncertainties that relate to this verification are contained within the test report accompanying this certificate.

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[redacted]

CALIBRATION 0789

Certificate number: U32430

Certificate of Calibration and Conformance

Test object:	**Sound Calibrator**
Manufacturer:	**Norsonic**
Type:	**1251**
Serial no:	**34485**
Customer:	Sharps Gayler LLP
Address:	Maltings House, Bentley, Ipswich. IP9 2LT.
Contact Person:	[redacted]

Measurement Results:	Level	Level Stability	Frequency	Frequency Stability	Distortion
1:	114.12 dB	0.01 dB	1000.26 Hz	0.00 %	<0.3 %
2:	114.12 dB	0.01 dB	1000.26 Hz	0.00 %	<0.3 %
3:	114.12 dB	0.06 dB	1000.26 Hz	0.00 %	<0.3 %
Result (Average):	**114.12 dB**	**0.03 dB**	**1000.26 Hz**	**0.00 %**	**<0.3 %**
Expanded Uncertainty:	0.10 dB	0.06 dB	1.00 Hz	0.01 %	0.10 %
Degree of Freedom:	>100	4	>100	>100	>100
Coverage Factor:	2.00	3.31	2.00	2.00	2.00

The stated level is relative to 20µPa. The level is traceable to National Standards.
The stated level is valid at reference conditions. The following correction factors have been applied during the measurement: Pressure: 0.0005 dB/kPa Temperature: 0.003 dB/°C Relative humidity: 0.000 dB/%RH Load volume : 0.0003 dB/mm3
The reported expanded uncertainty of measurements is based on a standard uncertainty multiplied by the coverage factor of k=2, providing a level of confidence of approximately 95%. Where the degrees of freedom are insufficient to maintain this confidence level, the coverage factor is increased to maintain this confidence level. The uncertainty has been determined in accordance with UKAS requirements.
Records: K:\C A\Calibration\Nor-1504\Nor-1018 CalCal\2019\NOR1251_34485_M1.nmf

Environmental conditions:	Pressure:	Temperature:	Relative humidity:
Reference conditions:	101.325 kPa	23.0 °C	50 %RH
Measurement conditions:	100.285 ± 0.041 kPa	22.4 ± 0.2 °C	41.7 ± 0.8 %RH

Date received for calibration: 19/07/2019
Date of calibration: 29/07/2019
Date of issue: 29/07/2019
Engineer

Supervisor [redacted]

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Certificate number: U32430

Preconditioning
The equipment was preconditioned for more than 4 hours in the specified calibration environment.

Measurements
The calibrator has been tested as described in the following annexes to BS EN IEC60942:2003 Sound Calibrators; B3.4 for sound pressure level, B3.5 for frequency, B3.6 for total distortion and A4.4 for short term stability of the pressure level.

Method
Calibration has been performed as set out in the current version of CA Technical procedure TP01

Instruments and program
A complete list of equipment, hardware and software that has been used in this calibration is available from the calibration laboratory on request.

Traceability
The measured values are traceable to an accredited national physical laboratory within the EU or EFTA.

Comment
Calibrated as received, no adjustments made.

Statement of conformance
As public evidence was available[1], from a testing organisation responsible for approving the results of pattern evaluation tests, to demonstrate that the model of sound calibrator fully conformed to the requirements for pattern evaluation described in annex A of BS EN IEC 60942:2003, the sound calibrator tested is considered to conform to all the class 1 requirements of that BS EN IEC 60942:2003.

[1] This evidence is held on file at the calibration laboratory.

Notes:
The sound pressure level generated by the calibrator in its ½ inch configuration was measured five times and averaged by a WS2P working standard microphone for class 1 or 2 devices or a LS2P reference microphone for class 0 or LS devices as specified in the International Standard BS EN 61094-4. The results of three replications and the mean of the measurements obtained are given in the measurement results table of this certificate. The frequency and distortion were measured in a similar manner. The figures in **BOLD** are the final results; a small correction factor may need to be added to the sound pressure level quoted here if the device is used to calibrate a sound level meter that is fitted with a free field response microphone. See manufacturer's handbooks for full details of this and other corrections that may be applicable.

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CALIBRATION

0789

Certificate number: U32159

Certificate of Calibration and Conformance

Test object:	**Sound Calibrator**
Manufacturer:	**Norsonic**
Type:	**1251**
Serial no:	**32476**
Customer:	Sharps Gayler LLP
Address:	38 Habitat Way, Wallingford, Oxford. OX10 9FT.
Contact Person:	[redacted]

Measurement Results:	Level	Level Stability	Frequency	Frequency Stability	Distortion
1:	114.14 dB	0.06 dB	1000.72 Hz	0.00 %	<0.3 %
2:	114.14 dB	0.06 dB	1000.72 Hz	0.00 %	<0.3 %
3:	114.15 dB	0.06 dB	1000.72 Hz	0.00 %	<0.3 %
Result (Average):	**114.14 dB**	**0.06 dB**	**1000.72 Hz**	**0.00 %**	**<0.3 %**
Expanded Uncertainty:	0.10 dB	0.02 dB	1.00 Hz	0.01 %	0.10 %
Degree of Freedom:	>100	>100	>100	>100	>100
Coverage Factor:	2.00	2.00	2.00	2.00	2.00

The stated level is relative to 20µPa. The level is traceable to National Standards.
The stated level is valid at reference conditions. The following correction factors have been applied during the measurement: Pressure: 0.0005 dB/kPa Temperature: 0.003 dB/°C Relative humidity: 0.000 dB/%RH Load volume : 0.0003 dB/mm3
The reported expanded uncertainty of measurements is based on a standard uncertainty multiplied by the coverage factor of k=2, providing a level of confidence of approximately 95%. Where the degrees of freedom are insufficient to maintain this confidence level, the coverage factor is increased to maintain this confidence level. The uncertainty has been determined in accordance with UKAS requirements.
Records: K:\C A\Calibration\Nor-1504\Nor-1018 CalCal\2019\NOR1251_32476_M1.nmf

Environmental conditions:	Pressure:	Temperature:	Relative humidity:
Reference conditions:	101.325 kPa	23.0 °C	50 %RH
Measurement conditions:	101.079 ± 0.043 kPa	21.8 ± 0.1 °C	48.1 ± 1.0 %RH

Date received for calibration: 21/06/2019
Date of calibration: 25/06/2019
Date of issue: 25/06/2019
Engineer [redacted]

Supervisor [redacted]

Certificate number: U32159

Preconditioning
The equipment was preconditioned for more than 4 hours in the specified calibration environment.

Measurements
The calibrator has been tested as described in the following annexes to BS EN IEC60942:2003 Sound Calibrators; B3.4 for sound pressure level, B3.5 for frequency, B3.6 for total distortion and A4.4 for short term stability of the pressure level.

Method
Calibration has been performed as set out in the current version of CA Technical procedure TP01

Instruments and program
A complete list of equipment, hardware and software that has been used in this calibration is available from the calibration laboratory on request.

Traceability
The measured values are traceable to an accredited national physical laboratory within the EU or EFTA.

Comment
Calibrated as received, no adjustments made.

Statement of conformance
As public evidence was available[1], from a testing organisation responsible for approving the results of pattern evaluation tests, to demonstrate that the model of sound calibrator fully conformed to the requirements for pattern evaluation described in annex A of BS EN IEC 60942:2003, the sound calibrator tested is considered to conform to all the class 1 requirements of that BS EN IEC 60942:2003.

[1] This evidence is held on file at the calibration laboratory.

Notes:
The sound pressure level generated by the calibrator in its ½ inch configuration was measured five times and averaged by a WS2P working standard microphone for class 1 or 2 devices or a LS2P reference microphone for class 0 or LS devices as specified in the International Standard BS EN 61094-4. The results of three replications and the mean of the measurements obtained are given in the measurement results table of this certificate. The frequency and distortion were measured in a similar manner. The figures in **BOLD** are the final results; a small correction factor may need to be added to the sound pressure level quoted here if the device is used to calibrate a sound level meter that is fitted with a free field response microphone. See manufacturer's handbooks for full details of this and other corrections that may be applicable.

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