hepworth acoustics

DAVIDSTOW WPF

APRIL 2021 NOISE ASSESSMENT

On behalf of:

Dairy Crest Limited t/a Saputo Dairy UK

Report No: P21-155-R01v1
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Report prepared by:
Hepworth Acoustics Ltd
1st Floor Aztec Centre
Aztec West
Almondsbury
Bristol
BS32 4TD

On behalf of:
Dairy Crest Limited t/a Saputo Dairy UK

Report prepared by:
Graham Bowland BSc MIOA – Technical Director

Report checked by:
Paul Bassett BSc MSc FIOA – Technical Director

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1.0 INTRODUCTION

1.1 Hepworth Acoustics Ltd was commissioned to carry out a noise assessment relating to the Water Processing Facility (WPF) associated with the Davidstow Creamery, the latter being located ~850m to the west of the WPF.

1.2 This noise assessment has been commissioned to evaluate current operational noise emissions from the WPF since a previous similar assessment was undertaken during April 2020, as set out in our report ref: P20-150-R01v1. The April 2020 assessment itself followed a baseline noise assessment undertaken in July/August 2018, as set out in report ref: P18-098-R01v2.

1.3 The key purposes of this noise assessment are to compare the current noise emissions from the WPF to those previously measured, especially more recently in April 2020, and also to establish the refreshed baseline for noise emissions, against which any future ongoing improvements, if necessary, may be evaluated.

1.4 A detailed programme of noise measurements has been undertaken on and around the WPF site over an extended period.

1.5 The various noise units and indices referred to in this report are described in Appendix I. All noise levels mentioned in the text have been rounded to the nearest decibel, as fractions of decibels are imperceptible.

2.0 ACOUSTIC CRITERIA

BS 4142

2.1 Relevant guidance to this assessment is set out in British Standard 4142: 2014 +A1: 2019 *Methods for rating and assessing industrial and commercial sound*. The standard provides methods for rating and assessing sound of an industrial nature from industrial or commercial premises.

2.2 The 'rating' level is based on the 'specific' L_{Aeq} sound level attributable to the operation with an 'acoustic feature' penalty added for any sound sources which give rise to tonal, impulsive, intermittent, or other characteristics readily distinctive against the residual acoustic environment.

2.3 BS 4142 stipulates that impacts should be assessed over a reference time interval of 1-hour during the daytime (0700-2300hrs) and 15-minutes during the night-time (2300-0700hrs).

2.4 An initial numerical estimate of the impact of the operation is determined by subtracting the background level from the rating level. BS 4142 states that:

- Typically, the greater this difference, the greater the magnitude of the impact
- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context
- A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context
- The lower the rating level is relative to the measured background level, the less likely it is that the operation will have an adverse impact or a significant adverse impact.
- Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

2.5 Where the initial estimate of the impact needs to be modified due to the context, BS 4142 states that all pertinent factors should be taken into account in determining whether the initial estimate of the impact needs to be modified, including:

- The absolute level of noise
- The character and level of the residual noise
- The sensitivity of the receptor

2.6 Regarding background sound levels, BS 4142 requires *that "values are reliable and suitably represent the particular circumstances and periods of interest… the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods*". It is also stated that "*diurnal patterns can have a major influence on background sound levels and, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night-time period for sleep purposes*".

BS 8233

2.7 British Standard 8233: 2014 *Guidance on sound insulation and noise reduction for buildings,* recommends design criteria for acceptable noise levels within residential accommodation. BS 8233 guidelines for the daytime and night-time are summarised in Table 1.

Table 1 : BS 8233 Recommended Internal Noise Levels

Activity	Location	Internal Noise Levels	
		Daytime 0700-2300hrs	Night-time 2300-0700hrs
Resting	Living room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining room / area	40 dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	35 dB $L_{Aeq,8hr}$

2.8 BS 8233 clarifies that the above guidance relates only to noise without specific character (e.g. such as that which does not have a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content) and that where such characteristics are present, lower noise limits might be appropriate.

2.9 Regarding outdoor living areas, BS 8233 states that "*it is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB L_{Aeq}, which would be acceptable in noisier environments.*".

3.0 NOISE SURVEYS

Trewassa Noise Monitoring

3.1 Continuous noise monitoring was undertaken at a single location to the south of residential properties at Trewassa, which is a hamlet to the northwest/north-northwest of the WPF, identified as Noise Monitoring Location 1 in Figure 1. The monitoring was undertaken in sequential 15-minute samples over the period commencing at 1900hrs on Monday 19 April 2021 and concluding at 1100hrs on Tuesday 29 April 2021.

3.2 There is no meaningful data for the period 0700-1900hrs on Tuesday 20 April 2021. This is due to damage caused by cattle to the noise monitoring equipment, which occurred shortly after the early part of this period, and not discovered until later in the afternoon, after which the problem was rectified.

3.3 The noise monitoring was undertaken by deployment of a Norsonic 140 Class 1 Integrating Sound Level Meter (serial no. 1406529). Field calibration checks were carried out before and after the monitoring using a Bruel & Kjaer Acoustic Calibrator, Type 4231 (serial no. 2389221), and no variation in the calibration levels was observed. The measurement microphone was fitted with a windshield and mounted above the Cornish hedge at the north boundary of the field to the north of the WPF site, at ~3m above local ground (to either side of the hedge) to ensure free-field conditions and to minimise any noise from any wind in long grass.

3.4 Continuous audio recording was also undertaken over this period.

3.5 It is understood that operations at the WPF were generally normal and routine throughout the course of the noise monitoring period.

3.6 Table 2 provides the summary of the noise levels. To provide a suitable summary of the considerable quantity of data recorded, the range of $L_{Aeq,15min}$, $L_{Amax,15min}$ and $L_{A90,15min}$ values has been determined for each 1-hour period, along the logarithmic average of $L_{Aeq,15min}$ and arithmetic average of $L_{A90,15min}$.

3.7 Accounting for the appropriate assessment time intervals prescribed by BS 4142, the hourly data has been considered for the night-time period, as this shows the range of 15-minute values in each hour, whereas for the daytime period, for ease this has been averaged further in to each daytime 4-hour period, hence still showing the range of 1-hour values and illustrating the general variations over time. This results in a larger quantity of data for the night-time period being presented than for the daytime.

3.8 All 15-minute L_{Aeq}, L_{Amax} and L_{A90} values are plotted graphically in Appendix II.

3.9 The data in Table 2 demonstrates that generally noise levels were fairly steady over the monitoring period.

3.10 Typically, the L_{Aeq} and corresponding L_{A90} values were also close in values, indicating that noise levels were generally steady over the course of individual 15-minute sample periods. This is particularly the case during the night-time, when there is minimum incidental extraneous noise, either at the WPF, or more locally at the noise monitoring location.

3.11 On occasions when there is greater difference between L_{Aeq} and corresponding L_{A90} values, typically during the daytime and of up to 4-5dB, this was typically due to vehicle activity, at the WPF site, and potentially also at Trewassa or within the intervening field.

3.12 It has also been noted previously that weather conditions, and in particular the wind speed and direction, is a significant factor with regard to noise from the WPF at Trewassa.

3.13 Consideration of the measured third octave band noise levels demonstrates little variation in the character of the noise, and also a general absence of pronounced tonal components. The noise is generally dominant across a broad mid-frequency range of 250Hz-2kHz.

Table 2 : Summary of Noise Measurements at Trewassa

Summary Time Period Start	Noise Level dB (T=15min)					Summary Time Period Start	Noise Level dB (T=15min)				
	$L_{Aeq,T}$		$L_{Amax,T}$	$L_{A90,T}$			$L_{Aeq,T}$		$L_{Amax,T}$	$L_{A90,T}$	
	Range	Ave.	Range	Range	Ave.		Range	Ave.	Range	Range	Ave.
19/04 1900	45-47	46	48-68	44-46	45	24/04 2300	46-47	47	49-63	45-45	45
19/04 2300	46-47	46	48-52	45-46	45	24/04 0000	46-46	46	50-52	45-45	45
20/04 0000	45-46	46	49-50	44-45	44	25/04 0100	46-46	46	49-54	45-45	45
20/04 0100	45-46	45	48-50	44-45	45	25/04 0200	46-47	46	51-65	45-45	45
20/04 0200	46-47	46	48-52	45-46	45	25/04 0300	46-46	46	50-61	45-45	45
20/04 0300	46-47	47	50-55	45-46	45	25/04 0400	46-47	46	51-60	45-45	45
20/04 0400	45-47	46	49-61	45-45	45	25/04 0500	47-50	49	59-72	45-46	45
20/04 0500	45-47	46	51-60	44-45	45	25/04 0600	47-49	48	62-66	45-46	46
20/04 0600	46-46	46	55-60	43-44	44	25/04 0700	48-50	49	57-67	45-47	46
20/04 1900	45-49	46	51-72	43-46	44	25/04 1100	48-51	49	58-71	45-47	46
20/04 2300	45-50	48	50-63	45-46	45	25/04 1500	48-50	49	58-75	45-46	46
21/04 0000	46-48	46	49-63	45-45	45	25/04 1900	46-49	47	51-61	45-46	45
21/04 0100	45-46	46	49-60	44-45	45	25/04 2300	46-47	46	50-57	45-45	45
21/04 0200	45-46	45	48-56	44-45	45	26/04 0000	46-46	46	49-51	44-45	45
21/04 0300	46-47	46	49-56	45-46	45	26/04 0100	46-47	46	52-63	45-45	45
21/04 0400	45-46	46	48-53	45-46	45	26/04 0200	46-46	46	49-51	45-45	45
21/04 0500	46-49	47	49-60	45-47	46	26/04 0300	46-47	46	50-63	45-45	45
21/04 0600	47-48	47	57-62	46-46	46	26/04 0400	46-47	46	50-54	45-45	45
21/04 0700	46-49	47	56-69	45-46	45	26/04 0500	47-48	47	54-68	45-46	45
21/04 1100	46-50	47	53-73	44-45	45	26/04 0600	49-51	50	62-71	46-47	46
21/04 1500	46-49	47	55-69	45-46	45	26/04 0700	47-51	49	57-67	44-47	46
21/04 1900	46-49	46	51-68	44-46	45	26/04 1100	44-50	47	53-79	40-45	42
21/04 2300	46-47	46	50-55	45-45	45	26/04 1500	45-47	46	58-69	40-42	42
22/04 0000	46-46	46	51-54	45-45	45	26/04 1900	44-46	45	50-65	42-45	43
22/04 0100	46-46	46	49-52	45-45	45	26/04 2300	42-44	44	45-53	41-44	43
22/04 0200	46-47	46	49-53	45-45	45	27/04 0000	42-45	44	47-51	41-44	43
22/04 0300	46-46	46	49-52	45-45	45	27/04 0100	44-46	45	47-51	43-44	43
22/04 0400	46-46	46	50-54	45-45	45	27/04 0200	45-47	46	50-51	43-46	45
22/04 0500	46-49	47	56-70	45-45	45	27/04 0300	45-46	45	50-59	43-45	44
22/04 0600	47-49	48	56-61	46-46	46	27/04 0400	45-46	45	49-55	44-45	44
22/04 0700	47-51	49	56-70	45-47	46	27/04 0500	47-48	47	51-66	44-46	45
22/04 1100	47-50	48	57-68	46-47	46	27/04 0600	47-53	51	57-69	46-49	47
22/04 1500	46-51	49	55-69	45-48	46	27/04 0700	44-52	48	57-70	41-48	44
22/04 1900	46-47	46	49-61	44-46	45	27/04 1100	43-51	46	54-71	39-42	41
22/04 2300	46-47	46	49-51	45-46	45	27/04 1500	44-49	47	55-69	41-44	42
23/04 0000	46-47	46	50-55	45-46	45	27/04 1900	44-49	45	48-74	42-44	43
23/04 0100	47-47	47	50-51	45-46	45	27/04 2300	43-44	43	49-56	40-42	41
23/04 0200	47-47	47	50-58	45-46	45	28/04 0000	43-45	44	48-66	41-42	42
23/04 0300	47-47	47	50-54	46-46	46	28/04 0100	43-46	44	47-68	41-42	42
23/04 0400	47-48	47	50-69	46-46	46	28/04 0200	43-44	44	47-56	41-42	42
23/04 0500	47-49	48	59-69	46-46	46	28/04 0300	42-43	43	47-49	40-41	41
23/04 0600	48-53	51	60-65	46-49	47	28/04 0400	43-45	44	47-55	41-44	42
23/04 0700	48-52	50	60-71	46-49	47	28/04 0500	45-47	46	53-70	44-45	44
23/04 1100	47-51	49	55-67	46-47	46	28/04 0600	46-48	47	56-69	43-45	44
23/04 1500	47-51	50	59-71	45-48	47	28/04 0700	45-47	46	56-67	42-46	44
23/04 1900	46-48	47	50-62	45-46	45	28/04 1100	43-48	45	54-72	41-44	42
23/04 2300	46-46	46	51-53	45-45	45	28/04 1500	44-49	45	56-73	41-43	42
24/04 0000	46-46	46	51-54	45-45	45	28/04 1900	44-46	46	49-66	41-45	44
24/04 0100	46-47	47	50-52	45-45	45	28/04 2300	44-46	45	48-56	43-45	44
24/04 0200	46-47	47	50-63	45-45	45	29/04 0000	43-43	43	46-53	41-42	42
24/04 0300	46-47	47	51-54	45-45	45	29/04 0100	42-44	43	49-55	41-42	41
24/04 0400	46-47	47	50-53	45-45	45	29/04 0200	44-44	44	49-57	43-43	43
24/04 0500	47-48	47	50-63	45-46	45	29/04 0300	44-45	44	47-52	42-44	43
24/04 0600	48-51	49	59-64	46-47	47	29/04 0400	45-46	45	52-55	44-45	44
24/04 0700	49-53	51	59-69	46-49	48	29/04 0500	46-49	48	52-72	45-47	46
24/04 1100	50-53	51	60-71	47-50	48	29/04 0600	48-51	50	59-63	46-47	47
24/04 1500	48-52	50	59-74	45-49	47	29/04 0700	47-51	49	58-71	45-48	46
24/04 1900	46-47	46	50-68	45-45	45	29/04 1100	44-48	46	55-67	41-46	44

On-site Noise Measurements

3.14 A set of reference noise level measurements was undertaken on Tuesday 20 April 2021 at the WPF site in locations near to individual fixed items of noise generating equipment, groups of fixed items, and buildings housing such items.

3.15 The on-site noise measurements were carried out using a Norsonic 118 Class 1 Integrating Sound Level Meter (serial no. 31617). Field calibration checks were carried out before and after the measurements using a Bruel & Kjaer Acoustic Calibrator, Type 4231 (serial no. 2389221), and no variation in the calibration levels was observed. The measurement microphone was fitted with a windshield.

3.16 Several measurement locations are directly equivalent to locations used for a similar exercise in 2018 and in 2020, whereas others are new to this study. The survey locations used for the 2021 on-site noise measurements are identified in Figure 2 and described in Table 3 along with the overall measured noise levels, and comparisons to 2018 and 2020 noise levels where available.

3.17 The L_{eq} and L_{90} third octave band noise levels corresponding to each of the above measurements are provided in Appendix III.

Table 3 : Summary of On-Site Noise Measurements

2021 Location Number (as per Fig. 2 this report)	2020 Location Number (as per Fig. 2 2020 report)	2018 Location Number (as per Fig 2 2018 report)	Description	Noise Level dB				
				2021		2020		2018
				L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}	L_{A90}
1	1		5m in front of centrifuge, facing SW unit	57	56	65	63	
1a			5m to side of centrifuge, facing SW unit	64	63			
1b			1m from open door at gantry level	75	75			
1c			Inside first floor area of centrifuge	84	84			
2	2	6	5m in front of centrifuge, between units	57	56	65	63	62
3	3		5m in front of centrifuge, facing NE unit	56	55	66	63	
4	4		On path NW of tank, facing loose pipe hanging down	56	55	64	63	
5	5	1	On gantry between BT1 and Divert	71	70	71	71	78
5a			1m above covering of BT1	67	67			
5b			1m above covering of Divert	63	62			
6	6	2	Ground level between BT1 and Diver	74	73	74	73	82
6a			1m from 2 pumps on ground to south of BT1	77	76			
7	7	3	Midway between outside edges of BT1 and Divert	68	68	70	69	65
8	8	4	Above manhole set back from BT1 and Divert	53	53	65	64	60
9	9	5	At site boundary set back from BT1 and Divert	51	50	60	59	53
10	10		1m from ground level pump towards W of BT1	77	77	79	78	
11	11		1m from ground level pump towards N of BT1	77	77	76	75	
12	12	9	To rear of DAF 2			63	62	77
13	13	10	At boundary to rear of DAF 2			60	59	61
14	14	14	1m to foot of gantry at N of AT2	67	66	69	68	56
15	15		At boundary to N of AT2	60	60	62	62	
16	16	15	1m to foot of gantry at SE of AT2	56	55	76	75	50
16a			1m to foot of gantry at S of AT2	70	69			
16b			At site boundary to S of AT2	63	63			
17	17	16	At gantry level - running water	73	72	71	71	68
18	18	8	5m from open shutter of DAF2	68	67	64	63	72
19	19		1m from turret to N of DAF1 extension	70	70	72	72	
19a			1m from turret to centre of DAF1 extension	73	72			
19b			1m from turret to S of DAF1 extension	74	74			
19c			1m from tonal noise emitting pipework to S of DAF1	76	74			
20	20		1m to W right corner of DAF1 extension	66	65	67	67	
21	21		5m from front DAF1 extension	67	66	68	67	

2021 Location Number (as per Fig. 2 this report)	2020 Location Number (as per Fig. 2 2020 report)	2018 Location Number (as per Fig 2 2018 report)	Description	Noise Level dB				
				2021		2020		2018
				L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}	L_{A90}
21a			1m from front DAF1 extension	70	70			
22	22	17	1m from shorter of ground level pumps	72	71	72	71	90
23	23	17	1m from longer of ground level pumps	69	68	73	72	90
24	24		On metal steps over plinth wall	75	74	75	74	
25	25		1m pump to south of BT1	79	78	79	78	
25a			1m from ground level pump towards E of BT1	80	79			
26	26		1m from pump to N side of Siltbuster	81	79	84	83	
27	27		2m to E (rear) side of Siltbuster	73	72	76	76	
28	28	7	5m from open door to DAF1	74	74	70	69	71
28a			10m from open door to DAF1	70	69			
29	29	19	Rear of DAF1	74	74	75	75	71
29a			2m from main louvre to rear of DAF2	82	82			
29b			2m above centre of general external plant area	81	80			
30	30		2m from unit, 1m from fan outlet	73	72	73	72	
31	31	12	On gantry - 1m from AT1a aerator to N	79	78	78	78	67
32	32	13	On gantry - 1m from AT1b aerator/blower to N			71	70	78
32a			Elevated microphone - 1m from AT1a aerator/blower to E	75	75			
32b			Elevated microphone - 1m from AT1b aerator/blower to E	77	76			
33	33		2m from pumps	73	72	74	74	
34	34	20	At site boundary 2m from pumps	68	65	68	67	67
35			1m from ARP	63	62			
36			1m to rear of containers	62	62			
37			1m to front at side of containers	58	57			
38			1m to front at centre of containers	64	61			

Additional Noise Measurement Exercise

3.18 A further noise measurement exercise was undertaken on the afternoon of Thursday 29 April 2021, during which, insofar as was operationally possible, principle items of plant at the WPF were sequentially switched off, until such a point that nothing further could be switched off, and were then sequentially switched back on.

3.19 During this period, noise levels were measured at Noise Monitoring Location 1 (identified in Figure 1) in sequential 30-second samples. Notwithstanding that this location was intended as the assessment location of interest, due to a number of factors, chiefly the wind conditions at the time of the exercise (generally northerly, hence reducing WPF noise towards the north) a secondary measurement location was used concurrently. As such, noise levels were measured at Noise Monitoring Location 2 (identified in Figure 1) in sequential 30-second samples over the same overall period. Subjective observations were also made at Noise Monitoring Location 2, with radio contact to WPF operatives switching the plant on and off.

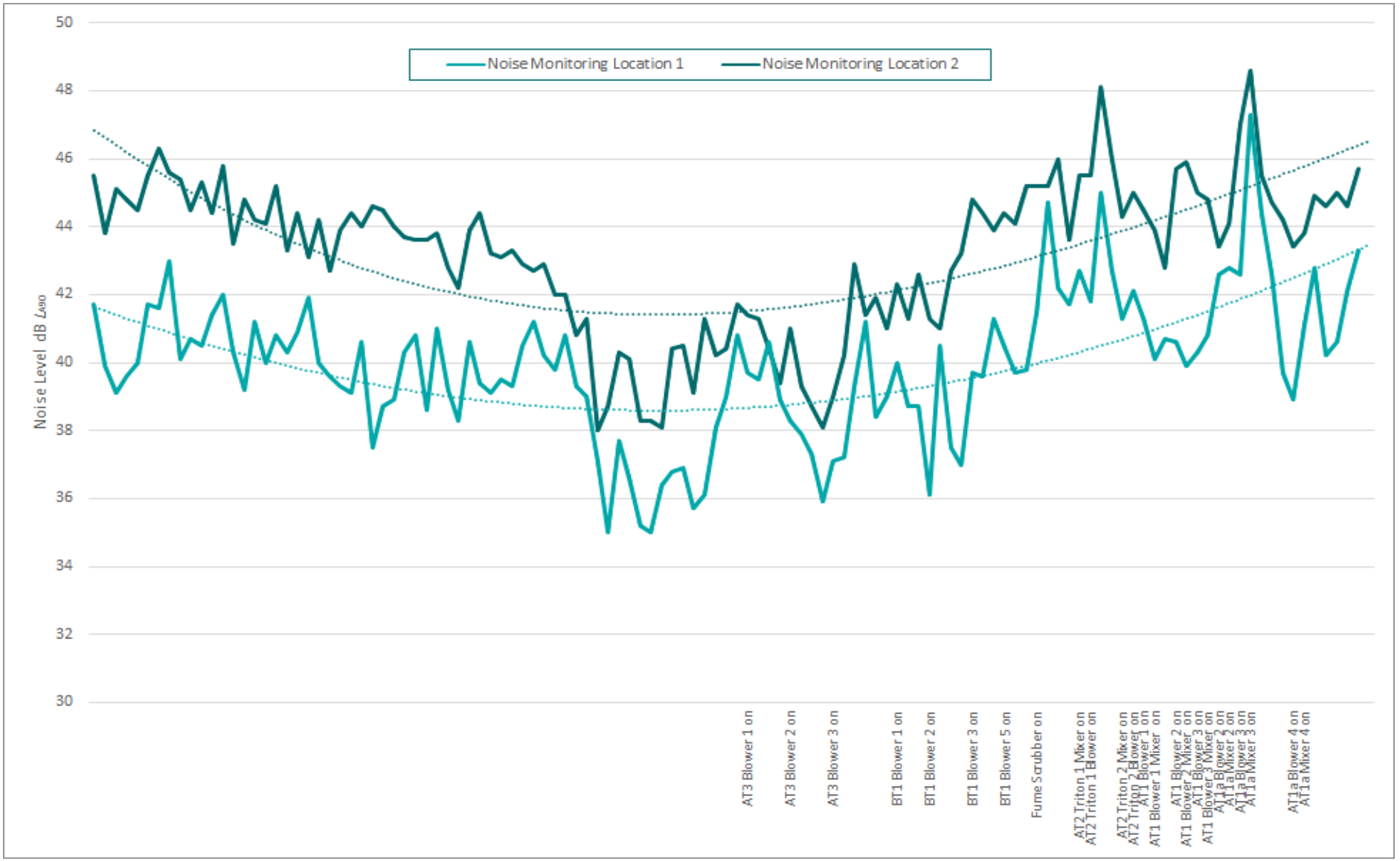
3.20 The above noise measurements were carried out using a Norsonic 118 Class 1 Integrating Sound Level Meter (serial no. 31617) at Noise Monitoring Location 1 and a Norsonic 140 Class 1 Integrating Sound Level Meter (serial no. 1406529) at Noise Monitoring Location 2. Field calibration checks were carried out before and after the monitoring using a Bruel & Kjaer Acoustic Calibrator, Type 4231 (serial no. 2389221), and no variation in the calibration levels was observed. The measurement microphone was fitted with a windshield and mounted at ~3m above local ground at Noise Monitoring Location 1, and at 1.5m above local ground at Noise Monitoring Location 2.

3.21 Switching off plant items was carried out in a relatively ad hoc fashion to reach the situation of minimum possible plant operation and hence, nominally, minimum overall noise emissions. From there, plant was switched on more methodically, with timings noted for each item starting up.

3.22 All 30-second L_{Aeq}, L_{Amax} and L_{A90} values are plotted graphically in Graph 1. As the items of plant that were switched on and off all operate with steady noise emissions, the L_{A90} noise index is of greatest interest to this study, as this parameter helps to reduce the influence of extraneous noise.

3.23 Graph 1 shows the time history of 30-second L_{A90} values at both locations, including annotations of the timings of switching various items of plant back on. A trendline has been added to reflect how the actual measured data is influenced significantly by extraneous noise, but that the trend of a steady reduction in noise levels during switching off of plant, and subsequent increase during switching on, is clearly evident.

Graph 1 – Measured $L_{A90,30second}$ Noise Levels During Plant On/Off Exercise



3.24 It was noted during the monitoring that noise from seagulls, and also distant light aircraft and road traffic and other extraneous sources, also affected the noise measurements.

3.25 Generally, where subjective observations were made, it was not possible to readily identify noticeable step-changes in noise level when items were switched on. There was some exception of this is the case of certain plant items to the north of the WPF site, hence closest to Noise Monitoring Location 2, however even in those cases, the perceived change was very slight and would not normally be noticed.

3.26 Graph 1 and the above descriptions therefore illustrate that, although noise levels during the monitoring did fluctuate fairly substantially over time, this was more attributable to extraneous noise. However, it is nonetheless evident from the data containing less extraneous noise, and from subjective impressions formed, that there was a gradual and smooth reduction in noise from the WPF during the period that plant items were being switched off, rather than it being clear and obvious when any one item is switched on/off.

4.0 ASSESSMENT OF MEASURED NOISE LEVELS

4.1 The noise assessments undertaken in 2018 and 2020 included assessments with reference to the guidelines set out in BS 4142. As a very broad summary, it was concluded that overall noise levels were broadly equivalent across the 2018 and 2020 noise surveys, at about 48-50dB L_{Aeq} in typical worst-case conditions. This accounted for variations relating to plant operation and also wind conditions. Noise levels were somewhat lower in more favourable conditions (i.e. northerly winds), when specific noise levels less than 45dB L_{Aeq} were common.

4.2 The assessments noted that the monitoring location at Trewassa is closer to the WPF than any of the nearby residences, such that noise levels at the actual residential locations will be at least 2dB lower, i.e. a typical worst-case specific noise level of 46-48dB L_{Aeq}. This applies where line-of-sight exists; elsewhere the noise levels will be reduced further due to acoustic barrier effects.

4.3 The assessment in 2018 included a +4dB acoustic feature penalty due to certain tonal components, however as these noise sources had been removed by 2020, the penalty was not applied to the later assessment. As such, although the overall noise level was comparable, the noise in 2020, compared to in 2018, was a far more broadband and steady accumulated noise, of relatively benign characteristics. Accounting for removal of the +4dB acoustic feature penalty included in the 2018 assessment, the overall conclusion was therefore that the quantifiable impact had reduced by 4dB based on the 2020 monitoring.

4.4 Considering the new 2021 data, it can be seen that noise levels were broadly at about 45-47dB L_{Aeq} for much of the survey, though were typically reduced further to 43-45dB L_{Aeq} towards the final part of the monitoring period. However, it is also understood that the wind conditions were broadly northerly and easterly throughout most of the monitoring period, which would lead to an expectation of slightly lower noise levels.

4.5 Therefore, it is likely that while there may have been some further reductions in noise from the WPF since April 2020, the impact on the overall noise levels may be slight.

4.6 Considering the on-site noise measurements, generally most plant noise emissions are comparable in 2021 to those in 2020. Mostly, individual variations in noise are of 1-2dB, or in some cases up to 4dB. There has been a notable reduction in on-site noise from the centrifuges of about 7-8dB, however this is unlikely to have resulted in an appreciated reduction in overall WPF noise at Noise Monitoring Location 1. Larger variations between 2021 and 2020 are observed only as a result of items operating during one survey and not the other.

4.7 The other notable exception to the above is at Locations 8 and 9, as per Figure 2, at which noise levels have reduced by 12dB and 9dB respectively. This is due to the introduction of a new 3m high acoustic barrier in this area of the site, which was introduced after the 2020 noise survey. This barrier is clearly providing a good level of reduction of noise from low level plant items around the base on the BT1 and Divert Tanks. As these are the some of the nearest plant items to Noise Monitoring Location 1, it is likely that introduction of the acoustic barrier may have resulted in a modest reduction in overall noise levels at Trewassa.

4.8 In respect of BS 4142, in previous assessments the rating level has been compared to background noise measurements taken at locations remote from Noise Monitoring Location 1, in areas where WPF noise was not substantially noticeable, to obtain a notional background noise level in the absence of any WPF noise. In line with BS 4142, the initial estimate of the impact based on a notional background noise environment, which does not include WPF noise, clearly indicated a significant adverse impact, depending on the context. This would still be the case based on the 2021 data.

4.9 However, assessment on this basis needs to be treated with caution, as the WPF is essentially a permanent noise source, so comparison to those background noise levels represents an artificial scenario, not one experienced at the actual receptors. Conversely, given that the background noise environment at actual receptors is in fact controlled by the same WPF noise as the specific, any BS 4142 initial estimate of the impact assessment based on comparison to measurable background noise levels may tend towards an under-estimation of impact.

4.10 Accordingly, consideration of absolute noise levels is potentially more appropriate as measure of noise impact in this case, as set out in previous assessments. As per the findings of those assessments, it is considered that, where possible, further reductions in WPF noise would be warranted.

4.11 Based on this assessment, further to ongoing implementation of measures to control noise emissions, it is found to be increasingly the case that no single specific item of plant is especially dominant in the overall noise at Trewassa. Rather, the low level of steady, continuous and broadband noise is a product of the accumulated noise from the many processes and plant items at the site.

4.12 Nonetheless, it is considered that the noise sources at gantry level are significant. To an extent, this is because these noise sources to not benefit from significant levels of acoustic screening from intervening structures, or from ground absorption, in the way that ground level noise sources do.

4.13 It may therefore be that these noise sources may be mitigated, potentially including full or partial enclosure of the blower units associated with aerators in their current location, or relocation of the blower to ground level locations, which is likely to be beneficial on its own, and will potentially also make applying further mitigation (if necessary) more straightforward.

4.14 It is also considered that noise emissions associated with the DAF1 extension may potentially be controlled, for example, by introduction of proprietary in-line silencers within the ductwork prior to the exhaust turrets on this building.

5.0 SUMMARY AND CONCLUSION

5.1 A noise assessment relating to the Water Processing Facility (WPF) associated with the Davidstow Creamery has been carried out.

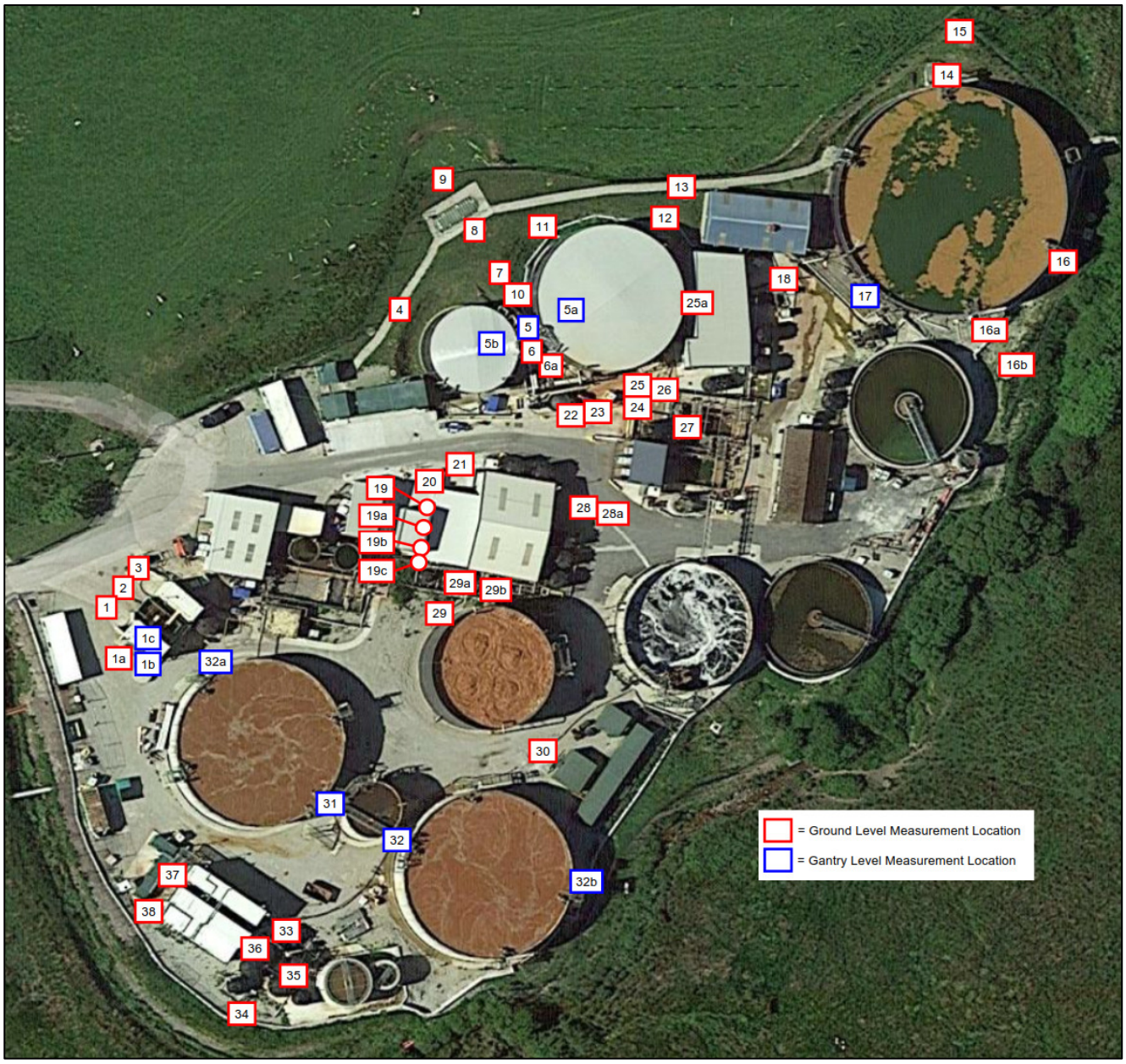
5.2 A detailed programme of noise measurements has been undertaken on and around the WPF site over an extended period.

5.3 The measured data has been assessed with comparison to an earlier noise assessment undertaken in 2018 and 2020, and with reference to relevant British Standard guidelines.

5.4 Some outline recommendations have been provided for other potential measures to reduce noise emissions further.

Figure 1: Off-Site Noise Measurement Locations

Figure 2: On-Site Noise Measurement Locations



Appendix I: Noise Units & Indices

Sound and the decibel

A sound wave is a small fluctuation of atmospheric pressure. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. In order to cope with this wide range of pressure variations, a logarithmic scale is used to convert the values into manageable numbers. Although it might seem unusual to use a logarithmic scale to measure a physical phenomenon, it has been found that human hearing also responds to sound in an approximately logarithmic fashion. The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120dB (threshold of pain).

Due to the logarithmic nature of decibels, when two noises of the same level are combined together, the total noise level is (under normal circumstances) 3 dB(A) higher than each of the individual noise levels e.g. 60 dB(A) plus 60 dB(A) = 63 dB(A). In terms of perceived 'loudness', a 3 dB(A) variation in noise level is a relatively small (but nevertheless just noticeable) change. An increase in noise level of 10 dB(A) generally corresponds to a doubling of perceived loudness. Likewise, a reduction in noise level of 10 dB(A) generally corresponds to a halving of perceived loudness.

The ear is not equally sensitive to sound at all frequencies. It is less sensitive to sound at low and very high frequencies, compared with the frequencies in between. Therefore, when measuring a sound made up of different frequencies, it is often useful to 'weight' each frequency appropriately, so that the measurement correlates better with what a person would actually hear. This is usually achieved by using an electronic filter called the 'A' weighting, which is built into sound level meters. Noise levels measured using the 'A' weighting are denoted dB(A) or dBA.

Frequency and Hertz (Hz)

As well as the loudness of a sound, the frequency content of a sound is also very important. Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or hertz (Hz). Sometimes large frequency values are written as kiloHertz (kHz), where 1 kHz = 1000 Hz.

Young people with normal hearing can hear frequencies in the range 20 Hz to 20 kHz. However, the upper frequency limit gradually reduces as a person gets older.

Glossary of Terms

When a noise level is constant and does not fluctuate, it can be described adequately by measuring the dB(A) level. However, when the noise level varies with time, the measured dB(A) level will vary as well. In this case it is therefore not possible to represent the noise climate with a simple dB(A) value. In order to describe noise where the level is continuously varying, a number of other indices can be used. The indices used in this report are described below.

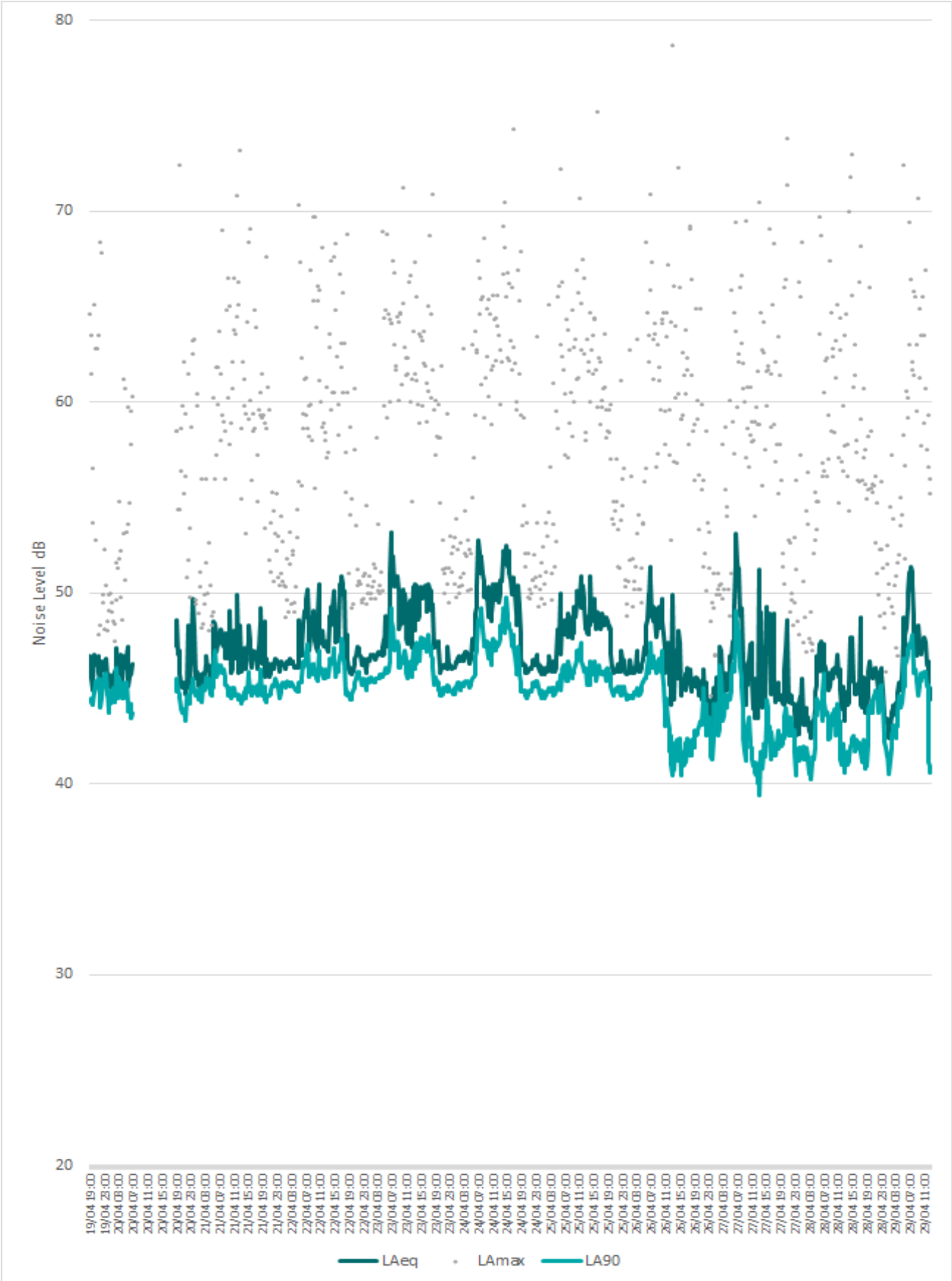
L_{Aeq} This is the A–weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period. In other words, L_{Aeq} is the level of a continuous noise which has the same total (A–weighted) energy as the real fluctuating noise, measured over the same time period. It is increasingly being used as the preferred parameter for all forms of environmental noise.

L_{Amax} This is the maximum A–weighted noise level that was recorded during the monitoring period.

L_{A90} This is the A–weighted noise level exceeded for 90% of the time period. L_{A90} is used as a measure of background noise.

L_{Ar} This is the rating sound level as defined with BS 4142, taking account of the specific noise level generated and any applicable acoustic feature penalties.

Appendix II: Off-site Noise Measurements at Noise Monitoring Location 1



Appendix III: On-site Noise Measurements

Third Octave L_{eq} data

Location No. (Fig 2)	Noise Level L_{eq} dB																							
	Third Octave Band Centre Frequency (Hz)																							
	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k
1	62	63	58	62	64	56	52	51	50	49	47	45	44	45	43	41	41	45	46	48	41	34	32	32
1a	65	62	63	63	63	63	61	59	55	56	53	52	53	52	53	50	50	52	52	53	45	43	42	37
1b	65	69	70	73	79	74	66	65	66	65	63	61	61	64	64	62	62	65	66	64	57	56	52	48
1c	70	77	75	73	85	80	74	75	75	74	72	71	71	73	74	71	71	75	75	74	67	66	64	60
2	64	61	59	60	62	57	54	53	48	47	47	45	44	43	43	41	41	43	44	46	43	33	32	31
3	63	61	60	61	60	56	53	51	50	46	44	44	45	45	43	41	41	43	42	47	40	31	30	28
4	64	64	56	58	58	52	54	49	48	49	49	47	47	46	46	44	42	39	38	37	35	32	29	24
5	67	67	67	64	63	64	63	60	63	64	63	60	62	63	61	60	58	55	54	54	52	48	49	42
5a	68	65	66	63	63	64	64	62	64	63	61	58	56	55	54	55	55	49	47	45	43	39	36	32
5b	66	60	61	61	59	58	59	57	58	57	56	54	53	52	53	53	48	46	44	43	39	36	33	26
6	68	70	66	65	63	63	63	62	62	64	64	60	64	69	64	63	61	59	58	60	57	53	55	48
6a	71	64	67	62	72	67	67	65	66	74	71	63	63	70	65	63	63	61	60	63	65	59	64	55
7	64	57	59	57	59	58	60	58	59	60	60	56	60	59	60	58	56	54	53	57	48	44	44	39
8	54	51	55	49	49	46	45	44	46	49	48	43	42	44	44	43	39	36	33	33	28	24	22	17
9	57	52	54	51	48	48	48	47	44	43	43	43	42	41	41	40	36	32	30	28	23	19	17	11
10	64	61	65	62	63	64	64	63	61	64	64	64	69	68	69	68	65	64	64	61	57	54	53	49
11	65	62	66	60	64	61	60	61	60	61	64	61	66	67	70	72	63	60	66	65	51	49	46	42
14	58	67	56	56	64	65	60	64	59	53	54	55	58	56	54	57	51	58	53	50	49	47	50	37
15	49	63	50	51	59	53	62	61	53	49	48	49	51	48	48	49	45	52	43	40	42	37	37	28
16	51	47	52	53	54	53	54	51	49	44	46	45	46	45	43	44	49	39	38	37	34	31	29	26
16a	60	52	56	58	62	63	62	67	60	56	55	56	61	57	57	60	64	52	55	54	50	48	47	47
16b	53	48	52	55	60	59	55	59	58	51	50	52	55	52	50	51	53	48	49	48	46	46	46	46
17	60	59	57	58	60	59	62	61	61	61	63	64	63	63	63	62	61	60	60	59	58	57	55	53
18	62	55	59	59	59	57	59	58	62	59	60	57	59	57	58	57	57	54	52	56	51	46	46	40
19	72	65	65	77	67	65	73	67	63	67	64	60	61	56	57	55	55	55	52	52	51	48	45	44
19a	83	71	70	82	73	65	75	73	64	66	63	61	61	57	58	57	56	58	55	57	61	58	58	59
19b	80	74	78	91	70	64	71	70	67	67	63	63	62	57	60	57	56	55	55	55	56	55	51	50
19c	80	63	63	67	77	70	81	76	67	71	64	61	67	63	64	62	63	60	58	56	53	50	47	45
20	71	59	66	78	64	59	61	59	58	58	57	56	58	54	54	51	50	49	47	44	44	43	39	35
21	80	65	63	72	62	61	64	61	60	58	59	58	59	56	56	54	53	52	50	51	46	45	40	37
21a	77	65	59	69	65	61	70	60	60	59	59	60	64	60	59	58	58	59	57	56	51	49	46	43
22	67	61	63	69	67	63	62	61	62	61	60	59	59	61	61	61	59	59	60	60	58	63	59	58
23	69	63	64	69	65	61	64	61	62	63	60	60	58	58	58	57	56	54	54	54	53	57	48	48
24	74	63	67	68	66	70	67	65	67	65	67	64	66	67	67	64	63	59	57	57	53	51	48	45
25	72	66	69	66	68	69	68	64	68	68	70	67	71	71	72	68	68	63	62	60	55	53	50	48
25a	63	64	68	66	65	65	64	63	66	65	69	66	71	72	73	71	67	65	64	62	58	55	54	50
26	76	66	65	67	66	68	67	64	69	66	70	66	67	70	75	71	73	64	60	57	54	50	50	47
27	69	62	63	63	63	62	65	63	65	62	63	62	62	63	64	62	63	61	58	57	54	52	50	47
28	73	64	64	69	64	65	69	67	67	66	64	64	66	64	64	63	62	62	61	60	59	58	55	51
28a	71	63	66	67	63	61	61	62	63	62	60	60	61	59	60	59	58	57	56	55	53	52	48	44
29	71	65	63	68	69	64	69	66	66	66	64	65	67	65	64	63	64	61	60	58	57	55	53	50
29a	82	69	67	71	72	69	74	72	73	76	73	72	76	73	72	70	70	69	68	67	65	64	61	57
29b	77	69	66	78	75	67	71	68	70	71	68	68	71	69	70	72	71	68	67	67	66	65	64	64
30	74	77	83	82	73	68	70	68	68	68	64	63	66	63	61	58	56	55	52	57	49	46	44	42
31	66	64	66	68	70	73	74	77	75	62	67	68	69	67	65	66	65	68	63	62	68	60	61	57
32a	67	65	70	70	69	68	68	72	68	63	63	66	66	64	63	66	61	65	62	59	58	51	53	45
32b	70	67	69	69	67	69	70	69	67	67	67	67	67	67	67	66	63	65	63	61	61	55	59	52
33	66	60	60	60	58	58	61	68	57	56	57	57	57	55	68	61	62	60	62	58	59	62	63	53
34	64	56	53	54	53	54	54	50	51	55	54	50	54	50	52	53	48	49	46	52	44	48	67	53
35	71	59	59	58	56	58	57	59	54	54	62	54	52	50	50	48	49	45	42	43	38	37	53	39
36	63	58	66	56	55	55	56	52	52	54	53	52	54	52	54	52	49	46	45	42	38	34	32	27
37	62	53	56	58	58	57	56	55	59	50	48	46	44	44	46	42	41	42	42	42	40	37	40	34
38	60	54	57	52	52	57	55	55	67	54	48	46	46	45	48	46	45	45	45	57	45	36	37	30

Third Octave L_{90} data

Location No. (Fig 2)	Noise Level L_{90} dB																							
	Third Octave Band Centre Frequency (Hz)																							
	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k
1	57	59	56	58	62	54	51	50	48	47	46	44	43	44	43	40	40	44	44	43	37	33	31	28
1a	59	58	60	60	62	60	59	58	53	55	52	50	52	51	52	50	49	51	51	50	44	42	41	36
1b	61	63	67	69	78	72	64	64	65	64	62	60	60	63	64	61	61	64	64	63	56	55	51	47
1c	67	68	72	71	80	76	72	73	73	72	71	69	70	72	73	70	70	74	74	73	66	66	63	60
2	59	55	56	57	60	55	52	52	47	46	46	44	43	42	42	41	40	42	42	41	39	32	31	27
3	58	57	57	58	58	54	51	50	48	45	43	43	44	44	43	41	40	42	41	38	32	30	28	23
4	61	57	55	56	54	51	52	48	46	47	48	45	46	45	45	43	41	39	38	36	33	31	29	23
5	64	65	60	61	60	61	61	59	61	63	62	59	61	62	60	59	57	54	53	53	51	47	48	42
5a	63	60	62	61	61	62	62	61	62	62	60	57	55	54	53	54	54	48	47	44	42	39	36	31
5b	63	56	58	59	57	56	57	56	57	56	55	52	52	51	52	52	47	45	44	42	38	35	32	26
6	65	65	62	62	61	60	62	60	61	63	63	59	62	67	63	62	60	58	57	59	56	53	54	47
6a	67	61	62	60	69	65	65	63	64	71	68	61	62	69	64	61	61	60	59	60	61	57	60	54
7	61	54	57	54	57	57	58	56	58	59	59	54	59	58	59	57	55	54	52	51	46	44	44	38
8	50	48	50	47	47	44	43	42	44	48	46	41	41	42	43	43	38	35	32	31	27	23	21	16
9	54	49	49	49	46	46	47	45	43	42	42	42	41	40	40	39	35	32	29	27	22	18	15	10
10	61	59	60	59	60	62	62	61	60	63	63	63	68	68	68	67	65	64	63	60	56	54	53	49
11	62	59	61	57	61	59	59	60	58	60	63	60	65	66	69	71	62	59	65	64	51	48	46	41
14	56	64	54	54	61	63	58	62	58	51	53	54	57	55	53	57	51	56	52	50	48	47	48	36
15	46	60	48	49	55	51	60	59	51	48	46	48	50	47	46	48	44	48	43	39	39	36	36	27
16	48	44	49	49	51	51	52	50	48	43	44	44	45	44	42	43	47	38	37	35	31	29	28	25
16a	56	49	53	55	59	61	60	66	58	55	53	55	60	56	56	59	61	52	54	52	49	47	47	47
16b	50	46	48	53	58	57	52	57	56	50	49	51	54	51	49	50	52	48	49	48	46	45	45	46
17	55	55	54	55	58	58	60	59	59	60	62	63	63	62	62	61	60	59	59	58	57	56	54	52
18	59	52	57	56	57	55	57	56	57	57	58	56	57	56	57	57	55	53	51	51	50	46	45	40
19	68	62	63	75	64	63	69	65	61	66	63	59	59	55	57	54	53	54	51	50	48	46	42	41
19a	80	69	69	81	68	64	73	67	62	64	61	60	59	56	57	56	55	56	54	56	61	58	57	58
19b	78	72	78	91	69	63	68	68	65	64	62	61	60	56	59	56	55	55	54	54	55	54	50	49
19c	77	61	61	65	70	69	80	71	65	67	62	59	63	60	60	60	59	57	55	53	52	49	47	44
20	67	57	65	78	61	58	60	57	56	57	56	55	57	53	53	50	50	48	46	44	43	42	38	35
21	79	63	61	71	60	59	61	60	58	57	58	57	57	55	55	54	52	52	50	47	45	44	40	37
21a	75	64	57	66	61	60	67	59	57	58	58	59	62	58	58	58	58	59	57	53	51	49	45	42
22	64	58	60	67	64	61	61	59	60	59	59	58	58	60	60	59	58	58	59	58	58	62	58	57
23	64	61	61	67	62	60	61	60	60	61	59	58	57	57	58	56	55	54	53	52	52	56	48	47
24	68	61	64	65	64	67	65	63	65	63	66	63	64	66	66	63	62	58	56	54	52	50	47	44
25	67	63	64	63	65	67	65	62	65	66	68	66	68	70	71	67	67	62	60	58	54	51	49	46
25a	60	61	63	62	63	64	63	62	64	64	67	65	70	71	72	70	67	65	63	61	58	55	53	49
26	72	63	62	64	63	66	65	63	68	65	69	65	66	67	72	68	70	63	59	55	53	50	49	46
27	65	59	59	61	61	60	63	62	64	61	62	61	61	62	62	61	61	60	57	56	54	51	50	46
28	70	61	62	68	61	63	66	65	65	65	63	63	65	63	63	63	62	61	61	60	59	57	54	50
28a	70	59	60	67	62	62	65	64	63	64	62	62	64	62	64	62	61	61	60	59	58	57	54	49
29	67	60	63	65	61	59	59	61	62	60	59	59	60	58	59	58	57	56	55	54	53	51	48	43
29a	66	61	60	66	67	63	67	63	65	64	63	64	66	64	63	62	63	60	60	57	56	54	52	49
29b	80	67	64	67	70	68	72	70	71	74	72	71	73	71	72	69	69	68	67	66	65	63	60	57
30	74	68	65	77	74	65	70	66	68	69	66	67	69	68	69	71	70	67	67	66	65	64	63	63
31	71	75	80	79	71	66	68	66	66	67	63	62	65	62	60	58	55	54	52	49	47	45	43	41
32a	61	62	63	65	68	71	72	75	73	61	65	67	68	66	64	65	64	67	62	62	66	59	59	55
32b	62	62	67	68	67	65	67	71	67	61	62	65	65	63	62	66	60	64	61	59	57	51	50	45
33	67	64	66	67	65	67	69	68	66	65	66	66	65	66	65	65	62	64	62	60	59	54	57	51
34	63	58	57	58	56	56	60	67	56	55	55	55	56	54	63	59	60	59	61	57	58	61	62	53
35	61	53	51	51	51	52	52	49	50	54	53	49	53	50	51	52	48	48	46	48	42	46	64	51
36	65	56	56	54	52	54	55	57	53	53	58	52	50	49	48	48	47	44	41	42	38	37	51	38
37	60	56	65	54	54	53	54	51	50	53	52	51	53	51	53	52	48	46	44	42	38	33	31	26
38	60	50	55	56	55	56	54	53	57	49	47	45	43	43	45	41	40	41	40	41	38	35	37	32