

BIOSSENCE POLEGATE LTD

BIOMASS CHP FACILITY, COPHALL WOOD

ADDENDUM TO NOISE IMPACT ASSESSMENT FIRST DRAFT

APRIL 2010

noise and vibration specialists



Biossence Polegate Ltd

Biomass CHP Facility, Cophall Wood

Addendum to Noise Impact Assessment

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1. BACKGROUND

Further to ongoing discussions Wealden District Council (WDC) and East Sussex County Council (ESCC), have raised concerns that weekend daytime background noise levels may be less than weekday periods. ESCC has confirmed that further noise monitoring is required to confirm that ambient and background baseline noise levels do not decrease significantly during weekend daytime periods. Additionally, calculated noise levels at receptors have been requested as single octave band levels in order to assess the impact of low frequency noise.

This document is provided as an addendum to Southdowns Biomass CHP facility noise impact assessment reference 1647w/Repfin to provide the additional information requested and to provide further support to the environmental statement and planning application.

2. NOISE MEASUREMENTS

Attended noise measurements were undertaken during daytime hours on a Sunday and unattended noise measurements were obtained over two consecutive weekend periods to obtain data on daily variations in noise levels, as described I further detail below.

2.1 Continuous Noise Monitoring

Continuous monitoring of baseline noise levels was undertaken approximately 1.5 m above local ground at LT1, a point approximately 5 m from the façade of 4 Nightingale villas, as shown on Figure A1 of Appendix A.

Noise levels were measured using a Rion NL-31 precision integrating sound level meter fitted with a weatherproof windshield. The sound level meter was powered by dry cell batteries and stored inside a weatherproof security box.

Measurements were obtained using the 'F' time weighting and A-weighting frequency network. The equipment was calibrated before and after the survey using a Rion NC-74 Class 1 Acoustic Calibrator to generate a calibration level of 94 dB at 1 kHz.

Hourly measurements were obtained for Saturday 6th, Sunday 7th, Saturday 13th, and Sunday 14th March 2010. The results of this survey are presented in Table B1 of Appendix B. Additionally, during the attended noise survey, a second Rion NL-31 sound level meter was used to obtain 5-minute sample noise measurements. This meter and the meter used for attended noise measurements operated with synchronised clocks to allow relative differences between the monitoring locations to be obtained. The results of the continuous 5-minute noise survey obtained at monitoring location LT1 are presented in Table B2 of Appendix B.

2.2 Attended Noise Monitoring

Supplementary attended short-term measurements were obtained on the 7th March 2010 at five locations ST1 – ST5, as shown on Figure A1, of Appendix A using a CEL 593 Type 1 Sound Level Analyser fitted with a CEL 250 microphone and windshield. This sound level meter was calibrated before and after noise measurements using a CEL 284/2 Acoustic Calibrator to generate a calibration level of 114 dB at 1 kHz. Noise measurements were obtained with the microphone set at 1.2 m above local ground using the FAST time constant. The results of this



survey are tabulated in Table B3 of Appendix B. $L_{Amax,F}$, $L_{A10,T}$, $L_{Aeq,T}$, and $L_{A90,T}$ noise levels were measured over three consecutive 5 minute periods from which the 15 minute cumulative level was calculated.

2.3 Weather

Weather conditions during the attended monitoring on 7th March were fair with no precipitation. Measurements of air temperature and relative humidity were 3.5°C and 53 % respectively. Wind speeds generally remained below 1 ms⁻¹. It was noted that at monitoring location ST5, which was slightly more exposed, wind speeds were slightly higher, although measurements indicated that these still remained below 2 ms⁻¹.

Weather records for the area (www.wunderground.com) are summarised in Table B4 and indicate that the weather was fairly stable during the monitoring periods with mean temperatures ranging between 3°C and 10°C whilst the mean relative humidity varied between 70% and 93%. Mean wind speeds remained below 5 ms⁻¹ and there was no recorded precipitation. Over the two weekend periods, the wind directions were North / Northeast and West / Northwest, respectively.

3. NOISE SURVEY RESULTS AND ANALYSIS

The results of the continuous noise monitoring survey are presented in graphical form on Figures A2 to A5 of Appendix A and tabulated in Table B1 of Appendix B. Daily ambient $L_{Aeq,16h}$ noise levels have been obtained using logarithmic, i.e. energy based, averaging and these are presented in Table 1 below. Mean maximum $L_{Amax,F}$ $L_{A10,T}$ and background $L_{A90,T}$ noise levels were obtained using arithmetic averaging and are also presented in this table. Overall mean daytime and night-time values are presented for each parameter and the range of levels from which mean values are obtained is shown in parentheses.

		Measured Noise Levels, dB re. 2 x 10 ⁻⁵ Pa.						
Day	Date	07:00 to 23:00 Hrs						
		L _{Amax,F}	L _{A10,16hr}	L _{Aeq,16 hr}	L _{A90,16 hr}			
Saturday	06-Mar-10	78 (75-87)	70 (67-70)	67 (63-68)	60 (48-64)			
Sunday	07-Mar-10	79 (74-86)	69 (66-70)	66 (62-68)	57 (45-63)			
Saturday	13-Mar-10	79 (75-87)	70 (67-71)	68 (63-69)	60 (47-65)			
Sunday	14-Mar-10	80 (76-100)	70 (67-72)	67 (62-69)	59 (44-65)			
Mean Values		79 (78-80)	70 (69-70)	67 (66-68)	59 (57-60)			

Table 1: Summary of Continuous Noise Survey Results, 6th, 7th, 13th and 14th March 2010

It is understood that weekend daytime CHP facility operations can be broken down into two modes, which are:

- Saturdays 07:30 15:00 hrs when all facility equipment operates and SRF and Woodchip building doors will periodically open for receipt of deliveries. The wood chip conveyor will also operate; and
- Saturdays 07:00 07:30 hrs and 15:00 23:00 hrs, and Sundays 07:00 23:00 hrs when all facility plant operates fully but SRF and Woodchip building doors will remain closed. The woodchip conveyor will not operate during this period.



Table 2 below presents a summary of the ambient and background noise levels obtained at LT1 (Nightingale Villas) broken down into these separate time periods.

Operating Bariad	Indox	LT1 Period Ambient and Background Noise Levels, dB
Operating Feriod	index	Mean
Saturday 07:00 - 15:00 hrs (site	L _{Aeq,1hr}	68
operating normally)	L _{A90,1hr}	63
Saturday 15:00 - 23:00 hrs (CHP	L _{Aeq,1hr}	67
site operating - no deliveries)	L _{A90,1hr}	57
Sunday 07:00 - 23:00 hrs (CHP	L _{Aeq,1hr}	67
site operating - no deliveries)	L _{A90,1hr}	58

Table 2: 4 Nightingale Villas – Summary of Weekend Period Ambient and Background Noise Levels

*Note: measurement data was obtained in hourly samples. It has therefore been necessary to include the 07:00 – 07:30 hrs period within the 07: - 15:00 hrs period when processing noise data.

The results of the attended sample noise measurements obtained on Sunday 7th March are summarised below in Table 3 based on the data presented in Table B3 of Appendix B.

Monitoring Loootion	Start	Dur.	Measure	d Noise Leve	els, dB re. 2	x 10 ⁻⁵ Pa.
Monitoring Location	Time	(mins)	L _{Amax,F}	L _{A10,5 min}	$L_{Aeq,5\ min}$	L _{A90,5 min}
ST1 - Nightingale Villas	10:05	15 min	82	76	73	67
(western boundary)	12:05	15 min	85	76	74	68
ST2 – CHP Northern Site Boundary	10:30	15 min	70	63	61	58
ST3 - Natewood Farm	10:55	15 min	71	63	61	58
ST4 - Brownings	11:20	15 min	71	65	63	60
ST5 - Nightingale Place	11:45 12:30	15 min 15 min	90 90	73 73	70 71	63 65

 Table 3: Summary of Attended Noise Monitoring 7th March 2010

During attendance at the noise monitoring locations, ST1 - ST5, it was observed that traffic noise from the A22 dominated the noise environment. This road is dual carriageway in this area and mostly subject to a 70 miles per hour speed limit. Consequently daytime noise levels are significantly elevated by this source.

Analysis of the attended 5-minute noise monitoring measurements has been undertaken in conjunction with the data obtained from the continuous unattended meter located at LT1 which logged data in 5-minute intervals. Mean level differences have been calculated between the attended locations, ST1 – ST5, and the unattended location LT1. A summary of the level differences is presented in Table 4 below.



	Mean Differences Between LT1 and Attended Monitoring Locations (ST1 - ST5), dB									
Measurement	ST1 - Nightingale Villas (western Boundary)	ST2 - Northern Site Boundary Farm		ST4 - Brownings	ST5 - Nightingale Place					
L _{Aeq} L _{A90}	7 5	-6 -4	-6 -3	-5 -4	3 1					

Table 4: Summary of Mean Level Differences between LT1 and Attended Monitoring Locations (ST1 – ST5)

The receptor level differences presented above in Table 4 above have been applied to the weekend, daytime mean noise levels presented in Table 2 to derive mean weekend, daytime period ambient and background noise levels for each of the receptor locations previously identified within Southdowns report reference 1647w/Repfin. A summary of the measured and calculated receptor levels is presented in Table 5 below.

		Weekend Da	ound Noise Levels (\$	ST1 - ST5), dB		
Period	Indice	R1 - Brownings	R2 - Nightingale Place	R3 - Nightingale Villas (western Boundary	R3 - Nightingale Villas (LT1) Mean Measured Level, dB	R4 - Natewood Farm
Saturday 07:00 - 15:00 brs (site operating	L _{Aeq}	63	71	75	68	62
normally)	L _{A90}	59	64	68	63	60
Saturday 15:00 - 23:00	L _{Aeq}	62	70	74	67	61
hrs (CHP site operating - no deliveries)	L _{A90}	53	58	62	57	54
Sunday 07:00 - 23:00	L _{Aeq}	62	70	74	67	61
- no deliveries)	L _{A90}	54	59	63	58	55

 Table 5: Receptor Daytime Weekend Period Ambient and Background Noise Levels

Comparison of the ambient and background noise levels presented above against those previously obtained during weekday, daytime periods indicates that weekend, ambient and background noise levels are similar or slightly higher than those previously obtained.



4. NOISE CALCULATIONS

4.1 Low Frequency Noise Criteria

The Acoustics research centre of Salford University has undertaken a study to recommend a method for assessing low frequency noise (LFN) suitable for use by Environmental Health Officers in the UK.

A proposed reference curve has been developed for the assessment of LFN within rooms and is reproduced below.

Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dB Leq	87	83	74	64	56	49	43	42	40	38	36	34
Table & Brangood Bafaranaa Curva												

Table 6: Proposed Reference Curve

4.2 Octave Band Calculations

Southdowns has previously developed a noise model of the proposed CHP site using SoundPLAN version 7.0 software which implements the noise propagation calculation procedure specified in ISO 9613.

Details of the calculation methodology, day and night operating assumptions, octave band source term noise levels and building element sound reduction indices are presented in section 5. of Southdowns' Biomass CHP Facility, Cophall Wood Noise Impact Assessment reference 1647w/Repfin.

The results output of this software has been interrogated further to provide day and night cumulative single octave band receptor noise levels. The octave band results for day (with and without building doors opening) and night-time operating periods are presented in Tables B5 – B7 of Appendix B.

Comparison has been made between the night-time predicted octave band receptor external noise levels presented in Table B7 of Appendix B and the proposed criterion values presented in Table 6 above. However, it must be noted that the predicted levels presented in Table B7 of Appendix A are external and would be subject to a reduction accross the façade of any building i.e. an external to internal correction.

PPG24 indicates that the overall insulation provided by a partially open window will be in the region of 10 - 15 dB(A). It is noted that the individual octave band reductions are likely to vary with frequency.

The highest externally predicted plant noise level during night-time periods is only 6 dB (at 63 Hz) above the internal criterion. On this basis, and assuming that there would be noise level loss across the façade at this frequency, no significant exceedance of the criterion level is anticipated.



5. DAYTIME WEEKEND NOISE ASSESSMENT

5.1 Plant Noise Levels

Cumulative sensitive receptor plant noise levels have been calculated using the SoundPlan version 7.0 noise model for both the weekend daytime operating scenarios i.e. full site operation with and without doors opening.

Table 7 below presents a summary of the calculated receptor cumulative plant noise levels.

Ref.	Monitoring Location	Predicted Site No	bise Level, dB L _{Aeq,T}
ID		Weekend Daytime Doors Open	Weekend Daytime Doors Closed
R1	Brownings	27	27
R2	Nightingale Place	35	35
22	Nightingale Villas (Western Boundary)	34	34
R3	Nightingale Villas (Free-field) Garden	34	34
R4	Natewood Farm	31	31

Table 7: Sensitive Receptor Calculated Plant Noise Levels

5.2 Ambient Noise Change

The calculated changes in ambient noise levels, i.e. the differences between ambient noise levels from all sources of noise in the environment with and without the proposed development in operation, are presented in full in Table B8 of appendix B and summarised below for the different weekend daytime periods in Table 8.

Monitoring	Calculated Change in Ambient Noise Level, dB L _{Aeg,T}							
Location	Saturday 07:00 - 15:00	Saturday 15:00 - 23:00	Sunday 07:00 - 23:00					
Brownings	< 0.1	< 0.1	< 0.1					
Nightingale Place	< 0.1	< 0.1	< 0.1					
Nightingale Villas (western boundary	< 0.1	< 0.1	< 0.1					
Nightingale Villas - (garden receptor)	< 0.1	< 0.1	< 0.1					
Natewood Farm	< 0.1	< 0.1	< 0.1					

Table 8: Calculated Changes in Ambient Noise Level With and Without Plant in Operation

The table above indicates that all predicted ambient noise changes are less than 1.0 dB and hence negligible



5.3 British Standard BS 4142

The specific noise levels presented in Table 6 above are assumed to require an acoustic character correction and have been corrected by 5 dB in accordance with British Standard BS 4142 to provide rating levels at the receptors.

Weekend, daytime period rating and background noise levels with calculated differences are presented in full in Tables B9 to B11 of Appendix B. A summary of the period level differences is presented below in Table 9 for each of the receptors considered.

Monitovina	Rating Level minus Background Noise Level, dB							
Monitoring	Saturday 07:00 - 15:00	Saturday 15:00 - 23:00	Sunday 07:00 - 23:00					
Location	hrs	hrs	hrs					
Brownings	-27	-21	-22					
Nightingale Place	-24	-18	-19					
Nightingale Villas (western boundary)	-24	-18	-19					
Nightingale Villas - (garden receptor)	-29	-23	-24					
Natewood Farm	-24	-18	-19					

Table 9: Predicted Differences Between Plant Rating Levels and Background Noise Levels

It can be seen that, for each of the sensitive receptors considered during each weekend, daytime operating period that the rating levels fall below the background noise levels by 19 dB or more and therefore provide a positive indication that complaints are unlikely.





6. CONCLUSIONS

Daytime, weekend attended and unattended noise monitoring has been undertaken around the Biossence, Polegate CHP development site to determine weekend, daytime, ambient and background noise levels. Site operation, cumulative, specific plant noise levels have been calculated using SoundPlan 7.0 for previously identified sensitive receptor locations.

Daytime, weekend ambient noise level changes have been calculated for each of the sensitive receptor locations considered and found to be less than 0.1 dB and are hence negligible.

Rating levels have been determined for each of the operating scenarios and time periods considered and compared to representative background noise levels. Rating levels are calculated to be 19 dB or more below background noise levels which, when assessed in accordance with British Standard BS 4142, provides a positive indication that complaints are unlikely.

Sensitive receptor cumulative single octave band plant noise levels have been calculated and compared to proposed internal noise criteria produced by the Acoustics Research Centre of Salford University. The highest externally predicted plant noise level during night-time periods is only 6 dB (at 63 Hz) above the internal criterion. On this basis, and assuming that there would be noise level loss across the façade at this frequency, no significant exceedance of the criterion level is anticipated.

APPENDIX A: FIGURES



FIGURE A1: NOISE MONITORING LOCATIONS AND COMBINED HEAT AND POWER FACILITY SITE







FIGURE A4: CONTINUOUS NOISE MONITORING RESULTS SATURDAY 13TH MARCH 2010



APPENDIX B: TABLES

Date of	Start	Start Dur (brs) Measured Noise Levels, dB re. 2 x 10 ⁻⁵				
Meas.	Time	Dur. (IIIS)	L _{Amax,F}	L _{A10,1 hr}	L _{Aeq,1 hr}	L _{A90,1 hr}
06/03/10	07:00	1:00	77.1	69.4	65.9	55.6
06/03/10	08:00	1:00	75.5	70.3	67.3	60.6
06/03/10	09:00	1:00	84.9	70.4	68.0	63.2
06/03/10	10:00	1:00	87.3	70.4	68.1	63.5
06/03/10	11:00	1:00	77.2	70.4	68.1	64.1
06/03/10	12:00	1:00	75.6	70.4	68.2	64.3
06/03/10	13:00	1:00	80.0	70.4	68.0	63.9
06/03/10	14:00	1:00	80.5	70.4	68.1	63.9
06/03/10	15:00	1:00	76.8	70.3	67.9	63.2
06/03/10	16:00	1:00	77.7	70.4	67.9	63.0
06/03/10	17:00	1:00	75.3	70.3	67.9	63.2
06/03/10	18:00	1:00	79.1	69.7	66.8	60.0
06/03/10	19:00	1:00	77.6	69.1	65.8	56.7
06/03/10	20:00	1:00	77.1	67.6	64.1	52.3
06/03/10	21:00	1:00	75.9	66.8	62.9	48.2
06/03/10	22:00	1:00	75.0	67.1	63.0	47.5
		Arith. Average	78.3	69.6	66.8	59.6
		Log. Average	80.1	69.7	67.1	61.8
		Minimum 📃	75.0	66.8	62.9	47.5
		Maximum	87.3	70.4	68.2	64.3
07/03/10	07:00	1:00	78.8	65.6	61.6	47.4
07/03/10	08:00	1:00	79.0	67.0	63.3	50.3
07/03/10	09:00	1:00	85.8	69.1	66.1	59.4
07/03/10	10:00	1:00	82.0	69.1	66.6	61.4
07/03/10	11:00	1:00	76.3	69.9	67.5	63.2
07/03/10	12:00	1:00	84.2	69.9	67.7	63.3
07/03/10	13:00	1:00	80.8	69.9	67.3	62.9
07/03/10	14:00	1:00	78.9	69.9	67.3	62.4
07/03/10	15:00	1:00	78.6	69.8	67.2	62.4
07/03/10	16:00	1:00	81.2	70.1	67.7	63.0
07/03/10	17:00	1:00	78.2	69.7	66.9	61.4
07/03/10	18:00	1:00	76.6	69.2	66.3	58.8
07/03/10	19:00	1:00	75.6	68.4	65.0	54.5
07/03/10	20:00	1:00	74.6	68.3	64.6	53.0
07/03/10	21:00	1:00	74.4	66.9	62.8	47.6
07/03/10	22:00	1:00	81.9	66.5	62.3	45.4
		Arith. Average	79.2	68.7	65.6	57.3
		Log. Average	80.4	68.9	66.0	60.2
		Minimum	74.4	65.6	61.6	45.4
		Maximum	85.8	70.1	67.7	63.3

Table B1: Continuous Noise Monitoring – 4 Nightingale Villas, 6th, 7th, 13th and 14th March 2010

Date of	Start	Dur (bre)	Measured Noise Levels, dB re. 2 x 10 ⁻⁵ Pa.			
Meas.	Time	Dui. (IIIS)	L _{Amax,F}	L _{A10,1 hr}	L _{Aeq,1 hr}	L _{A90,1 hr}
13/03/10	07:00	1:00	76.8	69.6	66.2	56.4
13/03/10	08:00	1:00	77.5	70.8	67.9	61.7
13/03/10	09:00	1:00	76.6	70.8	68.3	63.5
13/03/10	10:00	1:00	78.7	71.1	68.6	63.9
13/03/10	11:00	1:00	78.6	71.3	68.9	64.6
13/03/10	12:00	1:00	80.9	71.3	69.1	65.1
13/03/10	13:00	1:00	85.7	70.8	68.5	64.3
13/03/10	14:00	1:00	77.4	70.8	68.5	64.1
13/03/10	15:00	1:00	79.8	70.8	68.4	64.1
13/03/10	16:00	1:00	86.5	71.0	68.8	64.4
13/03/10	17:00	1:00	76.8	70.8	68.4	63.6
13/03/10	18:00	1:00	77.7	70.3	67.5	61.2
13/03/10	19:00	1:00	75.1	69.3	66.2	58.1
13/03/10	20:00	1:00	76.3	68.1	64.5	53.2
13/03/10	21:00	1:00	76.8	67.3	63.2	48.0
13/03/10	22:00	1:00	79.7	67.2	63.3	46.5
		Arith. Average	78.8	70.1	67.3	60.2
		Log. Average	80.3	70.3	67.6	62.4
		Minimum 📃	75.1	67.2	63.2	46.5
		Maximum	86.5	71.3	69.1	65.1
14/03/10	07:00	1:00	76.5	67.3	63.1	48.2
14/03/10	08:00	1:00	76.0	68.7	65.0	52.9
14/03/10	09:00	1:00	80.8	70.7	67.9	61.3
14/03/10	10:00	1:00	81.5	71.1	68.7	63.8
14/03/10	11:00	1:00	78.6	71.4	69.0	64.6
14/03/10	12:00	1:00	77.6	71.5	69.2	65.2
14/03/10	13:00	1:00	81.9	71.2	68.7	63.9
14/03/10	14:00	1:00	99.6	71.3	69.3	64.1
14/03/10	15:00	1:00	78.0	71.1	68.6	63.8
14/03/10	16:00	1:00	77.8	71.0	68.6	63.7
14/03/10	17:00	1:00	82.6	70.5	67.9	62.5
14/03/10	18:00	1:00	76.4	70.0	67.2	60.9
14/03/10	19:00	1:00	76.0	69.1	66.0	58.7
14/03/10	20:00	1:00	78.6	68.5	65.1	55.0
14/03/10	21:00	1:00	77.0	67.6	63.6	50.0
14/03/10	22:00	1:00	77.6	66.5	62.1	44.0
		Arith. Average	79.8	69.8	66.9	58.9
		Log. Average	88.1	70.1	67.4	61.8
		Minimum	76.0	66.5	62.1	44.0
		Maximum	99.6	71.5	69.3	65.2
		1				

 Table B1 ctd.: Continuous Noise Monitoring – 4 Nightingale Villas, 6th, 7th, 13th and 14th March 2010

Start Time	Ме	Measured Noise Levels, dB re. 2 x 10 ⁻⁵ Pa.								
Start Time	$L_{Amax,F}$	L _{A10, 5 min}	L _{Aeq, 5 min}	L _{A50, 5 min}	L _{A90, 5 min}					
10:00	84.7	68.8	66.5	65.7	61.0					
10:05	73.3	69.1	66.4	65.8	61.9					
10:10	72.5	69.2	66.6	66.3	62.0					
10:15	83.8	68.3	65.6	64.8	60.2					
10:20	74.4	69.3	66.6	66.1	60.5					
10:25	72.5	68.0	65.2	64.7	59.7					
10:30	77.4	68.8	66.8	66.1	62.0					
10:35	73.0	68.7	66.3	65.7	62.5					
10:40	72.3	69.3	66.7	66.2	62.0					
10:45	73.2	68.6	66.1	65.7	60.6					
10:50	73.4	69.2	66.8	66.3	61.9					
10:55	72.6	68.6	66.1	65.9	60.3					
11:00	72.9	69.6	67.2	66.8	62.4					
11:05	73.6	70.3	67.4	66.5	62.3					
11:10	72.1	69.8	67.4	66.9	64.0					
11:15	73.4	69.3	67.0	66.6	62.9					
11:20	76.1	69.8	67.5	67.2	62.5					
11:25	75.4	69.7	67.4	66.9	63.3					
11:30	73.2	69.9	67.8	67.5	64.3					
11:35	74.7	69.8	67.5	67.1	63.8					
11:40	76.2	69.7	67.3	66.9	61.8					
11:45	72.8	69.5	67.2	66.8	63.3					
11:50	75.0	69.1	66.9	66.5	62.7					
11:55	74.6	69.2	66.7	66.1	62.2					
12:00	72.5	69.5	66.7	66.2	60.9					
12:05	84.0	69.5	67.1	66.6	61.9					
12:10	71.8	69.6	67.2	66.8	63.0					
12:15	77.2	69.8	67.6	66.9	63.5					
12:20	73.4	69.3	67.0	66.9	62.3					
12:25	74.6	69.6	67.3	66.8	63.8					
12:30	73.6	69.6	67.4	67.1	63.2					
12:35	73.4	69.7	67.3	66.9	62.8					
12:40	82.0	70.3	68.6	67.1	63.2					
12:45	72.8	69.8	67.6	67.2	64.6					
12:50	76.1	69.4	67.5	67.3	64.2					
Arith. Average	75.0	69.4	67.0	66.5	62.4					
Log. Average	77.0	69.4	67.0	66.5	62.6					
Minimum	71.8	68.0	65.2	64.7	59.7					
Maximum	84.7	70.3	68.6	67.5	64.6					
		1	1	1						

 Table B2: LT1 Continuous 5-minute Sample Measurement Survey Results Sunday 7th March 2010

Monitoring	Start	Dur.	Measur	ed Noise Le	vels, dB re. 2	2 x 10 ⁻⁵ Pa.	Comments
Location	Time	(mins)	L _{Amax,F}	L _{A10,5 min}	L _{Aeq,5 min}	L _{A90,5 min}	e.g. dominant noise sources, events etc.
							Nightingale Villas
ST1	10:05	5 min	81.4	76	73.3	67	A22 traffic dominates ambient and background.
	10:10	5 min	81.0	77	73.5	67	A22 traffic dominates ambient and background.
	10:15	5 min	81.6	75	72.2	65	A22 traffic dominates ambient and background.
		Cumul	81.6	76	73.0	67	
ST1	12:05	5 min	80.1	76	73.3	66	A22 traffic dominates ambient and background
	12:10	5 min	79.6	76	73.5	68	A22 traffic dominates ambient and background
	12:15	5 min	85.4	77	74.2	69	A22 traffic dominates ambient and background
		Cumul	85.4	76	73.7	68	
							Northern Site Boundary
ST2	10:30	5 min	70.4	63	60.9	58	A22 traffic dominates ambient and background
	10:35	5 min	64.6	62	60.1	58	A22 traffic dominates ambient and background. High level aircraft
	10:40	5 min	66.0	63	61.5	59	A22 traffic dominates ambient and background
		Cumul	70.4	63	60.8	58	
			-				
							Natewood Farm
ST3	10:55	5 min	68.0	63	60.5	57	A22 dominates ambient and background. Door slam. Birdsong.
	11:00	5 min	71.4	63	61.6	59	A22 traffic dominates ambient and background. Birdsong.
	11:05	5 min	67.2	64	61.7	59	A22 traffic dominates ambient and background. Birdsong.
		Cumul	71.4	63	61.3	58	

 Table B3: Attended Noise Survey Results Sunday 7th March 2010

Monitoring	Start	Dur.	Measur	ed Noise Le	vels, dB re. 2	2 x 10 ⁻⁵ Pa.	Comments
Location	Time	(mins)	L _{Amax,F}	L _{A10,5 min}	L _{Aeg,5 min}	L _{A90,5 min}	e.g. dominant noise sources, events etc.
ST4	11:20	5 min	70.6	66	64.4	61	Brownings A22 traffic dominates ambient and background. Car moves in drive.
	11:25	5 min	70.6	64	62.5	59	Traffic dominates ambient and background. Local traffic. Conversation.
	11:30	5 min	66.6	64	62.1	59	A22 traffic dominates ambient and background. Birdsong.
		Cumul	70.6	65	63.1	60	
							Nightingale Place
ST5	11:45	5 min	89.6	73	70.2	64	A22 traffic dominates ambient and background. Breeze in trees.
	11:50	5 min	84.9	73	69.4	63	A22 traffic dominates ambient and background. Breeze in trees. Traffic dominates ambient and background. Local traffic. Breeze in
	11:55	5 min	82.9	73	69.5	63	trees.
		Cumul	89.6	73	69.7	63	Note: Wind slightly higher ~ 2 m/s
ST5	12:30 12:35 12:40	5 min 5 min 5 min Cumul	89.5 88.4 88.9 89.5	74 73 74 73	70.7 69.9 70.7 70.5	65 64 65 65	A22 traffic dominates ambient and background. A22 traffic dominates ambient and background. A22 traffic dominates ambient and background.
1							

 Table B3 ctd.: Attended Noise Survey Results Sunday 7th March 2010

Data	Temp. (℃)			Humidity (%)			Wind (m/s)		Wind	Precip	
Date	high	avg	low	high	avg	low	high	avg	Dir'n	(mm)	
06/03/2010	12	6	1	100	78	51	8	3	N	0	
07/03/2010	11	3	-1	83	70	40	8	3	NE	0	
13/03/2010	9	7	5	100	93	74	7	2	W	0	
14/03/2010	16	10	6	100	74	45	7	3	NW	0	
										r	

 Table B4: Continuous Noise Survey Weather Summary

Nama	Receptor 1/1 Octave Band Noise Levels (linear), dB by Centre Band Frequency, Hz										
Name	31	63	125	250	500	1k	2k	4k	8k		
R1 - Brownings	48.0	43.9	33.3	25.3	23.9	22.2	18.0	2.9	< 0		
R2 - Nightingale Place	52.2	47.9	41.1	32.4	31.3	29.8	26.8	16.5	< 0		
R3 - Nightingale Villas (western Boundary)	48.4	44.8	39.8	32.7	31.8	29.3	25.4	13.7	< 0		
R3 - Nightingale Villas	48.2	44.6	39.6	32.5	31.6	29.2	25.4	13.7	< 0		
R4 - Natewood Farm	49.7	45.4	36.3	27.4	27.8	26.2	22.5	9.7	< 0		

Table B5: Sensitive Receptor Cumulative Daytime 1/1 Octave Band Noise Levels For Full Site Operation with Deliveries

Namo	Rece	Receptor 1/1 Octave Band Noise Levels (linear), dB by Centre Band Frequency, Hz										
Name	31	63	125	250	500	1k	2k	4k	8k			
R1 - Brownings	47.9	43.7	33.1	25.2	23.8	22.1	18.0	2.8	< 0			
R2 - Nightingale Place	52.1	47.6	40.6	32.2	31.2	29.6	26.7	16.3	< 0			
R3 - Nightingale Villas (western Boundary)	48.3	44.4	39.0	32.5	31.6	29.2	25.3	13.6	< 0			
R3 - Nightingale Villas	48.1	44.2	38.8	32.3	31.5	29.1	25.4	13.6	< 0			
R4 - Natewood Farm	49.7	45.3	36.2	27.3	27.8	26.2	22.5	9.7	< 0			

Table B6: Sensitive Receptor Cumulative Daytime 1/1 Octave Band Noise Levels For Site Operation without Deliveries

Nama		Linear Octave Band Noise Levels (Hz)										
Name	31	63	125	250	500	1k	2k	4k	8k			
R1 - Brownings	47.3	43.1	30.1	19.0	16.0	13.2	9.7	< 0	< 0			
R2 - Nightingale Place	51.3	47.7	37.8	26.6	24.4	22.1	19.0	11.6	< 0			
R3 - Nightingale Villas (western Boundary)	45.9	41.0	33.6	24.5	22.9	20.1	16.5	8.3	< 0			
R3 - Nightingale Villas	46.0	41.3	33.8	26.0	23.5	20.8	17.1	8.2	< 0			
R4 - Natewood Farm	47.8	43.2	33.2	21.3	19.5	16.8	13.6	3.7	< 0			

Table B7: Sensitive Receptor Cumulative Night-Time 1/1 Octave Band Noise Levels

Monitoring Location	Ambient Noise Level, dB $L_{Aeq,T}$			Predicted Site Noise Level, dB L _{Aeq,T}			Calculated Ambient Noise Level, dB L _{Aeq,T}			Calculated Change in Ambient Noise Level, dB L _{Aeq,T}		
	Saturday 07:00 - 15:00	Saturday 15:00 - 23:00	Sunday 07:00 - 23:00	Saturday 07:00 - 15:00	Saturday 15:00 - 23:00	Sunday 07:00 - 23:00	Saturday 07:00 - 15:00	Saturday 15:00 - 23:00	Sunday 07:00 - 23:00	Saturday 07:00 - 15:00	Saturday 15:00 - 23:00	Sunday 07:00 - 23:00
					/							
Brownings	63	62	62	27	27	27	63	62	62	< 0.1	< 0.1	< 0.1
Nightingale Place	71	70	70	35	35	35	71	70	70	< 0.1	< 0.1	< 0.1
Nightingale Villas (western boundary	75	74	74	34	34	34	75	74	74	< 0.1	< 0.1	< 0.1
Nightingale Villas - (garden receptor)	68	67	67	34	34	34	68	67	67	< 0.1	< 0.1	< 0.1
Natewood Farm	62	61	61	31	31	31	62	61	61	< 0.1	< 0.1	< 0.1

 Table B8: Weekend Daytime Period Ambient Noise level Changes

		Saturday 0	7:00 - 15:00	
Monitoring Location	Background Noise Level, dB L _{A90,T}	Specific Noise Level, dB L _{Aeq,T}	Rating Noise Level, dB L _{Aeq,T}	Rating Minus Background Noise Level, dB
Brownings	59	27	32	-27
Nightingale Place	64	35	40	-24
Nightingale Villas (western boundary	63	34	39	-24
Nightingale Villas - (garden receptor)	68	34	39	-29
Natewood Farm	60	31	36	-24

Table B9: Saturday 07:00 – 15:00 hrs BS 4142 Noise Assessment

		Saturday 15	:00 - 23:00	,
Monitoring Location	Background Noise Level, dB L _{A90,T}	Specific Noise Level, dB L _{Aeq,T}	Rating Noise Level, dB L _{Aeq,T}	Rating Minus Background Noise Level, dB
Brownings	53	27	32	-21
Nightingale Place	58	35	40	-18
Nightingale Villas (western boundary	57	34	39	-18
Nightingale Villas - (garden receptor)	62	34	39	-23
Natewood Farm	54	31	36	-18

Table B10: Saturday 15:00 – 23:00 hrs BS 4142 Noise Assessment

		Sunday 07:0	0 - 23:00	
Monitoring Location	Background Noise Level, dB L _{A90,T}	Specific Noise Level, dB L _{Aeq,T}	Rating Noise Level, dB L _{Aeq,T}	Rating Minus Background Noise Level, dB
Brownings	54	27	32	-22
Nightingale Place	59	35	40	-19
Nightingale Villas (western boundary	58	34	39	-19
Nightingale Villas - (garden receptor)	63	34	39	-24
Natewood Farm	55	31	36	-19

Table B11: Sunday 07:00 – 23:00 hrs BS 4142 Noise Assessment