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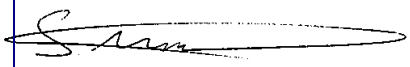
REPORT REF: 21426R01SWmdw

OUTLINE NOISE INVESTIGATION

MAELOR FOODS, PICKHILL LANE, CROSS LANES, WREXHAM LL13 0UE

CLIENT: Maelor Foods
Pickhill Lane
Cross Lanes
Wrexham
LL13 0UE

Report by:



Sam Williams AMIOA — Acoustics Consultant

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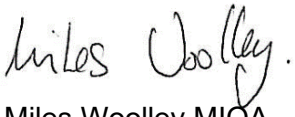

Miles Woolley MIOA — Managing Director

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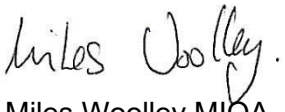


Miles Woolley MIOA — Managing Director

Revision Schedule:

Report	Date	Comment
21426R01SWmdw	27/07/2020	First issue

Executive Summary

Environoise has been instructed by Maelor Foods to complete an outline noise investigation of external plant at Maelor Foods, Pickhill Lane, Cross Lanes, Wrexham.

Noise levels were measured at positions representative of the residential receptors at School House, Holt Road and the nearest dwelling not owned by Maelor Foods on Pickhill Lane with further noise measurements taken on the Maelor Foods site.

A summary of our reports findings is given below:

Low Frequency Noise Investigation

Investigation Over Daytime and Night-Time Periods

Environmental noise level changes at School House did not correlate with changes in noise level at the Maelor Foods site resultant of plant operation. Plant noise levels on the Maelor Foods site are considered to have elevated noise levels at the receptor on Pickhill Lane.

Third-Octave Band Investigation

Corresponding dominant low frequencies were measured at Maelor Foods and the two residential receptors. The dominant site frequencies on site were 250Hz and 125Hz but these were less evident at both receptors.

Recommendation

A louvre is recommended between ammonia plant and atmosphere to the only remaining non-louvred ammonia duct to reduce noise levels to Pickhill Lane.

Table of Contents

1 Introduction

1.1 Overview

1.1.1 Environoise has been instructed by Maelor Foods to complete an outline noise investigation of external plant at Maelor Foods, Pickhill Lane, Cross Lanes, Wrexham.

1.1.2 The investigation has been investigated due to complaints from a resident at School House, Holt Road, Cross Lanes who complains of a continuous low-frequency noise which is consistent and cyclical in nature[1].

1.2 Site Layout

Surrounding Site Area

1.2.1 The complainant's property (measurement position 1, Figure 1.1) is situated 730 metres north-west of the Maelor Foods site. The nearest dwelling to the Maelor Foods site[2] is on Pickhill Lane, 220 metres from the Maelor Foods office building.

Figure 1.1: Maelor Foods site, surrounding area and unattended measurement positions.

[1] Informed by Mr and Mrs Inglis residents at School House, Holt Road, Cross Lanes in verbal conversation with Sam Williams, Environoise Consulting Limited on 13th July 2020.
[2] There are two closer dwellings to the Maelor Foods site on Pickhill Lane; however, these are owned by Maelor Foods for temporary employee accommodation and so have been excluded from assessment.

Site Noise Source Locations

1.2.2 The following plant noise sources were identified on site:

- **Ammonia Duct:** Extract ventilation duct from the internally situated ammonia plant which is switched off between 21.00 – 22.00hrs.
- **Vacuum System:** Noise breakout from the internal vacuum system operational 05.00 - 22.00hrs.
- **Chemical Air Scrubber:** Operational at design duty 05.00 – 21.00hrs with a timer set to reduce fan speed 21.00 – 06.00hrs.
- **Water Softening Plant:** Continuously in operation.
- **Aeration Tank:** Two partial enclosures, one with 2 x Aerzen D52S blowers and the other with 1 x Landia DK-6940 blower.

Figure 1.2: Maelor Foods site and plant noise sources.

2 Noise Surveys

2.1 Survey Notes and Results Summary

Unattended Noise Measurements

2.1.1 Unattended noise level measurements taken between 07.00hrs, Tuesday 14th July and 07.00hrs, Thursday 16th July 2020 have been considered within our assessment. A-weighted ambient and background noise levels ($L_{Aeq,15min}$, $L_{A90\ (15min)}$) and associated A-weighted octave band noise levels were obtained in 'free-field' position at a height of 1.5 metres above ground level. The measurement positions are shown in Figure 1.1. A summary of measured background and ambient noise level measurements is given in Table 2.1.

Table 2.1: Background noise levels measured at Positions 1 to 3.

Position	Subjective comment	Period	Background noise level range [$L_{A90\ (15mins)}$ (dB)]	Ambient noise level range [$L_{A90\ (15mins)}$ (dB)]
1	Measurement position at the front of School House, Holt Road. Dominant noise source was distant road traffic along the A525 and occasional distant HGV or FLT reversing alarms to the north-east.	Daytime (07.00 – 23.00hrs)	23 – 47	30 – 69
		Night-time (23.00 – 07.00hrs)	19 – 37	30 – 66
2	Measurement position at the north-east boundary of the Maelor Foods site. Dominant noise sources were the chemical scrubber and vacuum system with occasional HGV movements all of which are on the Maelor Foods site.	Daytime (07.00 – 23.00hrs)	39 – 58	39 – 61
		Night-time (23.00 – 07.00hrs)	39 – 52	39 – 58
3	Measurement position at the north-west boundary of the Maelor Foods site. Dominant noise sources were road traffic noise along the A525 and the ammonia extract duct noise on the Maelor Foods site.	Daytime (07.00 – 23.00hrs)	30 – 44	34 – 67
		Night-time (23.00 – 07.00hrs)	29 – 42	33 – 62

3 Low Frequency Noise Investigation

3.1 A Weighted Third-Octave Band Investigation

3.1.1 The resident at School House complains of a continuous low-frequency noise which has been subjectively described as consistent and cyclical in nature[3]; Therefore, we have used the L_{A90} parameter[4] so that continuous noise (i.e. plant) is considered and noise from infrequent car passes along the B5130 at Position 1 and Pickhill Lane at Position 2 are less of a contributory factor.

3.1.2 A weighted third octave band low-frequency noise levels (31.5Hz – 500Hz) have been compared for all three measurement positions. The time periods considered are 05.00 – 06.00hrs (see Figures 3.1 and 3.3) and 20.00 – 21.00hrs (see Figures 3.2 and 3.4) which are expected to be the periods with the lowest environmental noise levels attributable to non-plant sources whilst all Maelor Foods plant is operational.

Figure 3.1: Low-frequency analysis 20.00 – 21.00hrs, 14.07.2020.

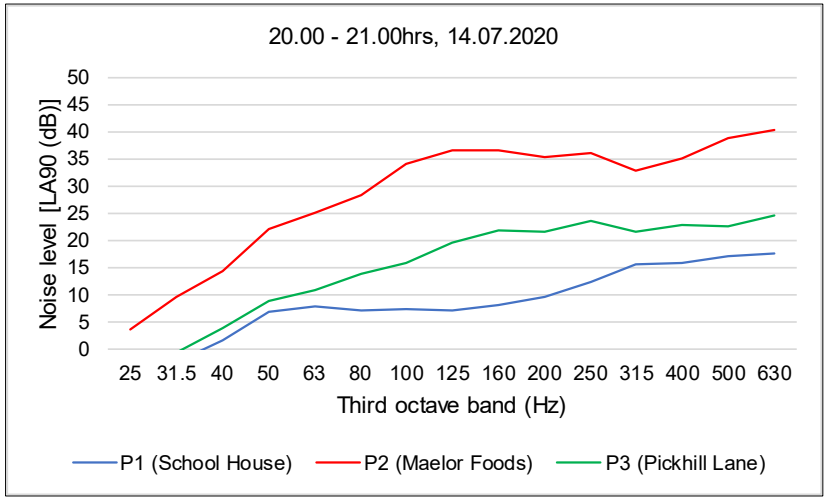
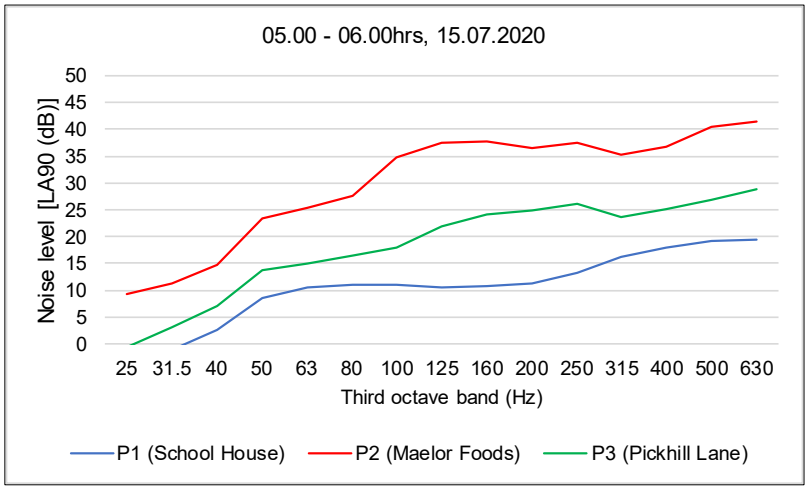


Figure 3.2: Low-frequency analysis 05.00 – 06.00hrs, 15.07.2020.



[3] Informed by Mr and Mrs Inglis residents at School House, Holt Road, Cross Lanes in verbal conversation with Sam Williams, Environoise Consulting Limited on 13th July 2020.
[4] The noise level that is exceeded 90% of the time.

Figure 3.3: Low-frequency analysis 20.00 – 21.00hrs, 15.07.2020.

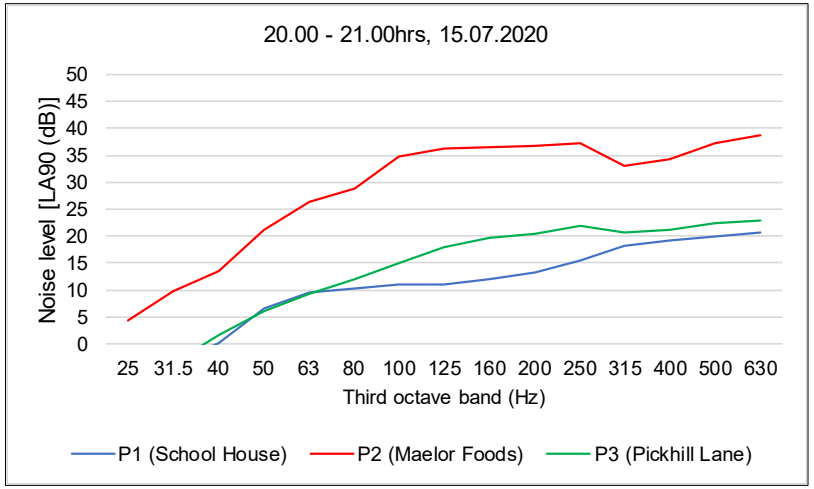
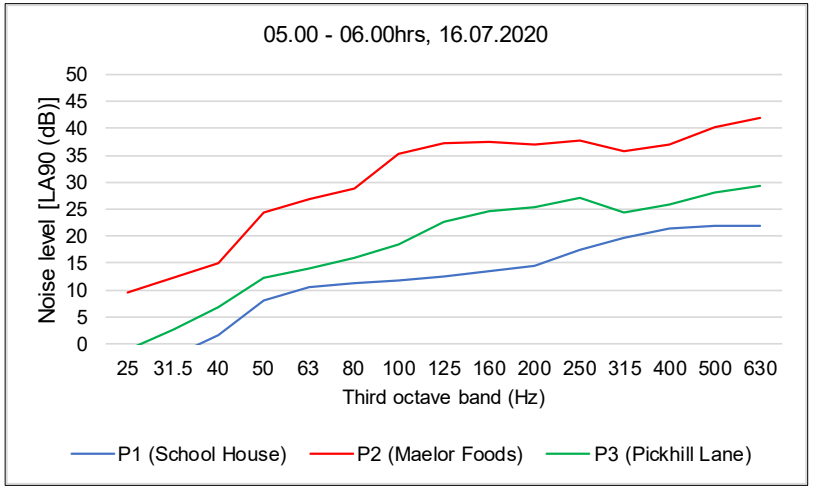


Figure 3.4: Low-frequency analysis 05.00 – 06.00hrs, 16.07.2020.



Discussion

3.1.3 The dominant A weighted frequency on the Maelor site was 250Hz and most noticeable on site during the morning start up due to other noise sources being less of a contributory factor compared with during the evening. The same 250Hz frequency was evident at the Pickhill Lane receptor (see Figures 3.2 and 3.4) but not at School House.

3.1.4 Noise levels correlate best between the Maelor site and School House at 50Hz which is most evident during start-up (see Figures 3.2 and 3.4); however, as A weighted figures are less than 10dB at the complainants no further comment is required.

3.1.5 No dominant low frequencies measured were considered tonal[5].

[5] When using the objective method of assessing tonality given in Annex C of BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound.

3.2 Investigation Over Daytime and Night-Time Periods

3.2.1 A weighted octave band (L_{90}) measurements have been plotted for each octave band between 31.5Hz and 500Hz over each daytime and night-time period (available on request). The perceived dominant site frequency (250Hz) is shown in Figure 3.6 and half frequency (125Hz) in Figure 3.5 with changes in noise level at both receptors shown.

Figure 3.5: Night-time LA90 at 125Hz on 14 - 15th July.

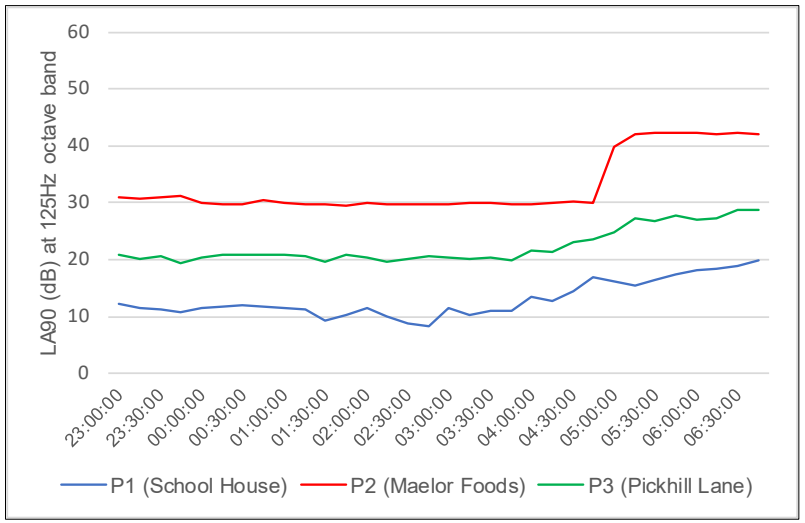
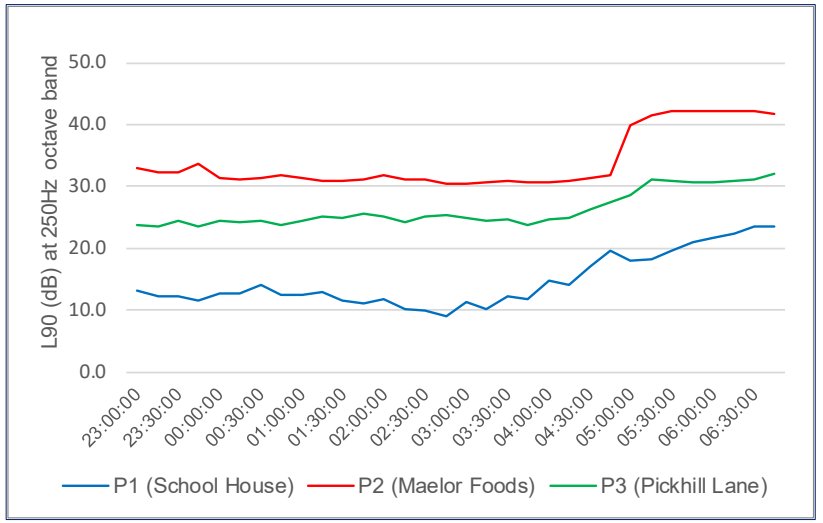


Figure 3.6: Night-time LA90 at 250Hz on 14 - 15th July.



Discussion

3.2.2 Figure 3.5 shows sudden increase at Maelor Foods with noise levels gradually increasing between 05.00 – 07.00hrs at both residential receptor positions; however, this is expected in part to be as a result of road traffic noise which is typical for this period of the night-time. To more accurately test this hypothesis noise levels at both residential receptors and Maelor Foods have been compared at the time of plant noise level increase and decrease to determine if the change in noise level at Maelor Foods is replicated at the residential receptors. This has been determined by calculating the difference of noise level at 04.45hrs and 05.00hrs (increase) and 20.45hrs and 21.00hrs (decrease). Tables 3.1 to 3.4 provide a summary with full calculations given in Appendix B.

3.2.3 The biggest change in noise level is shown in red and second in black bold.

School House

Table 3.1: Comparison of $L_{90\ (15min)}$ noise level change upon decrease of Maelor Foods plant noise levels at School House.

	School House (Position 1)					Maelor Foods (Position 2)				
	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz
20.45 and 21.00hrs, 14.07.20	-0.5	0.1	1.2	**1.5**	**1.6**	-4.3	-3.9	**-7.9**	**-4.6**	-2.4
20.45 and 21.00hrs, 15.07.20	0.3	-0.1	**-0.2**	**-0.5**	-1.2	-5.3	-4.5	**-11.5**	**-10.4**	-8.0

Table 3.2: Comparison of $L_{90\ (15min)}$ noise level change upon increase of Maelor Foods plant noise levels at School House.

	School House (Position 1)					Maelor Foods (Position 2)				
	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz
04.45 and 05.00hrs 15.07.20	0.3	-0.3	-0.8	**-1.5**	**-1.4**	0.7	3.2	**9.8**	**8.1**	6.7
04.45 and 05.00hrs, 16.07.20	2.5	**0.8**	-0.4	**0.5**	1.3	6.8	6.3	**10.8**	9.8	**10.4**

Pickhill Lane

Table 3.4: Comparison of $L_{90\ (15min)}$ noise level change upon decrease of Maelor Foods plant noise levels at Pickhill Lane.

	Pickhill Lane (Position 3)					Maelor Foods (Position 2)				
	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz
20.45 and 21.00hrs, 14.07.20	**-0.9**	-0.5	-0.3	-0.2	**0.7**	-4.3	-3.9	**-7.9**	**-4.6**	-2.4
20.45 and 21.00hrs, 15.07.20	0.6	0.1	-0.6	**-1.0**	**-1.3**	-5.3	-4.5	**-11.5**	**-10.4**	-8.0

Table 3.5: Comparison of $L_{90\ (15min)}$ noise level change upon increase of Maelor Foods plant noise levels at Pickhill Lane.

	Pickhill Lane (Position 3)					Maelor Foods (Position 2)				
	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz
04.45 and 05.00hrs, 15.07.20	-0.3	0.0	**1.5**	1.1	**1.5**	0.7	3.2	**9.8**	**8.1**	6.7
04.45 and 05.00hrs, 16.07.20	3.1	**3.9**	**2.9**	2.0	3.1	6.8	6.3	**10.8**	9.8	**10.4**

Discussion

3.2.4 As shown in bold in Tables 3.1 and 3.2, a change in noise level at the Maelor Foods site of up to -11.5dB and +10.8dB (both at 125Hz) was measured. The change in noise level on site is considered significant. The corresponding noise level changes at School House at the same time were -0.2dB and -0.4dB which is negligible.

3.2.5 As shown in Tables 3.2 and 3.3, the noise level changes at Pickhill Lane the same time were -0.6dB and +2.9dB. The -0.6dB decrease is considered negligible whilst the +2.9dB suggests that the increase in plant noise levels on site have elevated noise levels at the receptor.

3.2.6 Table 3.6 provides the highest measured background noise levels during the daytime and night-time periods. The highest measured daytime noise level at Maelor Foods is at 05.00hrs which corresponds with the start-up of plant on site. This is not the highest measured noise level at either residential receptor. Furthermore, the highest measured daytime noise level during the night-time period at the residential receptors is 06.30hrs at Position 1 (School House) and 06.45hrs at Position 3 (Pickhill Lane) which is a typical reflection of increasing morning road traffic noise levels.

Figure 3.6: Highest measured background noise levels for daytime and night-time periods.

Period	Position	Highest background noise level measured	Background noise level [$L_{A90\ (15min)}$ (dB)]
Daytime (07.00 – 23.00hrs)	1 (School House)	10.30hrs, 15/07/2020	47
	2 (Maelor Foods)	11.45hrs, 14/07/2020	58
	3 (Pickhill Lane)	14.30hrs, 15/07/2020	44
Night-time (23.00 – 07.00hrs)	1 (School House)	06.30hrs, 15/07/2020	37
	2 (Maelor Foods)	05.00hrs, 16/07/2020	52
	3 (Pickhill Lane)	06.45hrs, 15/07/2020	42

4 Conclusions

4.1 School House

4.1.1 Noise level changes at the Maelor Foods site do not correlate with noise level changes at the School House residential receptor.

4.2 Pickhill Lane

4.2.1 The measured noise level increased at 05.00hrs on 16th July 2020 on the Maelor Foods and at the Pickhill Lane receptor.

4.2.2 A detailed site source noise survey was outside of our scope of services, measurements were taken of the ammonia duct on site as this was a subjectively dominant noise source at measurement position 3. A recommendation for the treatment of the ammonia duct is given in section 5.

5 Recommendation

5.1 Louvre to Ammonia Duct

5.1.1 As discussed in section 4.3.1, we recommend that noise from ammonia duct shown in Figure 5.1 is mitigated. This is the only remaining ammonia duct which was not louvred; already louvred extracts were not audible at the measurement position. We recommend that a louvre is installed to the duct between the ammonia plant and atmosphere. The louvre should be of the same specification to those already installed and shown in Figure 5.2.

Figure 5.1: Open ammonia duct recommended for treatment.

Figure 5.2: Louvres already installed.

Appendix A: Acoustic Terms

Between the quietest audible sound and the loudest tolerable sound there is a million to one ratio in sound pressure (measured in Pascal, Pa). Because if this wide range a noise level scale based on logarithms is used in noise measurement called the decibel (dB) scale. Audibility of sound covers a range of approximately 0 to 140dB.

The human ear system does not respond uniformly to sound across the detectable frequency range and consequently instrumentation used to measure noise is weighted to represent the performance of the ear. This is known as the 'A weighting' and annotated as dB (A). Table 10.1 lists the sound pressure level in dB (A) for common situations.

Table A1: Noise levels for common situations.

Typical noise level dB(A)	Example
0	Threshold of hearing
30	Rural area at night, still air
40	Public library, refrigerator humming at 2m
50	Quiet office, no machinery, Boiling kettle at 0.5m
60	Normal conversation
70	Telephone ringing at 2m, Vacuum cleaner at 3m
80	General factory noise level, heavy goods vehicle from pavement
90	Powered lawn motor, operators' ear
100	Pneumatic drill at 5m
120	Discotheque – 1m in front of loudspeaker
140	Threshold of pain

The noise levels at a measurement point are rarely steady, even in rural areas, and vary over a range dependent upon the effects of local noise sources. Close to a busy motorway, the noise levels may vary over a range of 5dB(A), whereas in a suburban area this may increase up to 40dB(A) and more due to the multitude of noise sources in such areas (cars, dogs, aircraft etc.) and their variable operation. Furthermore, the range of night-time noise levels will often be smaller, and the levels significantly reduced compared with daytime levels. When considering environmental noise, it is necessary to consider how to quantify the existing noise (the ambient noise) to account for these second to second variations.

Human subjects are generally only capable of noticing changes in steady levels of no less than 3dB(A). It is generally accepted that a change of 10dB(A) in an overall, steady noise level is perceived to the human ear as a doubling (or halving) of the noise level. (These findings do not necessarily apply to transient or non-steady noise sources such as changes in noise due to change in road traffic flow, or intermittent noise sources). The equivalent continuous A-weighted sound pressure level, L_{Aeq}, is the single number that represents the average sound energy measured over that period. The L_{Aeq} is the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period. It is commonly used to express the energy value from individual sources that vary in level over their operational cycle

Appendix B: Calculations

Table B1: Comparison of $L_{90\ (15min)}$ noise level change upon increase/decrease of Maelor Foods plant noise levels at School House.

	School House (Position 1)					Maelor Foods (Position 2)				
	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz
20.45, 14.07.20	44.4	39.0	28.2	25.7	24.4	53.9	56.2	55.4	46.3	44.7
21.00, 14.07.20	43.9	39.1	29.4	27.2	26.0	49.7	52.3	47.5	41.6	42.3
Difference (dB)	**-0.5**	**0.1**	**1.2**	**1.5**	**1.6**	**-4.3**	**-3.9**	**-7.9**	**-4.6**	**-2.4**
04.45, 15.07.20	44.7	41.8	33.0	28.2	26.1	52.7	52.4	46.0	40.3	38.0
05.00, 15.07.20	45.0	41.5	32.2	26.7	24.7	53.3	55.6	55.9	48.5	44.7
Difference (dB)	**0.3**	**-0.3**	**-0.8**	**-1.5**	**-1.4**	**0.7**	**3.2**	**9.8**	**8.1**	**6.7**
20.45, 15.07.20	42.2	41.3	33.4	30.5	29.1	53.4	56.3	56.8	49.8	43.8
21.00, 15.07.20	42.5	41.2	33.2	30.0	27.9	48.1	51.8	45.3	39.4	35.7
Difference (dB)	**0.3**	**-0.1**	**-0.2**	**-0.5**	**-1.2**	**-5.3**	**-4.5**	**-11.5**	**-10.4**	**-8.0**
04.45, 16.07.20	41.8	40.3	33.1	29.3	26.6	53.2	52.9	46.0	40.8	38.0
05.00, 16.07.20	44.3	41.1	32.7	29.8	27.9	59.9	59.2	56.8	50.6	48.4
Difference (dB)	**2.5**	**0.8**	**-0.4**	**0.5**	**1.3**	**6.8**	**6.3**	**10.8**	**9.8**	**10.4**

Table B2: Comparison of $L_{90\ (15min)}$ noise level change upon increase/decrease of Maelor Foods plant noise levels at Pickhill Lane.

	Pickhill Lane (Position 3)					Maelor Foods (Position 2)				
	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz
20.45, 14.07.20	44.5	42.4	39.3	35.4	31.1	53.9	56.2	55.4	46.3	44.7
21.00, 14.07.20	43.6	41.9	39.0	35.2	31.8	49.7	52.3	47.5	41.6	42.3
Difference (dB)	**-0.9**	**-0.5**	**-0.3**	**-0.2**	**0.7**	**-4.3**	**-3.9**	**-7.9**	**-4.6**	**-2.4**
04.45, 15.07.20	46.1	44.6	39.7	36.1	32.3	52.7	52.4	46.0	40.3	38.0
05.00, 15.07.20	45.8	44.6	41.2	37.2	33.8	53.3	55.6	55.9	48.5	44.7
Difference (dB)	**-0.3**	**0.0**	**1.5**	**1.1**	**1.5**	**0.7**	**3.2**	**9.8**	**8.1**	**6.7**
20.45, 15.07.20	40.9	39.8	38.7	34.8	30.8	53.4	56.3	56.8	49.8	43.8
21.00, 15.07.20	41.5	39.9	38.1	33.8	29.5	48.1	51.8	45.3	39.4	35.7
Difference (dB)	**0.6**	**0.1**	**-0.6**	**-1.0**	**-1.3**	**-5.3**	**-4.5**	**-11.5**	**-10.4**	**-8.0**
04.45, 16.07.20	43.7	40.7	38.9	36.2	31.2	53.2	52.9	46.0	40.8	38.0
05.00, 16.07.20	46.8	44.6	41.8	38.2	34.3	59.9	59.2	56.8	50.6	48.4
Difference (dB)	**3.1**	**3.9**	**2.9**	**2.0**	**3.1**	**6.8**	**6.3**	**10.8**	**9.8**	**10.4**