



**Environmental Noise Assessment for Proposed Residential
Development on land adjacent to High Road, Whaplode,
Spalding, in accordance with British Standard 4142:2014**

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SUMMARY

An environmental noise assessment has been carried out for the proposed residential development on land adjacent to High Road, Whaplode, Spalding, on behalf of Haycroft Homes Ltd. The assessment was carried out in accordance with British Standard 4142:2014.

It includes attended and unattended noise monitoring, predictive noise modelling and assessment of the results.

The BS 4142 assessment shows that the noise impact on proposed dwellings from the adjacent agricultural industry site (Lincolnshire Field Products Ltd), is likely to have a “*low impact*” during the daytime and an “*adverse impact*” during the night-time.

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1 OBJECTIVES

- 1.1 To carry out an environmental *noise assessment for the proposed residential development on land adjacent to High Road, Whaplode, Spalding, in accordance with British Standard 4142:2014 (BS 4142 – Reference 1).
- 1.2 To recommend solutions to any problems identified by the assessment.

2 CONCLUSIONS

- 2.1 The daytime assessment in accordance with BS 4142 when assessed outside living rooms and within outdoor amenity areas to the worst affected dwellings, does not exceed the background noise level. This is likely to be an indication of a “*low impact*”.
- 2.2 The night-time assessment in accordance with BS 4142 when assessed outside bedrooms to the worst affected dwellings, exceeds the background noise level by +4 dB. This is likely to be an indication of an “*adverse impact*”.
- 2.3 Mitigation measures are discussed in Section 8 of this report.

*** see Appendix 1 for a Glossary of Terms**

3 RECOMMENDATIONS

- 3.1 This report should be used in support of the planning application for the proposed residential development on land adjacent to High Road, Whaplode, Spalding.
- 3.2 It is recommended that 1.8m high close-boarded fencing will be used to surround amenity areas of proposed dwellings as detailed in the “Finishes & Enclosures Site Plan” document supplied (Reference 4).

4 **BACKGROUND**

Haycroft Homes Ltd are proposing to develop an area of land adjacent to High Road, Whaplode, for residential purposes. The site is situated with High Road (A151) north of the site and existing industrial/agricultural premises in the form of Lincolnshire Field Products (LFP) Ltd to the east of the site. Acoustic Associates (Peterborough) were asked to undertake an environmental noise assessment in accordance with BS 4142:2014 for the proposed development and this report documents the results of that assessment. A location plan of the site is shown in Figure 1.

5 **CRITERIA FOR THIS ASSESSMENT**

5.1 **British Standard BS 4142:2014**

5.1.1 BS 4142 (Reference 1) is a standard which describes a method for assessing whether the 'specific noise' from an industrial source is likely to give rise to complaints from residents of the adjacent dwellings. The 'specific noise' levels are determined outside dwellings. The specific noise level is determined for reference time periods of 1-hour for the daytime (7am to 11pm) and 15 minutes for the night time. Tonal or impulsive characteristics of a noise are likely to increase the scope for complaints and this is taken into account by adding a value to the specific noise source level to obtain the 'rating level'. The value may be between 0 and 15 dB depending on objective and subjective measures detailed in the standard. Table 1 details the values added for when using the subjective method.

Characteristics of noise	Noise at receptor	Value to add to specific noise level for rating level
Noise has tonal characteristics	Just perceptible	+2 dB
	Clearly perceptible	+4 dB
	Highly perceptible	+6 dB
Noise has impulsive characteristics	Just perceptible	+3 dB
	Clearly perceptible	+6 dB
	Highly perceptible	+9 dB
Other - characteristics that are neither tonal nor impulsive but are readily distinctive against the residual acoustic environment,	-	+ 3 dB
Intermittency	If intermittency is readily distinctive in the residual acoustic environment	+3 dB

Table 1 – BS 4142 – Corrections to noise to calculate rating level – subjective method

5.1.2 BS 4142 requires that the rating level of a noise is compared with the existing background noise ($L_{A90,T}$). Guidance given in the standard states the following regarding the difference between the rating level and the background noise.

- A difference of 0 dB is indicative of a “*minor impact*”;
- A difference of +5 dB is indicative of an “*adverse impact*”;
- A difference of +10 dB is indicative of a “*significant adverse impact*”.

6 NOISE ASSESSMENT

6.1 Ambient noise

Noise monitoring equipment was set up at the proposed development site at Monitoring Locations 1 & 2 (See Figure 1). Location 1 was at a distance of approximately 180m south of High Road and approximately 170m west of the LFP site. Location 2 was approximately 40m south of High Road and approximately 230m north-west of the LFP site. Noise was continuously monitored during the daytime periods from 10:00-13:00 hours on Thursday 22nd December 2016. Noise was also continuously monitored at Location 1 throughout the daytime and night-time periods from 15:30 hours on Thursday 5th January 2017 to 07:00 hours on Friday 6th January 2017. The noise monitoring locations used were in free-field conditions at a height of 1.5 metres above ground level. Appendix 2 gives details of the noise instrumentation used and Figure 2 shows photographs of the monitoring locations.

Weather conditions during the monitoring periods on Thursday 22nd December 2016 were sunny with clear skies, slightly damp ground conditions from a thawing overnight frost, temperature ranged between 5°C to 7°C and wind speeds averaged between 4 m/s to 5 m/s from the south.

Weather conditions during the monitoring periods between Thursday 5th January 2017 to Friday 6th January 2017 were dry with approximately 10% cloud cover and mostly clear skies overnight, temperature ranged between -1°C to 1°C, wind speeds overnight averaged around 1 m/s to 1.3 m/s from the south increasing to around 3.6 m/s by morning.

6.2 Specific noise

The proposed development site is subjected to industrial noise emissions from agricultural vehicle movements and activities along the southern and eastern sides of the LFP site. This is of most concern during the early morning periods. Noise measurements were taken of such activities to the south of the LFP site during the night-time at Monitoring Location 3 on Friday 6th January 2017 (See Appendix 6 for results). In addition, noise measurements taken on 24th July 2015 and used for previously conducted noise assessments (References 5-7), have also been used for this assessment to take account of agricultural vehicle movements along the south east corner and east side of the LFP site.

6.3 Computer noise model of the site and surrounding area

A computer noise model of the site and surrounding area was generated using Woelfel IMMI Computer Noise Modelling Software (Reference 2) which uses the methods given in ISO 9613 – 2 (Reference 3) to calculate noise levels given a topographical model of the site. The model was calibrated using industrial noise measurements taken on site as detailed in Appendix 7. (See Figures 3 & 4 for industrial noise contour maps of the site).

7 **RESULTS**

7.1 Measured noise levels

The long term noise monitoring results taken at Location 1 are shown in Appendix 3 In graphical form. The graph show the 'energy average' noise level ($L_{Aeq,T}$), maximum sound pressure level ($L_{Amax,T}$) and the background noise level ($L_{A90,T}$) during 15 minute interval periods. The results from the short term monitoring taken at Locations 1-3 are shown in Appendices 4-6.

7.2 Background noise levels

Statistical analysis of background ($L_{A90,T}$) noise levels from measurements taken on site give a modal ($L_{A90,T}$) daytime value of around 44 dB(A). Analysis of night-time ($L_{A90,T}$) noise levels taken during likely periods of industrial activities (05:00-07:00 hours) while specific noise from industrial sources were not present, range between an ($L_{A90,T}$) of 37-40 dB(A). Therefore, a daytime background ($L_{A90,T}$) noise level of 44 dB(A) and a night-time background ($L_{A90,T}$) noise level of 37 dB(A) have been used for the assessment in accordance with BS 4142.

7.3 BS 4142 assessment

The impact of predicted specific noise emissions from the LFP site at the location of the proposed dwellings has been assessed using the 'subjective method' for rating noise emissions. Noise associated with the movement and operation of agricultural vehicles on the LFP site is impulsive in character and just perceptible above residual noise levels from road traffic on High Road. Therefore a penalty rating for noise impulsivity of +3 dB has been used. For impulsive characteristics of noise BS 4142 states:

"A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible."

Taking the above into account, the assessment level is the difference between the background noise level and the rated noise level. For this BS 4142 states:

“A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context. A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context. Where the rating level does not exceed the background noise level, this is an indication of the specific noise source having a low impact, depending on the context.”

Table 2 shows the assessment results in accordance with BS 4142:

Worst affected locations	Predicted specific noise level ($L_{Aeq,T}$) dB(A)	Predicted rating noise level ($L_{Aeq,T}$) dB(A), with penalty of +3 dB for impulsivity	Background noise level ($L_{A90,T}$) dB(A)	Rating over background noise level (dB)
Daytime				
Outside east façade to Plots 30-31	34	37	44	-7
Outdoor amenity areas to Plots 24-29	31	34	44	-10
Night-time				
Outside east façade to Plots 30-31	38	41	37	+4

Table 2 – Assessment results in accordance with BS 4142

The BS 4142 assessment when assessed outside the worst affected dwellings during the daytime shows that the rating level does not exceed the background noise level which is indicative of the specific noise source having a “*low impact*” and unlikely to lead to noise complaints. When assessed outside the worst affected dwellings during the night-time the assessment shows that the rating level exceeds the background noise level by +4 dB and likely to be indicative of an “*adverse impact*”. Mitigation measures are discussed in Section 8.

8 NOISE MITIGATION

It is shown in Figures 3 & 4 that predicted industrial noise emissions from the LFP site at 1m from the façades of the worst affected proposed dwellings are unlikely to exceed an $L_{Aeq,T}$ of around 40 dB(A) daytime or night-time. Taking into account the assumptions that noise levels inside dwellings are typically around 30 dB(A) less than outside with closed windows and around 15 dB(A) less than outside with windows partially open, Acceptable internal noise levels can be achieved inside proposed dwellings with windows closed or open. In addition, acceptable noise levels within outdoor amenity spaces can also be achieved. Therefore no further mitigation measures are considered necessary.

Predictions within this report on noise levels outside dwellings are based on the assumption that outdoor amenity areas to proposed dwellings will be enclosed with 1.8m high close-boarded fencing as described in the "Proposed Finishes & Enclosures Site Plan" (Reference 4).

9 DISCUSSIONS

9.1 For the assessment in accordance with BS 4142, the night-time background noise levels used were taken during likely periods of external/internal industrial activities (05:00-07:00 hours) while specific noise from industrial sources were not present. Analysis showed that during these periods the background noise level ranged between an ($L_{A90,T}$) of 37-40 dB(A), hence the lowest value during these periods was used to represent a worst case scenario. However, should specific noise from industrial sources (external or internal) be present during earlier night-time periods (for example 03:00-07:00 hours), then night-time background noise level would be around 35 dB(A). Although this scenario is unlikely to happen for most of the year, during peak summer months and busy harvest periods such a scenario ought to be considered. Therefore, taking external agricultural vehicle movements (between 03:00-07:00 hours) into consideration as an example, in accordance with BS 4142, would show a night-time background noise level exceedance of around +6 dB, and likely to be indicative of an adverse impact during the night-time.

9.2 Following recent communications with the developer in relation to the proposed development site, it is our understanding that LFP operations associated with a vegetable processing plant which was previously located internally to the western side of the LFP site have now ceased, following noise complaints from existing residents adjacent to this location. It has been communicated that this plant has been re-located to another one of LFP's industrial/agricultural sites away from Whaplode. Therefore taking this noise source into consideration within this assessment is not necessary.

REFERENCES

1. *British Standard BS 4142:2014, Methods of rating and assessing industrial and commercial sound*; BSI, 2014.
2. *Wolfel IMMI Computer Noise Modelling Software.* ; www.woelfel.de, 2014.
3. *ISO 9613-2 Acoustics of sound during propagation outdoors, Part 2: General method of calculation*; ISO, 1996.
4. *Andrew M Wright Ltd - Proposed Finishes & Enclosures Site Plan - Drawing No: PD04 (Revision P3) - Drawing Date: 22nd April 2016*
5. *Acoustic Associates (Peterborough) - Noise Assessment of Vehicle Movements at Lincolnshire Field Products Ltd - Report No: SS/J2988/15703*
6. *Acoustic Associates (Peterborough) - Environmental Noise Assessment for Proposed Residential Development Site at Kirk Gate, Whaplode, Spalding - Report No: DLM/J3013/15749-1*
7. *Acoustic Associates (Peterborough) - Environmental Noise Assessment for Proposed Residential Development Site at Kirk Gate / Cross Street, Whaplode, Spalding - Report No: DLM/J3056/15908-1*

Appendix 1 – Glossary of terms

Sound Pressure	The variation of ambient pressure that is detected by the ear as sound.
Noise	Unwanted sound
decibel (dB)	Ten times the logarithm of the square of the ratio of the Sound Pressure to a reference pressure (20 micro-Pascal's).
Sound Pressure Level (L_p)	The decibel version of the Sound Pressure.
A-Weighting	A frequency weighting which simulates the response of the ear. An A-Weighted Sound Pressure Level is denoted by L _{pA} and has units of dB(A)
L_{Aeq,T}	The value of the A-weighted sound pressure level, in decibels [dB(A)], of a continuous steady sound that within a specified time interval (T), for example 16 hours, has the same mean-square sound pressure as a sound that varies with time. Therefore, the average over a 16 hour period would be denoted as L _{Aeq,16h}
L_{Amax,T}	The maximum A-Weighted sound pressure level that was encountered during the measurement period.
L_{A90,T}	The A-Weighted sound pressure level that is exceeded for 90% of the time (T). This is usually used a measure of background noise.
Free Field	Where noise can propagate freely without any reflections from buildings etc.
Octave Band	A band of frequencies the upper limit of which is twice the lower limit. They are known by their centre frequency, e.g., 63, 125, 250, 500, 1000, 2000
NPSE Criteria	
NOEL	No Observed Effect Level
LOAEL	Lowest Observed Adverse Effect Level
SOAEL	Significant Observed Adverse Effect Level

BS 4142 Terms

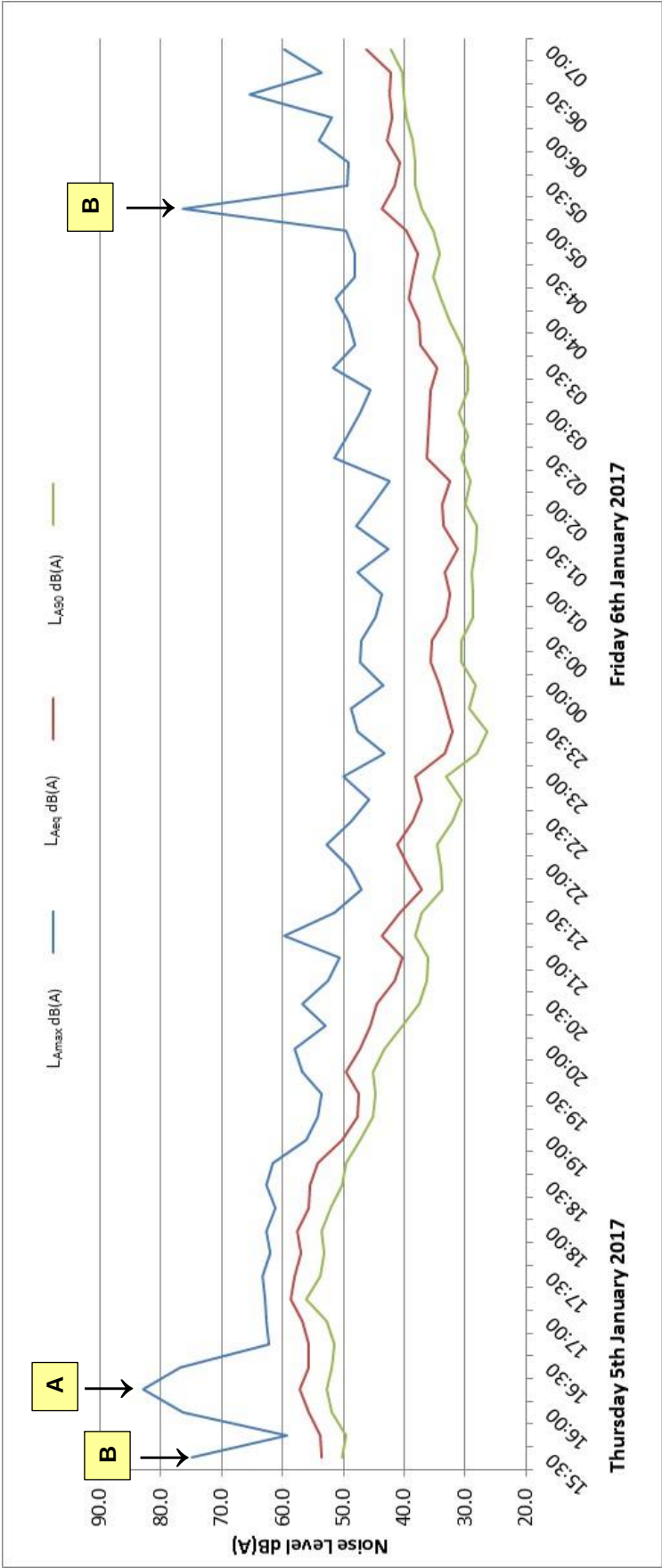
T_r	The reference time interval over which an equivalent continuous A-weighted sound pressure is determined. Day time = 1 hour Night-time = 15 minutes
T_m	The measurement time interval over which measurements are taken.
Ambient Noise	Total sound in a given situation at a given time.
Residual Noise	The ambient noise remaining at a given position in a given situation when the specific noise is suppressed to a degree such that it does not contribute to the ambient noise.
Specific Noise Level Rating Level L_{Ar,T_r}	The dB L_{Aeq,T_r} of the noise sources being assessed at a site. The specific noise level plus any correction (+5 dB) for the character of the noise, known as the Rating Level.
Assessment Level	Difference between Rating Level ($L_{Ar,T}$) and Background Noise ($L_{A90,T}$)
Sound Power Level (L_{WA})	The noise level from the source in terms of sound power, in dB(A).

Appendix 2 – Noise instrumentation

Type	Manufacturer	Description	Serial Number	Last Calibration Date	Calibration Certificate No.
Svan 949	Svantek	Sound level meter	8101	05/02/2015	152827
4230	Brueel & Kjaer	Sound level calibrator	781674	19/01/2015	152452
820A	Larson Davis	Sound level meter	0709	18/01/2016	158779

The calibration of the instrumentation was checked at the start and end of the tests and there was no significant drift.

Appendix 3 – Results of long term noise monitoring at Location 1



- A** = L_{max} event caused by two consecutive “bangs” from a bird deterrent in nearby farm field.
- B** = L_{max} events caused by technician closing/opening lid to noise monitoring equipment used on site.

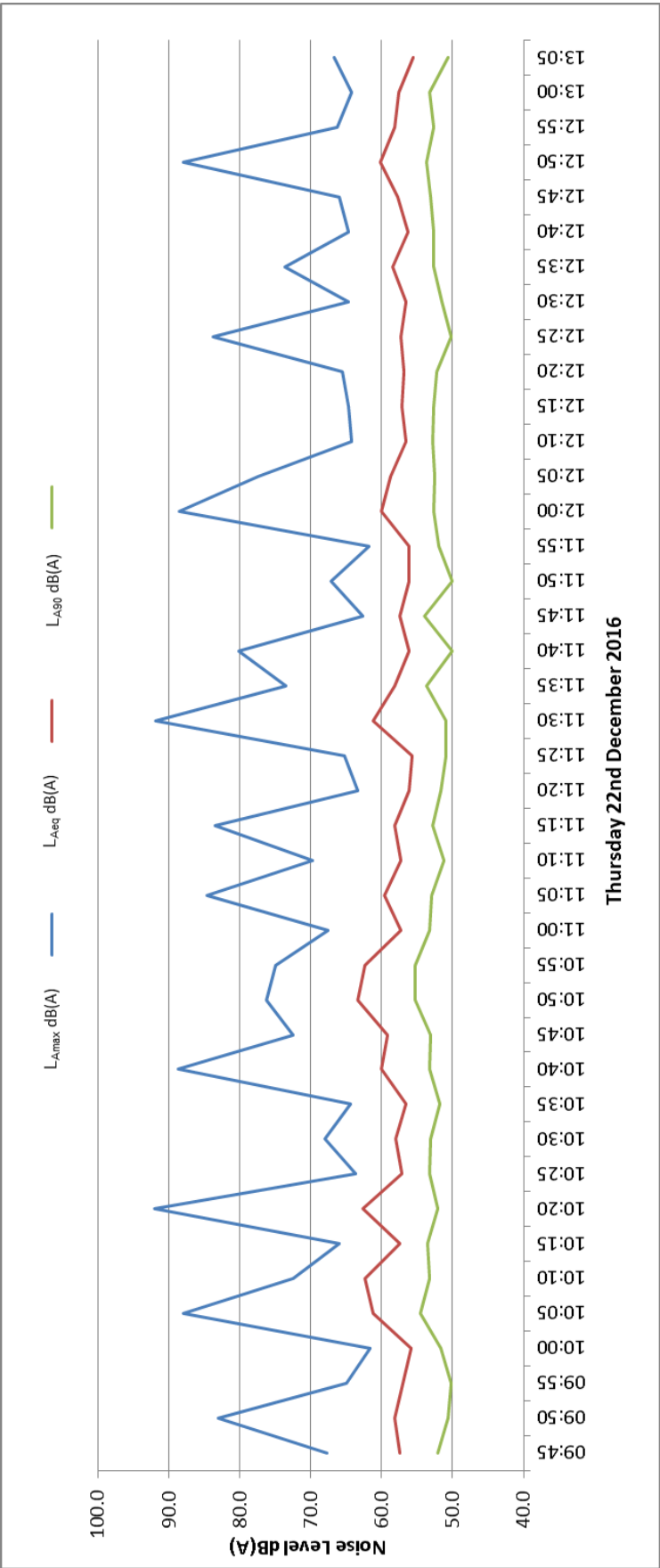
Appendix 4 – Results of short term noise monitoring at Location 1

Time (Hours)	Ambient Noise Level (L_{Aeq,5min}) dB(A)	Background Noise Level (L_{A90,5min}) dB(A)	Maximum Noise Level (L_{Amax,5min}) dB(A)	Comments
22nd December 2016 (10:15 – 12:00 hours)				
10:10 – 10:15	61.3	45.5	73.7	Frequent road traffic on High Road (A151) mostly dominant throughout. Distant military aircraft dominant on few occasions around 10:00-10:25 hours, 10:40, 10:52 & 10:55 hours. Two consecutive loud bangs audible from a bird deterrent in neighboring farm field at 10:20 hours, 10:41, 11:06, 11:15, 11:34 & 11:41 hours. Couple of faint clangs/bangs audible from direction of LFP site at 11:15 hours.
10:15 – 10:20	51.7	45.8	65.9	
10:20 – 10:25	57.1	45.1	79.9	
10:25 – 10:30	54.2	47.8	66.4	
10:30 – 10:35	46.3	44.5	51.2	
10:35 – 10:40	46.6	44.4	58.5	
10:40 – 10:45	53.5	45.4	83.8	
10:45 – 10:50	47.0	44.8	53.1	
10:50 – 10:55	56.6	46.1	74.0	
10:55 – 11:00	63.6	47.8	76.2	
11:00 – 11:05	53.9	44.8	70.6	
11:05 – 11:10	52.0	45.3	79.1	
11:10 – 11:15	45.4	43.4	52.8	
11:15 – 11:20	51.0	44.4	79.6	
11:20 – 11:25	45.3	43.7	49.4	
11:25 – 11:30	45.0	43.4	52.1	
11:30 – 11:35	52.2	43.2	82.4	
11:35 – 11:40	48.0	44.1	76.8	
11:40 – 11:45	51.2	44.1	79.9	
11:45 – 11:50	46.0	44.1	54.5	
11:50 – 11:55	45.7	43.5	65.0	
11:55 – 12:00	45.4	43.6	51.5	

Appendix 4 – Results of short term noise monitoring at Location 1 (continued)

Time (Hours)	Ambient Noise Level ($L_{Aeq,5min}$) dB(A)	Background Noise Level ($L_{A90,5min}$) dB(A)	Maximum Noise Level ($L_{Amax,5min}$) dB(A)	Comments
22nd December 2016 (12:00 – 13:00 hours)				
12:00 – 12:05	49.7	43.3	77.8	Frequent road traffic on High Road (A151) dominant throughout. Two consecutive loud bangs audible from a bird deterrent in neighboring farm field at 12:01, 12:10, 12:30, 12:37 & 12:52 hours. Couple of faint clangs/bangs audible from direction of LFP site at 12:33 hours.
12:05 – 12:10	51.1	43.0	79.9	
12:10 – 12:15	44.8	43.0	62.0	
12:15 – 12:20	46.4	43.5	61.7	
12:20 – 12:25	44.8	42.9	52.5	
12:25 – 12:30	44.5	42.5	53.0	
12:30 – 12:35	53.5	43.2	84.1	
12:35 – 12:40	53.3	43.6	84.9	
12:40 – 12:45	45.7	43.2	55.2	
12:45 – 12:50	46.2	44.2	51.3	
12:50 – 12:55	50.6	43.9	78.4	
12:55 – 13:00	45.9	42.9	51.8	

Appendix 5 – Results of short term noise monitoring at Location 2



Appendix 6 – Results of specific noise measurements taken on site

Measurement	Time	Measured Octave Band Data (Hz)								L _{Aeq,T} dB(A)	L _{A90,T} dB(A)	L _{Amax,T} dB(A)	Comments
		63	125	250	500	1k	2k	4k	8k				
Ambient noise level dominated by road traffic on High Road (A151)	05:34 (77 secs)	26.2	26.4	28.3	33.9	35.0	27.4	20.9	16.0	38.9	37.0	44.9	Road traffic dominant
Two tractors idling approximately 40m away	06:15 (13 secs)	3.2	22.6	33.9	32.6	37.9	38.5	36.8	31.9	43.8	43.0	46.4	Minimal contribution from road traffic
	06:17 (7 secs)	3.6	21.5	32.1	33.6	36.7	39.9	36.9	32.4	44.0	42.3	53.2	Some contribution from road traffic
	06:22 (5 secs)	2.5	20.7	32.1	33.0	38.1	40.0	35.9	32.5	44.2	43.1	48.4	
One tractor driving/moving approximately 40m away, and one tractor idling	06:25 (25 secs)	30.9	37.0	40.0	43.0	40.8	36.6	29.8	21.7	47.2	45.1	59.2	Some contribution from road traffic
One tractor moving approximately 40m away, and one tractor moving in distance	06:26 (30 secs)	25.3	32.9	39.3	44.5	40.9	34.9	28.3	22.5	47.3	45.5	51.8	Some contribution from road traffic
Two tractors idling approximately 80-100m away	06:28 (7 secs)	29.6	29.5	36.3	40.5	38.2	30.5	24.1	26.5	44.0	43.0	47.0	Some contribution from road traffic
	06:32 (6 secs)	25.1	29.7	34.6	40.8	38.3	30.3	25.6	28.0	43.9	42.6	47.6	
Ambient noise level dominated by road traffic on High Road (A151)	06:45 (223 secs)	27.4	26.4	29.2	36.4	38.6	30.7	18.1	16.5	41.6	39.8	46.9	Road traffic dominant

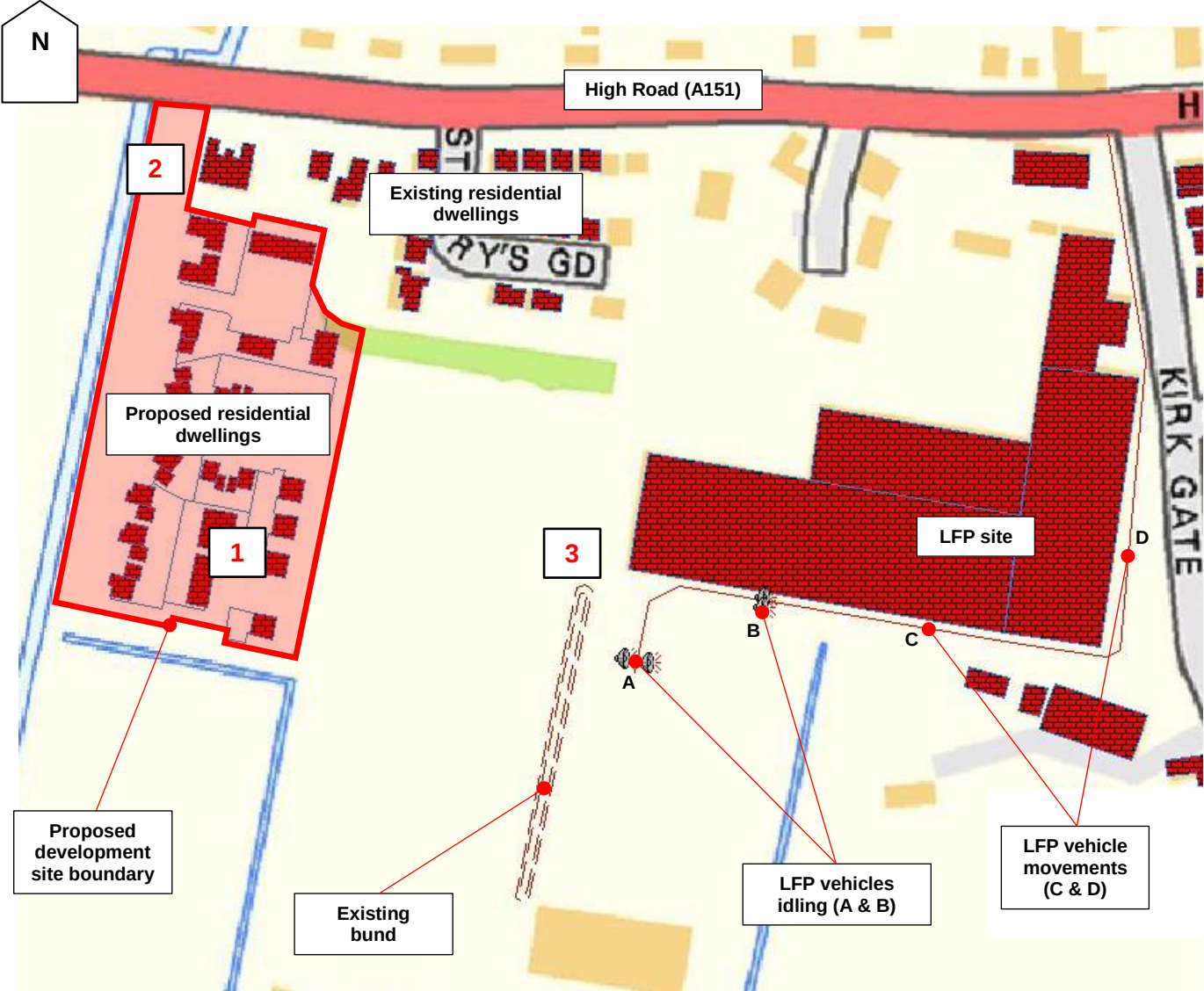
(Specific noise measurements taken at Location 3 on Friday 6th January 2017)

Appendix 7 – Breakdown of industrial noise sources on the LFP site

Location (as shown in Figure 1)	Noise source / activity	Period	On-time (minutes)	Estimated overall sound power emission level L_w dB(A)	Estimated overall sound power level L_w dB(A) (as line source where applicable)	Estimated sound power level L_w dB(A) (with time correction)
A	Agricultural vehicles parked stationary idling to the south of LFP	Daytime	10 mins	88.0	n/a	80.2
		Night-time			n/a	86.2
B	Agricultural vehicles parked stationary idling to the south of LFP	Daytime	15 mins	88.0	n/a	82.0
		Night-time			n/a	87.0
C	Agricultural vehicle movements along south side of LFP	Daytime	1 min	98.3	72.9	58.1
		Night-time			72.9	64.1
D	Agricultural vehicle movements along east side of LFP	Daytime	1 min	98.3	74.3	74.3 ¹
		Night-time			74.3	74.3 ¹

1 No time correction has been applied for vehicles passing along the east side of LFP given the regularity of vehicle movements to this side.

Figure 1 – Site location plan



? = Noise monitoring locations

A-D = Industrial noise source locations associated with LFP vehicle movements (see Appendix 7)

Figure 2 - Photographs of noise monitoring locations



Photograph showing monitoring locations 1 & 3



Photograph showing monitoring location 2

Figure 3 – Industrial noise contours (1.5m above ground level) – daytime

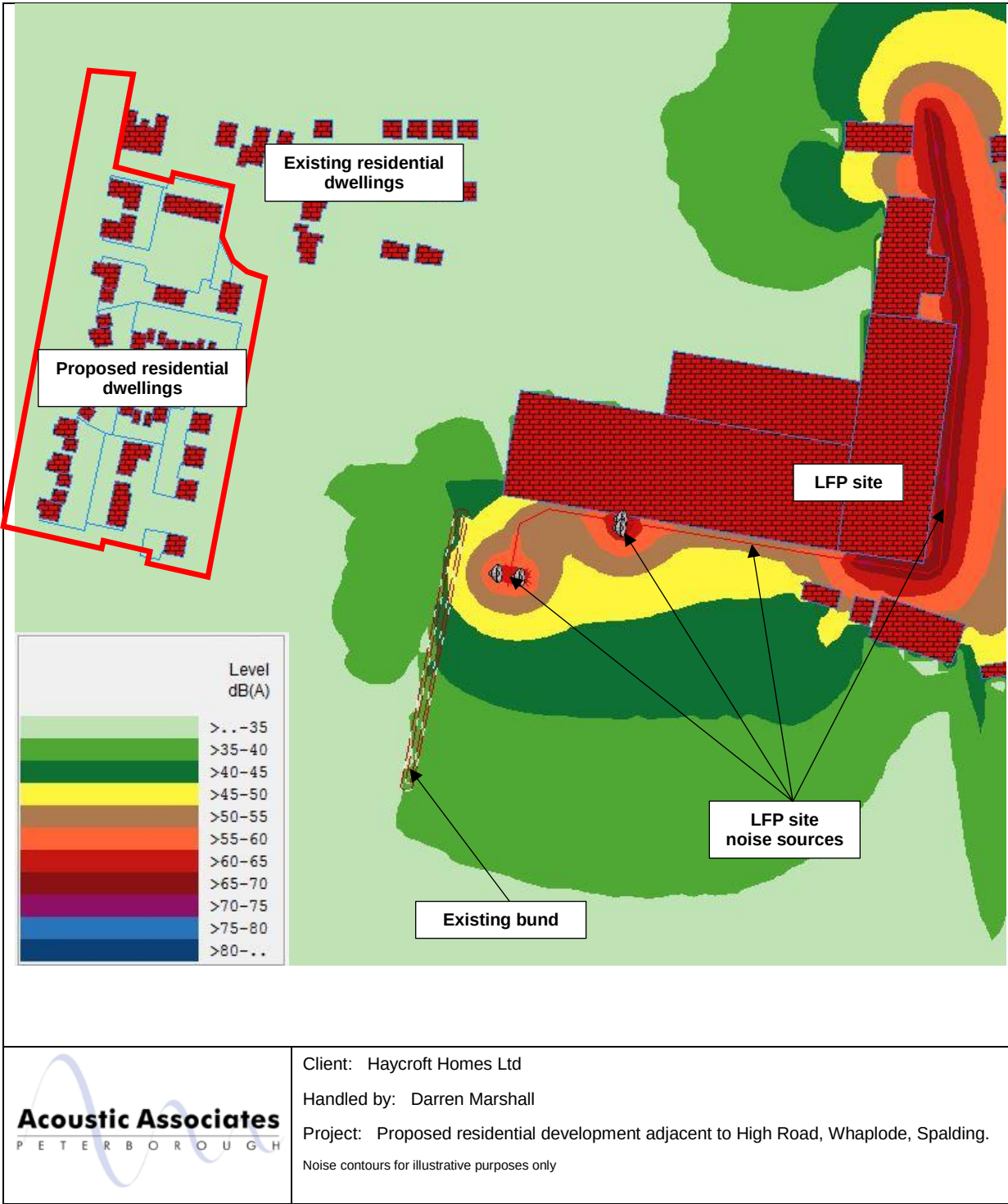


Figure 4 – Industrial noise contours (1.5m above ground level) – night-time

