

Noise Impact Assessment Stagecoach Bus Depot Extension Barnsley

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1. Revision register

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A	First Issue	ACG	15/06/11
B	Added 5.1, 5.2; 7.3; 11.6; 3.5, 3.7 Revised 11.5, 11.8, 3.4	ACG	20/06/11

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3. Summary

- 3.1 Stagecoach Yorkshire operates a bus depot adjacent to the A61 Wakefield Road, Barnsley.
- 3.2 Stagecoach wishes to extend their depot to the north of the existing site.
- 3.3 The potential noise impact from the additional bus movements proposed as a result of the extension are modelled acoustically.
- 3.4 With the addition of a 3 metre barrier at the location identified in Figure 2, the calculated rating level under the worst case conditions at the Nearest Noise Sensitive Location is 3 dB above the background noise level. This is of marginal significance according to BS 4142.
- 3.5 It is therefore anticipated that this rating may be acceptable to environmental health.
- 3.6 It is considered that the additional bus movements on Wakefield Road as a result of the extension are likely to have a negligible impact when assessed using the guidance of Design Manual for Roads and Bridges.
- 3.7 It is anticipated that a negligible impact is unlikely to be of any significance.

4. Introduction

- 4.1 Stagecoach Yorkshire operates a bus depot adjacent to the A61 Wakefield Road, Barnsley.
- 4.2 Stagecoach wishes to extend their depot to the north of the existing site.
- 4.3 There is existing capacity for 96 buses which is proposed to be increased to 130 buses.
- 4.4 The site location is shown in Figure 1.
- 4.5 The proposed extension layout plan is shown in Figure 2.
- 4.6 This report presents the evaluation of the potential noise impact from the proposed development on the Nearest Noise Sensitive Locations (NNSL).
- 4.7 This assessment is based on previous data of bus noise measurements, acoustic modelling described in this report, and measurements of site background noise levels.
- 4.8 The potential noise impact of the sources identified is calculated and rated according to BS 4142, Reference 1, and assessed in terms of Design Manual for Roads and Bridges (DMRB), Reference 2.

5. Noise criteria guidelines

- 5.1 Planning Policy Guidance Note 24 (PPG 24), Reference 7, contains guidance on noise for local planning authorities.
- 5.2 PPG 24 makes reference to BS 4142 for the assessment of noise from industrial and commercial sources affecting residential accommodation.
- 5.3 It is therefore proposed that the additional bus and vehicle movements as a result of the extension whilst in the depot should be assessed according to BS 4142.
- 5.4 It is suggested that a limit for the rating not to exceed 'marginal significance' is appropriate.
- 5.5 A brief description of the guidance of BS 4142 is contained in Appendix 2.
- 5.6 It is proposed that the additional bus and vehicle movements on Wakefield Road as a result of the extension are assessed using the guidance of DMRB.
- 5.7 The local authority has not indicated its preference for adherence to any other performance standards in this case.

6. Nearest noise sensitive location

- 6.1 The nearest noise sensitive location to the current depot is the houses on Brunswick Close as shown in Figure 1.
- 6.2 However it is understood from the local authority that there is a planning application to convert the Royal Arms Public House to residential.
- 6.3 The location of the Royal Arms Public House is shown in Figure 1.
- 6.4 The Royal Arms Public House would be the nearest noise sensitive location with respect to the proposed extension and has therefore been considered as the Nearest Noise Sensitive Location for this assessment.

7. Existing noise environment

- 7.1 The existing noise environment was measured between 23:15 and 00:15 on 3rd May 2011 and between 04:45 and 08:00 on the 4th May 2011.
- 7.2 The survey times were chosen as these are the time anticipated that buses will return and leave the depot.
- 7.3 The most significant noise source during the measurement period was road traffic on Wakefield Road. Although the noise of the existing bus movements is included in the measurements, this was not noted to dominate the background noise environment.
- 7.4 The microphone was located 1.5 metres above ground level and away from other reflecting surfaces, such that the measurements are considered free-field.
- 7.5 Data was recorded in 1/1 octave bands at one second intervals throughout the measurement period.
- 7.6 The average temperature was around 4 °C during the surveys, and road surfaces were dry and the wind still.
- 7.7 The measurement position is indicated on Figure 1.
- 7.8 The equipment used for the measurements is shown in Appendix 1.
- 7.9 An illustration of the measurements in progress is shown in Figure 3.
- 7.10 The time history of the $L_{Aeq, 1 \text{ sec}}$ recorded is presented in Figures 4 and 5.
- 7.11 The measured background noise level between 04:45 and 08:00 and between 23:15 and 00:15 is shown in Table 1.

8. Noise modelling

8.1 Bus noise source

8.2 Noise levels from a stationary bus with the engine revving hard have been measured previously by Apex Acoustics.

8.3 The octave band sound power from a single bus is shown in Table 2, at 99 dB(Z), and 87 dB(A).

8.4 Noise transmission model

8.5 Noise transmission and propagation is modelled using proprietary software, Cadna/A, Reference 4.

8.6 This models noise propagation outdoors according to ISO 9613, Reference 3.

8.7 All buildings and the ground are taken to have a reflection loss of 1 dB and three reflection paths calculated for each source.

8.8 The site layout is taken from Stagecoach drawings, Reference 6.

8.9 The noise impact from the bus run out and bus run in are evaluated as described below.

8.10 Run out bus movements

8.11 The greatest concentration of bus run out movements occurs in the early morning start up period, according to the current timetable as shown in Table 4.

8.12 It is understood that drivers check their buses before departing the depot. This check takes around 6 minutes when the bus engine may be running.

8.13 The reference period for noise impact is five minutes during the night time between 23:00 and 07:00 hrs, and one hour during the remaining hours, according to BS 4142.

8.14 The highest concentration of bus movements at night in any five minute period is between 06:55 and 06:58 hrs, when there are seven buses departing on the timetable.

8.15 As the existing capacity for 96 buses is proposed to be increased to 130 buses. This results in a potential 35% increase in bus movements

- 8.16 Applying this proposed increase in bus numbers to the current timetable, it is anticipated that up to 10 buses could be departing in any 5 minute period and therefore as a worst case 10 buses could have their engines running simultaneously within the proposed extension.
- 8.17 This is a prudent assumption as in reality it is unlikely that all the buses leaving in any 5 minute period will be parked within the proposed extension area.
- 8.18 The background noise level is also likely to be higher at other times, particularly in the day time period, where the reference time period is also one hour.
- 8.19 All these factors are likely to result in a lower calculated noise impact at other times of the day, and the worst case period only is assessed.
- 8.20 Figure 6 shows the acoustic model for the run out period; Figure 7 shows the noise contours for the same run out period.
- 8.21 **Run in bus movements**
- 8.22 The bus run in movements are less concentrated than the run out period according to the current timetable as shown in Table 4.
- 8.23 It is understood that the extension area is to be used just for parking. Noise will only therefore be generated by the bus being driven in and parked.
- 8.24 It has been assumed that a maximum of two buses will enter the extension area within any five minute period, with their engines running for the full five minute period. This is also a prudent assumption, as they generally take less time to enter and park than this.
- 8.25 In practice some returning buses will be parked in the existing depot area, and therefore have less noise impact than that modelled here.
- 8.26 Figure 8 shows the acoustic model for the run in period; Figure 9 shows the noise contours for the same run in period.

8.27 Noise barriers

8.28 A noise barrier has been included in the acoustic model. A 3 metre high barrier has been assumed at the position shown in Figure 2.

8.29 This barrier should be constructed with a superficial mass of at least 20 kg/m², and without any significant gaps or cracks. A proprietary structure or close boarded timber fence may be adequate, so that noise propagation through the barrier is of less significance than that over it.

9. Noise Impact

9.1 BS 4142 Rating

9.2 Noise from buses is generally broadband without any of the distinguishing characteristics identified in BS 4142, so that no penalty is added to the specific noise calculated.

9.3 The rating level is therefore considered to be the specific noise as calculated at the NNSL.

9.4 Table 5 shows the BS 4142 rating at the NNSL due to the highest potential concentration of buses running out.

9.5 Table 6 shows the BS 4142 rating at the NNSL due to the highest potential concentration of buses running in.

9.6 DMRB

9.7 Table 3 shown the classification of magnitude of noise impact in the short term due to increased traffic flow from DMRB.

9.8 There is existing capacity for 96 buses which is proposed to be increased to 130 buses.

9.9 The increase in the noise level on Wakefield Road due to the additional buses alone leaving and entering the site is calculated by $10 \cdot \log_{10}(130/96) = 1.3$ dB.

9.10 In fact the buses on Wakefield Road are only a small proportion of the existing traffic. Therefore the actual increase in noise from the additional buses is anticipated to be significantly less than 1.3 dB

9.11 An increase of 1.3 dB is considered to have a minor impact magnitude according to DMRB, whereas the anticipated impact is likely to be less than 1 dB which would be classified as a negligible impact.

11. Conclusion

- 11.1 Calculations have been presented on the basis of a 3 m high barrier at the position as shown in Figure 2.
- 11.2 The bus run out noise impact is based on a maximum of 10 buses departing from the extension area in any 5 minute period at any time after 04:45 hrs.
- 11.3 The bus run in noise impact is based on a maximum of 2 buses arriving in the extension area in any 5 minute period at any time after 23:00 hrs.
- 11.4 Under the most adverse circumstances as described, the calculated rating level at the NNSL is 3 dB above the background noise level. This is of marginal significance according to BS 4142.
- 11.5 It is therefore anticipated that this rating may be acceptable to environmental health.
- 11.6 The depot extension is further away from the current nearest noise sensitive location on Brunswick Close than the existing depot. Bus movements within the extension rather than the existing depot will result in a reduced noise impact at Brunswick Close.
- 11.7 The proposed additional bus movements on Wakefield Road as a result of the extension are likely to have a negligible impact when assessed using the guidance of Design Manual for Roads and Bridges.
- 11.8 It is anticipated that a negligible impact as a result of the additional buses on Wakefield Road will be acceptable to environmental health.

12. References

1. BS 4142: 1997, Method for rating industrial noise affecting mixed residential and industrial areas.
2. The Design Manual for Road and Bridges (DMRB).
3. ISO 9613: Acoustics - Attenuation of sound during propagation outdoors.
4. Cadna/A environmental noise modelling software, version 4.0.135, Datakustik GmbH.
5. Barnsley Depot Run Out/In Times, from 9 May 2011.
6. Proposed Parking Area Wakefield Road Depot, Barnsley, Drawing Number 748/B/002, March 2010
7. Planning Policy Guidance: Planning and Noise, PPG 24, 1994. Department of the Environment.

14. Figures

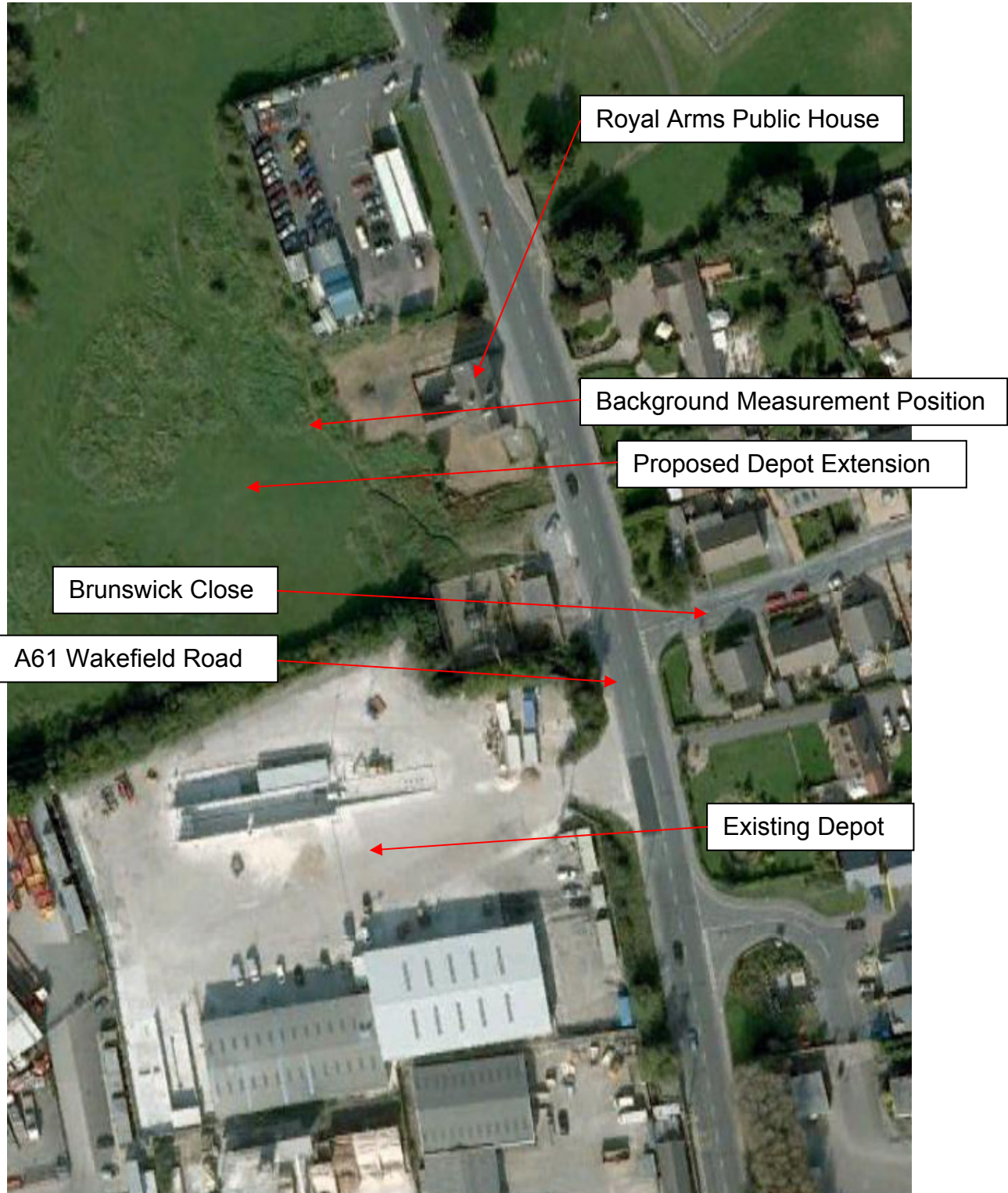


Figure 1: Site location

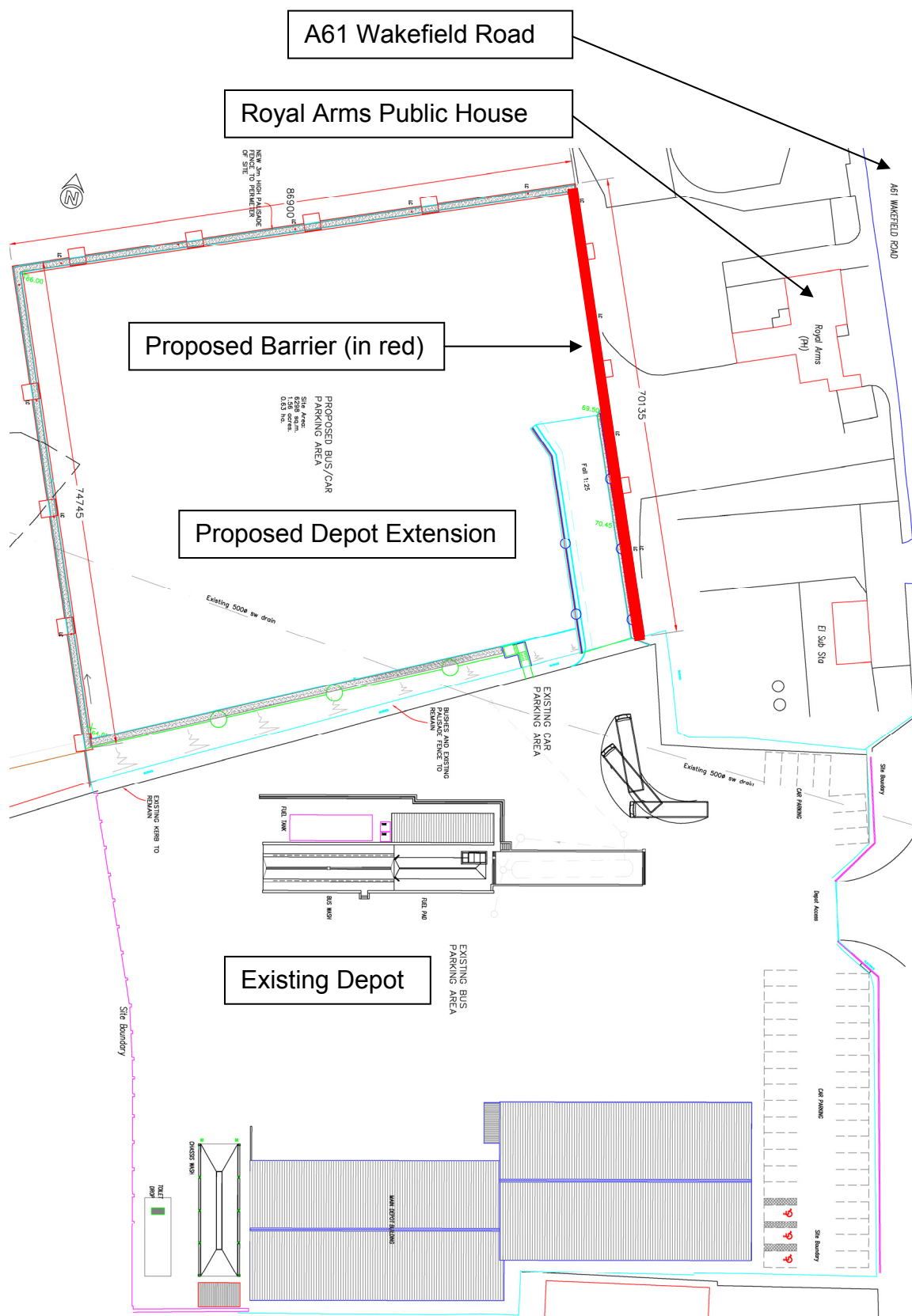




Figure 3: Background measurements in progress

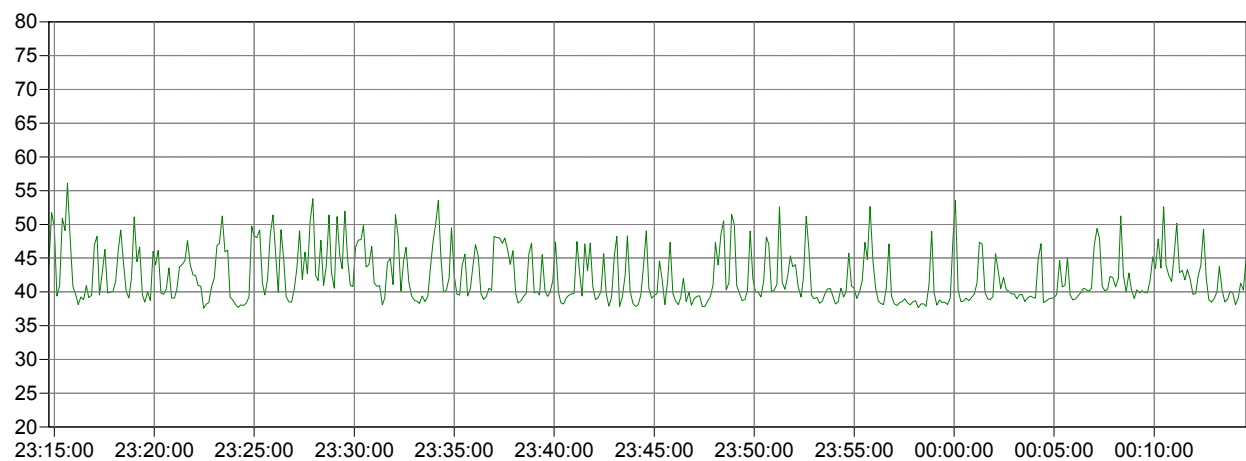


Figure 4: Time history of residual $L_{Aeq, 1 \text{ sec}}$ recorded between 23:15 and 00:15

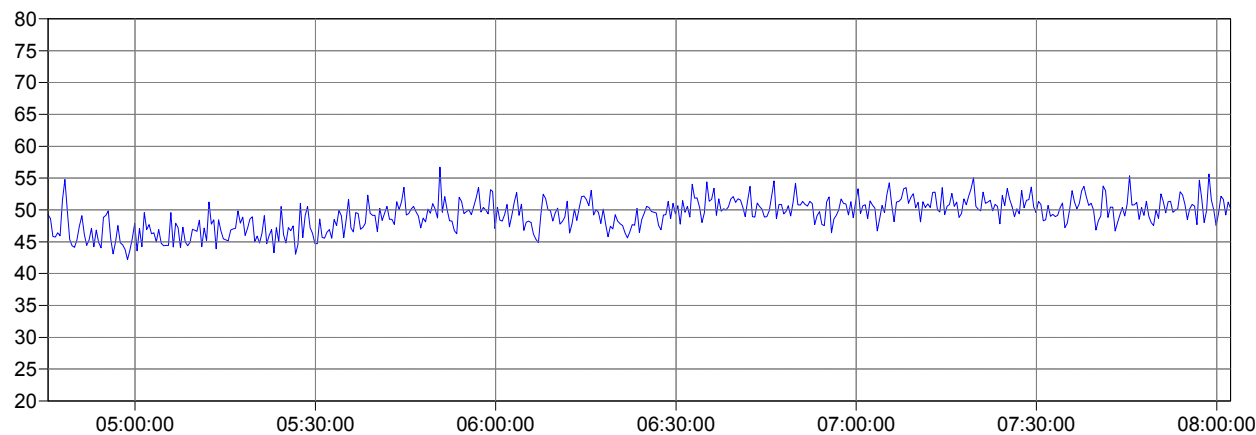


Figure 5: Time history of residual $L_{Aeq, 1 \text{ sec}}$ recorded between 04:45 and 08:00



Figure 6: Plan view showing noise model for bus run out.

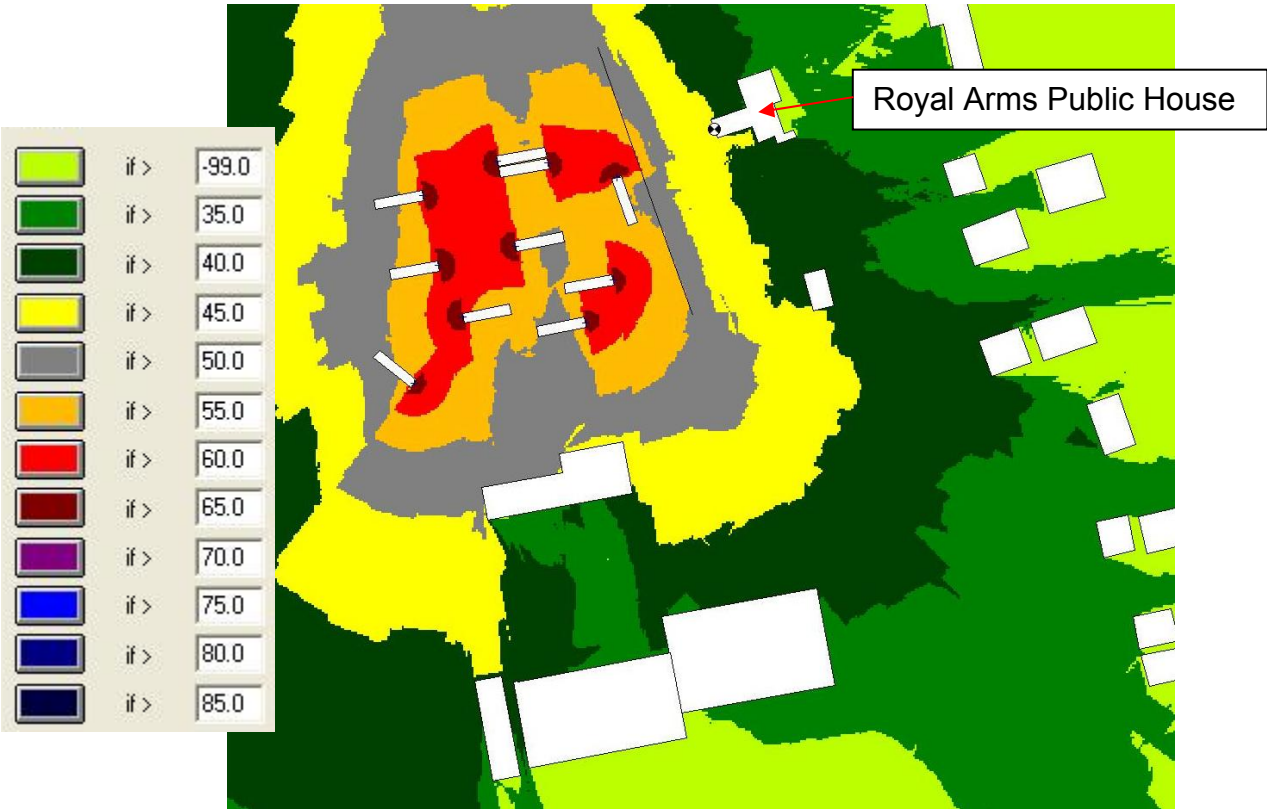


Figure 7: Plan view showing noise propagation contours for bus run out.



Figure 8: Plan view showing noise model for bus run in.

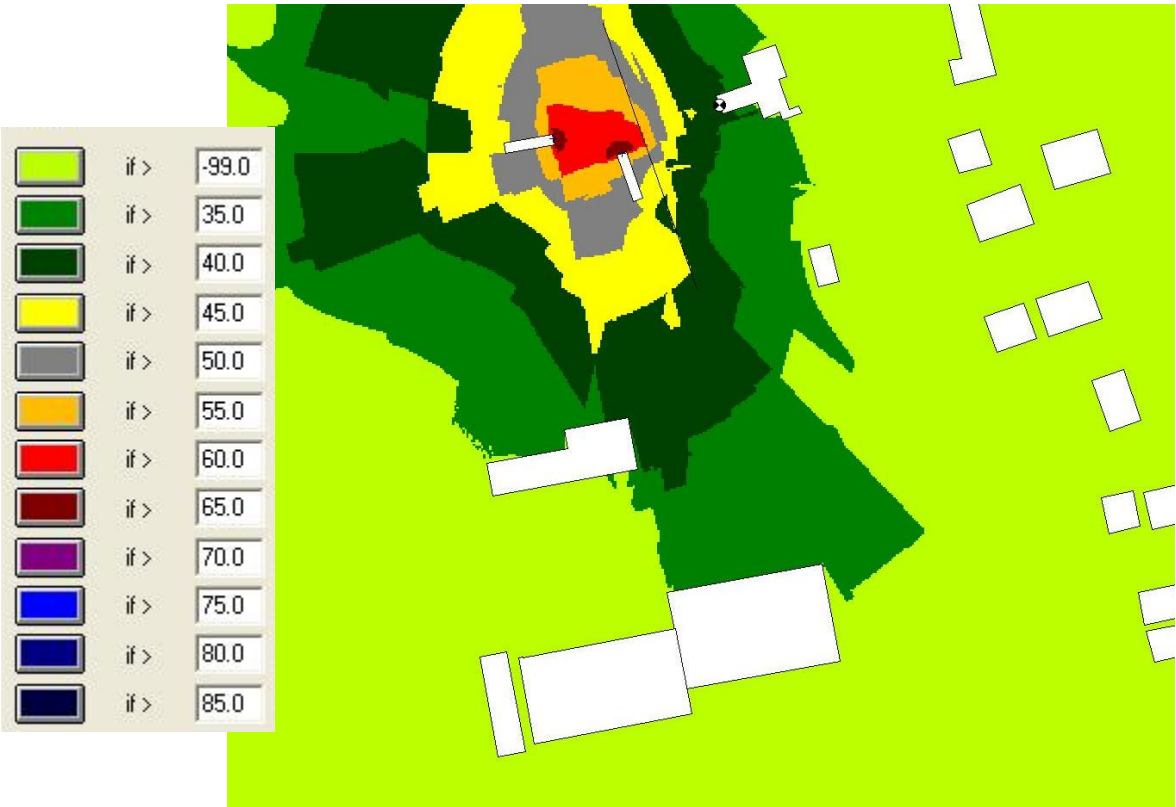


Figure 9: Plan view showing noise propagation contours for bus run in.

15. Tables

Measurement Period	L _{A90}
04:45 – 05:00	43
05:00 – 06:00	44
06:00 – 07:00	46
07:00 – 08:00	47
23:15 – 00:15	38

Table 1: Measured background noise levels

Source sound power level / L _w	dB (Z)	dB(A)	Octave Band Centre Frequency / Hz						
			63	125	250	500	1000	2000	4000
Single typical bus	99	87	99	87	85	83	84	79	73

Table 2: Assumed sound power level for a single typical bus

Magnitude of Impact	Noise change, L _{A10,18h}
0	No Change
0.1-0.9	Negligible
1.0-2.9	Minor
3.0-4.9	Moderate
5+	Major

Table 3: Classification of magnitude of noise impact in the short term due to increased traffic flow from DMRB

Barnsley Depot Run Out/In Times - from 9 May 2011						
Monday - Friday		Saturday		Sunday		
Bus Time Out	Bus Time in	Bus Time Out	Bus Time in	Bus Time Out	Bus Time in	
4:50	16:13	4:40	14:18	06:05	17:48	
4:52	16:31	4:47	14:52	07:07	18:25	
4:57	17:32	4:57	16:42	07:29	19:13	
4:57	17:47	5:01	16:43	07:44	21:06	
5:01	17:48	5:26	17:18	07:52	23:07	
5:07	17:50	5:30	17:32	07:57	23:25	
5:09	17:50	5:35	17:39	08:14	23:25	
5:12	17:51	5:42	17:43	08:14	23:27	
5:14	17:58	5:46	17:45	08:30	23:30	
5:29	17:58	5:47	17:50	08:32	23:32	
5:30	17:58	5:47	17:50	08:44	23:34	
5:36	18:06	5:55	17:51	09:02	23:37	
5:44	18:08	5:57	17:55	09:05	23:38	
5:46	18:09	6:01	17:58	09:22	23:40	
5:55	18:10	6:02	17:58	09:30	23:41	
5:56	18:10	6:02	17:59	09:30	23:42	
5:57	18:10	6:02	18:06	09:32	23:50	
6:05	18:13	6:04	18:20	09:34	23:56	
6:05	18:27	6:05	18:20	09:37	23:56	
6:07	18:28	6:10	18:28	09:40	00:00	
6:09	18:28	6:12	18:29	09:48	00:06	
6:10	18:31	6:16	18:32	09:52	00:16	
6:12	18:32	6:17	18:32	10:10	00:21	
6:12	18:37	6:17	18:39	10:20	00:25	
6:16	18:38	6:26	18:44	10:31	00:25	
6:20	18:44	6:27	18:45	10:37	00:31	
6:20	18:44	6:30	18:49			
6:22	18:45	6:31	18:50			
6:26	18:46	6:32	18:50			
6:27	18:50	6:32	18:51			
6:27	18:50	6:37	18:52			
6:27	18:51	6:37	18:57			
6:27	18:52	6:39	18:58			
6:28	18:56	6:42	18:59			
6:30	18:57	6:42	19:00			
6:32	18:58	6:42	19:03			
6:32	19:00	6:45	19:08			
6:36	19:07	6:46	19:12			
6:37	19:08	6:47	19:18			
6:39	19:12	6:58	19:19			
6:39	19:15	6:59	19:25			
6:40	19:16	7:02	19:31			
6:42	19:18	7:12	19:35			
6:42	19:25	7:12	19:35			

Monday - Friday			Saturday			Sunday		
Bus Time Out		Bus Time in	Bus Time Out		Bus Time in	Bus Time Out		Bus Time in
6:46		19:26	7:29		19:40			
6:48		19:30	7:36		19:43			
6:50		19:31	7:37		19:52			
6:52		19:35	7:37		19:56			
6:55		19:37	7:37		20:10			
6:56		19:40	7:40		20:12			
6:56		19:52	7:42		20:22			
6:56		20:10	7:44		20:25			
6:57		20:12	7:44		20:52			
6:57		20:22	7:54		21:05			
6:58		20:43	7:58		21:12			
7:01		20:52	8:02		21:13			
7:01		21:05	8:04		22:05			
7:06		21:13	8:07		23:05			
7:06		22:05	8:07		23:06			
7:06		23:05	8:09		23:07			
7:07		23:06	8:12		23:12			
7:09		23:07	8:19		23:25			
7:11		23:12	8:22		23:27			
7:12		23:12	8:22		23:27			
7:12		23:25	8:33		23:34			
7:12		23:27	8:36		23:38			
7:16		23:34	8:42		23:40			
7:16		23:37	8:42		23:40			
7:22		23:38	8:47		23:41			
7:23		23:41	8:55		23:42			
7:24		23:52	8:57		23:52			
7:25		23:55	9:02		23:56			
7:26		23:56	9:07		23:56			
7:27		23:56	9:07		00:04			
7:30		23:56	9:12		00:16			
7:32		00:05	9:14		00:21			
7:33		00:07	9:22		00:25			
7:34		00:16	9:25		00:26			
7:35		00:21	9:27		00:31			
7:36		00:25						
7:39		00:26						
7:46		00:31						

Table 4: Run out/in times from 9th May 2011

Parameter	Level at Royal Arms Public House / dB(A)
Measured background, L_{90}	43
Total sound power from ten buses running simultaneously	97
Calculated specific level, L_{eq}	46
Rating level, L_{eq}	46
Excess over background	+3

Table 5: Rating according to BS 4142 for bus run out

Parameter	Level at Royal Arms Public House / dB(A)
Measured background, L_{90}	38
Total sound power from two buses running simultaneously	90
Calculated specific level, L_{eq}	41
Rating level, L_{eq}	41
Excess over background	+ 3

Table 6: Rating according to BS 4142 for bus run in

16. Appendix 1: Equipment used

Equipment	Model	Serial no.
Sound Level Meter	Norsonics 140	1403423
Calibrator	Norsonics 1251	32918

Both meter and calibrator have current calibration certificates traceable to national standards. The meter was calibrated before and after measurements with no significant drift in levels.

17. Appendix 2: Assessment guidance of BS 4142

The principal guidance for the assessment of industrial noise impact in mixed residential areas is BS 4142. This method involves the determination of a specific noise level due to the source in question at the nearest noise sensitive location, NNSL, thence a rating level. The difference between the rating level and background level at the NNSL is calculated. According to BS 4142:

- A difference of around +10 dB or more indicates that complaints are likely.
- A difference of around +5 dB is of marginal significance.
- If the rating level is lower than 10 dB below the background level (< -10 dB) then this is a positive indication that complaints are unlikely.

It may be considered that for broadband noise sources, a level of 10 dB below the background is generally indiscernible above the background noise, hence the above assessment of BS 4142.

A single penalty of 5 dB may be added to the specific level if the noise:

- contains a distinguishable, discrete, continuous note (whine, hiss, screech, hum, etc.);
- contains distinct impulses (bangs, clicks, clatters, or thumps);
- is irregular enough to attract attention.

BS 4142 also indicates that where background levels are below 30 dB(A), and rating levels below 35 dB(A), these levels are below the scope of the assessment according to that standard. There is no other formal guidance for the assessment in these cases.

Its scope covers the external noise transmission, measurement and assessment of noise levels only; noise levels within buildings are outside its scope.

18. Appendix 3: Glossary

The British Standards and other documents referenced should be consulted for definitions of terms and a more extensive glossary.

Background noise level, $L_{A90,T}$

The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of a given time interval, T, measured using Fast time weighting, and quoted to the nearest whole number of decibels.

Specific noise source

The noise source under investigation for assessing the likelihood of complaints.

Specific noise level, $L_{Aeq, T}$

The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval.

Rating level, $L_{Aeq, T}$

The specific noise level plus any adjustment for the characteristic features of the noise.

Ambient noise

Totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far.

Residual noise

The ambient noise remaining at a given position in a given situation when the specific noise source is suppressed to a degree such that it does not contribute to the ambient noise.