

Infinity Garden Village (Wragley Way)

ENVIRONMENTAL STATEMENT

Volume 3

Appendices and Figures to the Main Technical Studies

June 2019



**Hallam Land
Management**

Appendix F

Subject: Construction Noise Criteria
Project: Infinity Garden Village
Date: May 2019

Operational Hours

The normal working hours within the site shall be Mondays to Fridays between 0800 and 1800 hours and Saturdays between 0800 and 1300 hours, with no working on Sundays or Public Holidays. Exceptionally, consent for work outside these hours may be given after any necessary consultation, particularly with the Environmental Health Officer (EHO). Fourteen days' notice should normally be required from the Contractor when seeking such consent.

The noise levels scheduled below for periods outside normal working hours shall only be permitted when consent has been given to exceptional working.

Ambient Noise Levels

The ambient noise level, $L_{Aeq,T}$ from all sources when measured 1.5m above the ground at any noise sensitive receiver position shall either not exceed the appropriate level given in the agreed Schedule or not exceed by more than 3dB(A) the existing ambient noise level, $L_{Aeq,T}$, at the receiver location measured over the same period, whichever is the greater.

If ambient noise levels are above or close to the limits set out in the schedule, it may be appropriate to carry out noise monitoring at or near the noise sensitive receiver locations prior to commencement of the works. The updated data should be made available to the Contractor. It should act as the baseline existing ambient noise level data with which compliance with the requirements set out is to be tested. The data should either be measured at or be corrected to be representative of the pre-existing noise levels at the noise sensitive positions and provided in terms of hourly L_{A90} , L_{Aeq} and $L_{Amax,S}$ noise indices.

Exceptionally, the Contractor may be given permission to carry out works which exceed the noise levels in the Schedule, provided that 14 days notice of the date and timing of the work is given and the Contractor demonstrates that he has taken all reasonable measures to mitigate the noise nuisance. After consultation with the Local Authority and any other interested bodies a decision would normally be given within 7 days of receipt of the notice.

If the need arises to measure noise levels at a location other than one of the designated noise sensitive locations, the permitted noise level shall be related to the nearest designated noise sensitive location. The permitted noise levels at another location shall take into account the



difference in distance, topography and screening between the noise source and the nearest designated noise sensitive location and the noise source and the measuring location.

Proposed construction noise criteria are set out in the table below.

Total Noise Levels at Designated Noise Sensitive Locations			
Period	Hours	Ambient Construction Noise Level $L_{Aeq,T}$, dB(A)	Period T over which Ambient $L_{Aeq,T}$ is applicable, hours
Mondays to Fridays	0800-1800	65	any 4 hours
Mondays to Fridays (if permitted)	1800-2200	55	any 1 hour
Saturdays (if permitted)	0800-1300	65	any 4 hours
	1300-1800	55	any 1 hour
	1800-2200	55	
Sundays (if permitted)	0800-0900	55	any 1 hour
	0900-1700	55	
	1700-2200	55	
Any day (if permitted)	2200-0800	Construction Noise Levels subject to negotiation with EHO	

T1 Construction Noise limits

(i) Construction noise levels in the schedule relate to free-field conditions, where designated noise sensitive locations are located more than 3.5m from building façades or other reflective surfaces other than the ground. Where noise designated noise sensitive locations are located within 1.0m from building façades, the permitted noise levels can be increased by 3 dB(A).

(ii) The ambient noise level, $L_{Aeq,T}$ at a designated noise sensitive location is the total L_{Aeq} from all the noise sources in the vicinity over the specified period.

(iii) The existing ambient noise level, $L_{Aeq,T}$ at a designated noise sensitive location is the total L_{Aeq} from all the noise sources in the vicinity over the specified period prior to the commencement of the Works.

The Contractor shall employ the best practical means to minimise the noise and vibration produced by his operations and shall have regard to the recommendations in BS5228:2009 "Code of practice for noise and vibration control on construction and open sites".



Without prejudice to the generality of the Contractor's obligations set out above the Contractor shall comply in particular with the following requirements:-

- All vehicles and mechanical plant used for the purpose of carrying out the works shall be fitted with effective exhaust silencers and shall be maintained in good and efficient working order so that extraneous noises shall be reduced to a minimum.
- All compressors and generators shall be "sound reduced" models fitted with properly lined and sealed acoustic covers which shall be kept closed whenever the machines are in use. All ancillary pneumatic percussion tools shall be fitted with mufflers or silencers of the type recommended by the manufacturers. Generators shall be positioned and enclosed so as to minimise noise transmission to the inhabitants in the neighbourhood as agreed with the Employers Agent.
- All pumps shall be positioned and enclosed so as to minimise noise transmission to inhabitants in the neighbourhood.
- All machines in intermittent use shall be shut down in the intervening periods between work or, where this is impracticable, throttled down to a minimum.
- No machine shall be permitted which uses a system of dropping a heavy weight, power assisted or by gravity, for the purpose of breaking up paving or foundations.
- Access to the Site shall be such as to ensure a minimum of disturbance to persons in adjacent buildings by vehicles or plant entering or leaving the Site. No deliveries to Site shall take place outside the agreed working hours.
- Any work agreed to be carried out between 2200 and 0800 hours will be subject to agreement to noise levels with Environmental Health Officer. The Contractor shall provide details on work involved, machinery or plant used, exact location, and calculated noise levels at monitoring points.

Any fixed or static plant operating outside normally permitted working hours shall not give rise to a 'rating level', as defined in BS4142:1997 "Rating industrial noise affecting mixed residential and industrial areas," in excess of the existing free-field background L_{A90} noise levels at noise control stations. The existing baseline free-field background noise levels are to be provided as explained earlier.

Without prejudice to the foregoing and to requirements of particular clauses in the Conditions of Contract, the Contractor shall not be permitted to carry out works as stated below, except where such work is absolutely necessary for the saving of life or property and the safety of the Works or as is required under the terms of the Contract.

Piling, including sheet piling, by percussive methods outside the hours of 0800 to 1800 Mondays to Fridays.



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The maintenance of mechanical or other constructional plant in the proximity of noise sensitive buildings outside the hours of 0800 to 1800 on Mondays to Saturdays or at any time on Sundays and public holidays.

All construction operations shall be such that they do not exceed a peak particle velocity vibration level of 5 mm/s at any nearby sensitive location as well as the VDV's set out in the table below in the relevant areas.

Areas	VDV 07:00h to 23:00h, m/s ^{1.75}	VDV 23:00h to 07:00h m/s ^{1.75}
Residences	0.2	0.1
Commercial Buildings	0.2	0.4

T2 Construction Vibration Dose Value Criteria

 End of Section

Appendix E

Subject: Construction Noise Criteria
Project: Infinity Garden Village
Date: May 2019

In order to assess the effects of construction noise and vibration, it is necessary to establish standards below which the impact is considered to be acceptable. Hence, if an assessment indicates that the standards are likely to be exceeded, alternative construction methods would need to be considered or specific means of mitigation adopted. Proposed construction noise criteria are set out in the table below. The construction noise criteria refer to the total ambient noise level including existing sources and construction noise. The criteria are based on guidance given in Annex E of BS 5228-1:2009.

		Total Noise Levels at Designated Noise Sensitive Locations	
Period	Hours	Ambient Construction Noise Level $L_{Aeq,T}$, dB(A)	Period T over which Ambient $L_{Aeq,T}$ is applicable, hours
Mondays to Fridays	0800-1800	75	any 4 hours
Mondays to Fridays (if permitted)	1800-2200	65	any 1 hour
Saturdays (if permitted)	0800-1300	75	any 4 hours
	1300-1800	65	any 1 hour
	1800-2200	65	
Sundays (if permitted)	0800-0900	65	any 1 hour
	0900-1700	65	
	1700-2200	65	
Any day (if permitted)	2200-0800	Construction Noise Levels subject to negotiation with EHO	

T1 Construction Noise limits



(i) Construction noise levels in the schedule relate to free-field conditions, where designated noise sensitive locations are located more than 3.5m from building façades or other reflective surfaces other than the ground. Where noise designated noise sensitive locations are located within 1.0m from building façades, the permitted noise levels can be increased by 3 dB(A).

(ii) The ambient noise level, $L_{Aeq,T}$ at a designated noise sensitive location is the total L_{Aeq} from all the noise sources in the vicinity over the specified period.

(iii) The existing ambient noise level, $L_{Aeq,T}$ at a designated noise sensitive location is the total L_{Aeq} from all the noise sources in the vicinity over the specified period prior to the commencement of the Works.

E.1 Vibration Criteria

With regard to standards for vibration during construction, these have been developed with reference to the documents and recommended values set out below.

Document	Onset of Effect of Vibration on People	Onset of Potential Cosmetic Damage to Buildings
BS 5228:1992:Part 4 ¹	0.15 – 0.30 mms^{-1} PPV	10.00 mms^{-1} PPV
DIN 4150:1986:Part 3 ²	0.20 mms^{-1} PPV	5.00 – 20.00 mms^{-1} PPV
BS 6472:2008 ³	0.20 $\text{ms}^{-1.75}$ VDV_{day} 0.10 $\text{ms}^{-1.75}$ $\text{VDV}_{\text{night}}$	N/A

T2 Vibration standards summary

It is worth noting that the 0.2 mms^{-1} PPV (Peak Particle Velocity) referred to in DIN 4150 and BS 6472 is around the human threshold of perception of vibration, although there is some variation between individuals.

Taking all these factors together, we propose that all construction processes that are likely to generate a vibration level in excess of 1.0 mms^{-1} PPV at any location within any nearby sensitive building, are subject to a more detailed assessment to determine whether mitigation measures are appropriate. That assessment should be undertaken with a view to establishing not only the levels of vibration likely to be generated but also the duration and frequency of their occurrence so that Vibration Dose Values (VDVs) can be calculated and compared to the

¹ British Standard 5228: 1992: Noise control on construction and open sites: Part 4.

² Deutsche Norm 4150: 1992: Erschütterungen im Bauwesen – Einwirkungen auf Menschen in Gebäuden.

³ British Standard 6472: 2008: Evaluation of human exposure to vibration in buildings (1Hz to 80Hz).



relevant standards. If these are also exceeded, then mitigation measures or alternative means of carrying out particular activities will need to be investigated.

We are not aware of any buildings near the site that are classified as Historic. However this should be verified in order that an appropriate assessment can be made in the event of the above suggested 1.0 mms^{-1} PPV being exceeded.

E.2 Section 61 Agreements and Code of Construction Practice

The Environmental Protection Act 1990 gives Local Authorities powers to control noise from construction sites by reference to Sections 60 and 61 of the Control of Pollution Act 1974 (COPA). Section 61 facilitates a process by which a Contractor agrees a method of working with a Local Authority, often stipulating hours and methods of working and occasionally agreeing specific noise limits at sensitive locations. The advantage of such an agreement is that compliance with it protects the Contractor from being served with a notice to cease works on account of the noise and vibration impact. The Local Authority has the power under Section 60 of COPA to serve such a notice if it deems the construction noise to be causing a nuisance.

As a means of minimizing the risk of noise disturbance and disruption, the Developer may make it a contractual obligation for the Contractor(s) to establish Section 61 Agreements (or similar) with the Local Planning Authority for the works to be carried out. The content of those agreements cannot as yet be defined in detail, but the following areas might be discussed and included.

- Hours of working: limited to those times when the sensitivity of affected parties nearby is not so acute.
- Methods and types of plant: particular construction or demolition methods may be disallowed on the site due to the severity of the noise typically generated, as may certain types of plant.
- Low noise plant and noise mitigation: directives on the selection of low noise plant where practical may be included as well as specific types of mitigation for equipment or processes which lend themselves to the same.
- Noise limits: occasionally and under specific circumstances it may be appropriate to set noise limits for certain periods and at certain locations.
- Monitoring, liaison and reporting: the agreement may specify that noise and vibration monitoring is required at certain locations for record keeping and evaluation purposes. Particular parties responsible for liaison and reporting to the local planning authority and other nominated parties may also be identified.

Section 61 Agreements can be a valuable tool which will enable the local authority to control the noise impact from construction activity while giving the Contractor an agreed framework within which the operations can be carried out. This minimises the risk of disruption to operations without leading to unacceptable consequences for noise sensitive parties. In order



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to demonstrate the method of control that would be imposed by the Employer on any Contractor undertaking construction works on the site, the next Appendix contains an example for a Code of Construction Practice dealing with noise and vibration

 End of Section



Assessment 1: DM25 vs .DS25(P1/2) Short Term Effect

Link Ref.	Description	18-hour traffic flow		Change in Noise Level,	Short Term Effect
		DM25	DS25(P1/2)	dB $L_{A10, 18 \text{ hour}}$	
1	Deep Dale Lane (south)	4,373	5,070	+0.6	Neutral/Negligible
2	Deep Dale Lane (north)	4,116	4,399	+0.3	Neutral/Negligible
3	Wragley Way (west of Deep Dale Lane)	4,996	5,081	+0.5	Neutral/Negligible
4	Arleston Lane	4,405	5,099	+0.6	Neutral/Negligible
5	Wragley Way (west of Arleston Lane)	4,852	5,826	+0.6	Neutral/Negligible
6	Stenson Road (south of Wragley Way)	7,520	7,744	+0.1	Neutral/Negligible
7	Stenson Road (north of Wragley Way)	9,217	9,443	+0.0	Neutral/Negligible
8	Grampian Way (east of Stenson Road)	16,511	16,598	+0.0	Neutral/Negligible
9	Stenson Road (north of Grampian Way)	15,607	15,744	+0.0	Neutral/Negligible
10	Grampian Way (west of Sinfin Lane)	17,165	18,973	+0.4	Neutral/Negligible
11	Sinfin Lane (north of Grampian Way)	17,788	18,605	+0.2	Neutral/Negligible
12	Wilmore Road	15,885	16,032	+0.1	Neutral/Negligible
13	Sinfin Lane (north of Wilmore Road)	28,927	16,777	-1.7	Minor Beneficial
14	Stenson Road (north of Blagreaves Lane)	25,391	25,785	+0.1	Neutral/Negligible
15	Warwick Avenue	30,979	29,320	-0.1	Neutral/Negligible
16	Kenilworth Avenue	25,391	25,919	+0.1	Neutral/Negligible
17	Osmaston Park Road	27,343	27,724	+0.1	Neutral/Negligible
18	Link Road East of Junc 24	-	-	-	-
19	Link North of junction 25	-	-	-	-
20	West of junction 19	-	-	-	-
21	North East of Junc 20b	-	-	-	-
22	North West of Junction 20b	-	-	-	-
23	West of Junction 15	-	-	-	-



Assessment 2: DM25+A50 vs .DS25(P1/2)+A50

Short Term Effect

Link Ref.	Description	18-hour traffic flow		Change in Noise	Short Term Effect
		DM25+A50	DS25(P1/2)+A50	Level, dB <i>L</i> _{A10, 18 hour}	
1	Deep Dale Lane (south)	19,023	19,720	+0.2	Neutral/Negligible
2	Deep Dale Lane (north)	7,825	8,108	+0.2	Neutral/Negligible
3	Wragley Way (west of Deep Dale Lane)	16,298	16,383	+0.2	Neutral/Negligible
4	Arleston Lane	2,904	3,597	+0.8	Neutral/Negligible
5	Wragley Way (west of Arleston Lane)	15,937	16,911	+0.2	Neutral/Negligible
6	Stenson Road (south of Wragley Way)	8,033	8,257	+0.1	Neutral/Negligible
7	Stenson Road (north of Wragley Way)	19,899	20,125	+0.0	Neutral/Negligible
8	Grampian Way (east of Stenson Road)	17,619	17,706	+0.0	Neutral/Negligible
9	Stenson Road (north of Grampian Way)	20,634	20,771	+0.0	Neutral/Negligible
10	Grampian Way (west of Sinfin Lane)	15,725	17,532	+0.4	Neutral/Negligible
11	Sinfin Lane (north of Grampian Way)	17,653	18,471	+0.2	Neutral/Negligible
12	Wilmore Road	16,205	16,352	+0.1	Neutral/Negligible
13	Sinfin Lane (north of Wilmore Road)	30,285	18,134	-1.6	Minor Beneficial
14	Stenson Road (north of Blagreaves Lane)	20,559	20,953	+0.2	Neutral/Negligible
15	Warwick Avenue	33,406	31,747	-0.1	Neutral/Negligible
16	Kenilworth Avenue	26,956	27,483	+0.1	Neutral/Negligible
17	Osmaston Park Road	29,199	29,580	+0.1	Neutral/Negligible
18	Link Road East of Junc 24	-	-	-	-
19	Link North of junction 25	-	-	-	-
20	West of junction 19	-	-	-	-
21	North East of Junc 20b	-	-	-	-
22	North West of Junction 20b	-	-	-	-
23	West of Junction 15	-	-	-	-



Long Term Effect

Assessment 3: DM25+A50 vs .DS40(Full)+A50+Emp.

Link Ref.	Description	18-hour traffic flow		Change in Noise Level,	
		DM25+A50	DS40(Full)+A50+Emp.	dB $L_{A10, 18 \text{ hour}}$	Short Term Effect
1	Deep Dale Lane (south)	19,023	4,508	-6.2	Moderate Beneficial
2	Deep Dale Lane (north)	7,825	4,523	-2.4	Neutral/Negligible
3	Wragley Way (west of Deep Dale Lane)	16,298	2,548	-7.5	Moderate Beneficial
4	Arleston Lane	2,904	7,277	+3.3	Minor Adverse
5	Wragley Way (west of Arleston Lane)	15,937	19,672	+0.9	Neutral/Negligible
6	Stenson Road (south of Wragley Way)	8,033	9,481	+0.7	Neutral/Negligible
7	Stenson Road (north of Wragley Way)	19,899	25,321	+1.0	Neutral/Negligible
8	Grampian Way (east of Stenson Road)	17,619	21,622	+0.9	Neutral/Negligible
9	Stenson Road (north of Grampian Way)	20,634	28,029	+1.3	Neutral/Negligible
10	Grampian Way (west of Sinfin Lane)	15,725	27,866	+2.2	Neutral/Negligible
11	Sinfin Lane (north of Grampian Way)	17,653	27,110	+1.8	Neutral/Negligible
12	Wilmore Road	16,205	19,688	+0.8	Neutral/Negligible
13	Sinfin Lane (north of Wilmore Road)	30,285	34,545	+0.6	Neutral/Negligible
14	Stenson Road (north of Blagreaves Lane)	20,559	37,256	+2.0	Neutral/Negligible
15	Warwick Avenue	33,406	38,657	+0.6	Neutral/Negligible
16	Kenilworth Avenue	26,956	28,629	+0.2	Neutral/Negligible
17	Osmaston Park Road	29,199	32,963	+0.5	Neutral/Negligible
18	Link Road East of Junc 24	-	20,131	-	-
19	Link North of junction 25	-	3,453	-	-
20	West of junction 19	-	8,838	-	-
21	North East of Junc 20b	-	30,244	-	-
22	North West of Junction 20b	-	17,830	-	-
23	West of Junction 15	-	3,484	-	-



Long Term Effect

Assessment 4: DM30+A50 vs .DS30(Full)+A50+Emp.

Link Ref.	Description	18-hour traffic flow		Change in Noise Level, dB $L_{A10, 18 \text{ hour}}$	Short Term Effect
		DM30+A50	DS30(Full)+A50+Emp.		
1	Deep Dale Lane (south)	21,333	4,508	-6.7	Moderate Beneficial
2	Deep Dale Lane (north)	8,731	4,218	-3.2	Minor Beneficial
3	Wragley Way (west of Deep Dale Lane)	18,141	2,498	-7.3	Moderate Beneficial
4	Arleston Lane	3,079	7,716	+3.3	Minor Adverse
5	Wragley Way (west of Arleston Lane)	17,961	18,756	+0.1	Neutral/Negligible
6	Stenson Road (south of Wragley Way)	8,309	8,879	+0.3	Neutral/Negligible
7	Stenson Road (north of Wragley Way)	21,995	27,331	+0.9	Neutral/Negligible
8	Grampian Way (east of Stenson Road)	18,833	20,086	+0.3	Neutral/Negligible
9	Stenson Road (north of Grampian Way)	22,201	26,174	+0.7	Neutral/Negligible
10	Grampian Way (west of Sinfin Lane)	16,668	26,516	+1.7	Neutral/Negligible
11	Sinfin Lane (north of Grampian Way)	18,630	25,640	+1.3	Neutral/Negligible
12	Wilmore Road	17,027	18,421	+0.3	Neutral/Negligible
13	Sinfin Lane (north of Wilmore Road)	31,362	24,174	-0.8	Neutral/Negligible
14	Stenson Road (north of Blagreaves Lane)	21,042	35,523	+1.7	Neutral/Negligible
15	Warwick Avenue	34,352	36,116	+0.2	Neutral/Negligible
16	Kenilworth Avenue	27,914	28,629	+0.1	Neutral/Negligible
17	Osmaston Park Road	30,236	30,772	+0.1	Neutral/Negligible
18	Link Road East of Junc 24	-	18,502	-	-
19	Link North of junction 25	-	3,454	-	-
20	West of junction 19	-	7,983	-	-
21	North East of Junc 20b	-	28,759	-	-
22	North West of Junction 20b	-	16,340	-	-
23	West of Junction 15	-	3,485	-	-



Long Term Effect

Assessment 5: DS30(Full)+A50-Emp. vs .DS30(Full)+A50+Emp.

Link Ref.	Description	18-hour traffic flow		Change in Noise	
		DS30(Full) +A50-Emp.	DS30(Full) +A50+Emp.	Level, dB $L_{A10, 18 \text{ hour}}$	Short Term Effect
1	Deep Dale Lane (south)	3,903	4,508	+0.6	Neutral/Negligible
2	Deep Dale Lane (north)	4,218	4,218	-0.0	Neutral/Negligible
3	Wragley Way (west of Deep Dale Lane)	1,789	2,498	+3.0	Neutral/Negligible
4	Arleston Lane	6,523	7,716	+0.6	Neutral/Negligible
5	Wragley Way (west of Arleston Lane)	17,588	18,756	+0.3	Neutral/Negligible
6	Stenson Road (south of Wragley Way)	8,891	8,879	-0.0	Neutral/Negligible
7	Stenson Road (north of Wragley Way)	25,258	27,331	+0.3	Neutral/Negligible
8	Grampian Way (east of Stenson Road)	19,558	20,086	+0.1	Neutral/Negligible
9	Stenson Road (north of Grampian Way)	24,776	26,174	+0.2	Neutral/Negligible
10	Grampian Way (west of Sinfin Lane)	24,839	26,516	+0.2	Neutral/Negligible
11	Sinfin Lane (north of Grampian Way)	24,398	25,640	+0.2	Neutral/Negligible
12	Wilmore Road	18,210	18,421	+0.0	Neutral/Negligible
13	Sinfin Lane (north of Wilmore Road)	24,174	24,174	+0.0	Neutral/Negligible
14	Stenson Road (north of Blagreaves Lane)	32,886	35,523	+0.3	Neutral/Negligible
15	Warwick Avenue	35,723	36,116	+0.0	Neutral/Negligible
16	Kenilworth Avenue	28,629	28,629	+0.0	Neutral/Negligible
17	Osmaston Park Road	30,884	30,772	-0.0	Neutral/Negligible
18	Link Road East of Junc 24	17,458	18,502	+0.3	Neutral/Negligible
19	Link North of junction 25	2,411	3,454	+1.6	Neutral/Negligible
20	West of junction 19	7,803	7,983	+0.1	Neutral/Negligible
21	North East of Junc 20b	27,877	28,759	+0.1	Neutral/Negligible
22	North West of Junction 20b	16,340	16,340	+0.0	Neutral/Negligible
23	West of Junction 15	3,634	3,485	-0.2	Neutral/Negligible



Long Term Effect

Assessment 6: DM40+A50 vs .DS40(Full)+A50+Emp.

Link Ref.	Description	18-hour traffic flow		Change in Noise Level,	
		DM40+A50	DS40(Full)+A50+Emp.	dB $L_{A10, 18 \text{ hour}}$	Short Term Effect
1	Deep Dale Lane (south)	22,855	4,508	-7.0	Moderate Beneficial
2	Deep Dale Lane (north)	9,352	4,523	-3.2	Minor Beneficial
3	Wragley Way (west of Deep Dale Lane)	19,400	2,548	-8.2	Moderate Beneficial
4	Arleston Lane	3,675	7,277	+2.4	Neutral/Negligible
5	Wragley Way (west of Arleston Lane)	19,191	19,672	+0.1	Neutral/Negligible
6	Stenson Road (south of Wragley Way)	8,904	9,481	+0.3	Neutral/Negligible
7	Stenson Road (north of Wragley Way)	23,549	25,321	+0.3	Neutral/Negligible
8	Grampian Way (east of Stenson Road)	20,195	21,622	+0.3	Neutral/Negligible
9	Stenson Road (north of Grampian Way)	23,799	28,029	+0.7	Neutral/Negligible
10	Grampian Way (west of Sinfin Lane)	17,884	27,866	+1.6	Neutral/Negligible
11	Sinfin Lane (north of Grampian Way)	19,991	27,110	+1.2	Neutral/Negligible
12	Wilmore Road	16,640	19,688	+0.6	Neutral/Negligible
13	Sinfin Lane (north of Wilmore Road)	33,676	34,545	+0.1	Neutral/Negligible
14	Stenson Road (north of Blagreaves Lane)	21,795	37,256	+1.7	Neutral/Negligible
15	Warwick Avenue	36,876	38,657	+0.2	Neutral/Negligible
16	Kenilworth Avenue	29,975	28,629	-0.3	Neutral/Negligible
17	Osmaston Park Road	-	32,963	-	-
18	Link Road East of Junc 24	-	20,131	-	-
19	Link North of junction 25	-	3,453	-	-
20	West of junction 19	-	8,838	-	-
21	North East of Junc 20b	-	30,244	-	-
22	North West of Junction 20b	-	17,830	-	-
23	West of Junction 15	-	3,484	-	-



Long Term Effect

Assessment 7: DM40 vs .DS40(Full)+A50+Emp.

Link Ref.	Description	18-hour traffic flow		Change in Noise Level,	
		DM40	DS40(Full) + A50+Emp.	dB $L_{A10, 18 \text{ hour}}$	Short Term Effect
1	Deep Dale Lane (south)	4,885	4,508	-0.4	Neutral/Negligible
2	Deep Dale Lane (north)	4,626	4,523	-0.1	Neutral/Negligible
3	Wragley Way (west of Deep Dale Lane)	5,615	2,548	-3.1	Minor Beneficial
4	Arleston Lane	4,951	7,277	+1.4	Neutral/Negligible
5	Wragley Way (west of Arleston Lane)	5,420	19,672	+5.0	Minor Adverse
6	Stenson Road (south of Wragley Way)	8,453	9,481	+0.5	Neutral/Negligible
7	Stenson Road (north of Wragley Way)	10,296	25,321	+3.6	Minor Adverse
8	Grampian Way (east of Stenson Road)	18,558	21,622	+0.6	Neutral/Negligible
9	Stenson Road (north of Grampian Way)	17,542	28,029	+2.0	Neutral/Negligible
10	Grampian Way (west of Sinfin Lane)	19,293	27,866	+1.4	Neutral/Negligible
11	Sinfin Lane (north of Grampian Way)	19,993	27,110	+1.2	Neutral/Negligible
12	Wilmore Road	17,854	19,688	+0.3	Neutral/Negligible
13	Sinfin Lane (north of Wilmore Road)	32,513	34,545	+0.2	Neutral/Negligible
14	Stenson Road (north of Blagreaves Lane)	28,539	37,256	+0.9	Neutral/Negligible
15	Warwick Avenue	35,855	38,657	+0.3	Neutral/Negligible
16	Kenilworth Avenue	29,387	28,629	-0.2	Neutral/Negligible
17	Osmaston Park Road	30,733	32,963	+0.2	Neutral/Negligible
18	Link Road East of Junc 24	-	20,131	-	-
19	Link North of junction 25	-	3,453	-	-
20	West of junction 19	-	8,838	-	-
21	North East of Junc 20b	-	30,244	-	-
22	North West of Junction 20b	-	17,830	-	-
23	West of Junction 15	-	3,484	-	-

Infinity Garden Village

Environmental Noise Survey

Report 13/1580/R1

Infinity Garden Village

Environmental Noise Survey

Report 13/1580/R1

Wragley Way, Derby

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Revision	Description	Date	Prepared	Approved
2	ES Issue	28 May 2019	Richard Masey	Ian Yates

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Environmental Noise Survey

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Attachments

Glossary of Acoustic Terms

13/1580/SP1-2

Site plan showing noise measurement positions

13/1580/TH1.1

Time history displaying noise levels at unattended measurement position L1 (2013)

13/1580/TH1.2

Time history displaying noise levels at unattended measurement position L1 (2019)

13/1580/TH2.1

Time history displaying noise levels at unattended measurement position L2 (2013)

13/1580/TH2.2

Time history displaying noise levels at unattended measurement position L2 (2019)

13/1580/TH3.1

Time history displaying noise levels at unattended measurement position L3 (2013)

13/1580/TH3.2

Time history displaying noise levels at unattended measurement position L3a (2019)



Environmental Noise Survey

13/1580/SCH1-1

Schedule showing results from attended measurement positions and derived day and night time levels from unattended measurement positions (2013)



End of Section



Environmental Noise Survey

1 Introduction

- 1.1 Land to the south of Wragley Way and north of the A50 has been identified in local planning policy as suitable for residential development.
- 1.2 Cole Jarman have been appointed to undertake surveys to quantify the prevailing noise levels at the site.
- 1.3 This report details the methodology and results of surveys carried out in 2013 and 2019.

2 Site Description

- 2.1 The site is located immediately to the north of the A50 and south of Wragley Way, Derby. It is flanked by a railway line to the west and agricultural land to the east. The extents of the site are indicated on the attached site plan 13/1580/SP1-2.
- 2.2 To the north of Wragley Way is a large residential area. All other areas on and around the proposed site consist of agricultural land. Three roads also pass through the site, these being Stenson Road, Arleston Lane and Deep Dale Lane.
- 2.3 At the time of the measurements in both 2013 and 2019, the A50 was observed to be the dominant noise source across the site. Only at locations close to the other roads around the site did those roads have any significant effect on noise levels. Similarly, near the north western boundary of the site the railway made a significant contribution to noise levels.

3 Noise Survey Methodology and Instrumentation

3.1 2013

- 3.1.1 In order to quantify the existing ambient noise levels at the site in 2013, noise surveys were undertaken at three long term unattended locations and eight attended locations. Long term measurements (denoted 'L') commenced on 26th April 2013 and were concluded the following day. Short term measurements (denoted 'S') were carried out at various times over those two days.
- 3.1.2 All short term measurements were made in general accordance with the Calculation of Road Traffic Noise (CRTN) 'Shortened Measurement Procedure'. This then enables the usage of the DEFRA conversion method to produce daytime and night time $L_{Aeq,T}$ noise levels.
- 3.1.3 Measurement locations are indicated on attached site plan figure 13/1580/SP1-2 and described as follows:
 - L1 - In the south east corner of the site, approximately 40 m from the kerb of Deep Dale Lane and approximately 60 m from the A50.



Environmental Noise Survey

- L2 – Approximately 90 m from the A50 and approximately 100 m from Arleston Lane.
- L3 – At the north-west boundary of the site, approximately 15 m from the nearest rail.
- S1 – Approximately 3 m from the kerb, South of Wragley Way in the north east part of the site.
- S2 – Approximately 2 m from the kerb to the West of Deep Dale Lane and approximately 100 m south of the intersection with Wragley Way.
- S3 – In the north east corner of a small field in the north east part of the site, approximately 200 m from the eastern end of Wragley Way.
- S4 – At the eastern end of Farmhouse Road, north of the housing estate, north of Wragley Way. This position was approximately 5 m from the kerb.
- S5 – Midway along the proposed development site, south of Wragley Way and to the east of Arleston Lane, approximately 3 m from the kerb of Arlestone Lane and approximately 50 m south of Wragley Way.
- S6 – Approximately 3 m from the kerb, south of Wragley Way, midway between Arleston Lane and Stenson Road
- S7 – Approximately 1 m from the kerb east of Stenson Road and around 100 m south of the western end of Wragley Way.
- S8 – Approximately 3 m from the kerb at the western end of Wragley way.

3.1.4 All positions were free field and at a height 1.5 m above ground level. The only exception was L3, where the microphone was located approximately 4 m above ground to gain a clear view of the rails.

3.1.5 Long term measurements were made in terms of L_{Aeq} , L_{Amax} , and L_{A90} over consecutive 1 hour periods, with a 5 minute resolution to allow more detailed inspection where appropriate (see attached Glossary of Acoustic Terms for an explanation of noise units used). Attended measurements were conducted over 10 minute periods.

3.1.6 Noise measurements were made using the equipment detailed in the following table:



Environmental Noise Survey

Item	Manufacturer	Type
Sound Level Analyser	Norsonic	118
Acoustic Calibrator	Norsonic	1251
Weatherproof windshield	Norsonic	1212
Sound Level Analyser	Rion	NL-52
Acoustic Calibrator	Rion	NC-74

T1 Equipment used during 2013 noise survey

- 3.1.7 The sound level analysers were fitted with windshields and were calibrated before and after the measurements, to ensure that acceptable levels of accuracy were maintained throughout.
- 3.1.8 The weather conditions over the survey period were dry and cloudy with a light breeze from the south and west.

3.2 2019

- 3.2.1 Key locations were selected to be surveyed again in 2019, in order to gauge whether any significant changes in noise climate had occurred since 2013.
- 3.2.2 Long term measurements commenced on 16th April 2019 and were concluded the following day. Short term measurements were carried out at various times over those two days.
- 3.2.3 Measurement locations are indicated on attached site plan figure 13/1580/SP1-2 and described as follows:
- L1 - In the south east corner of the site, approximately 40 m from the kerb of Deep Dale Lane and approximately 60 m from the A50.
 - L2a – Approximately 130 m from the A50 and approximately 100 m from Arleston Lane; this was a surrogate position for the original L2, to avoid being affected by a farm vehicle working in the vicinity of L2 for a period on 16th April 2019.
 - L3a – At the north-west boundary of the site, approximately 15 m from the nearest rail; this was a surrogate position for the original L3 (which now has occupied houses in its vicinity, rendering it more vulnerable to interference).
 - S7a – Approximately 3 m from the kerb east of Stenson Road and around 100 m south of the western end of Wragley Way.
- 3.2.4 All positions were free field and at a height 1.5m above ground level. The only exception was L3a, where the microphone was located approximately 3m above ground to gain a clear view of the rails.



Environmental Noise Survey

- 3.2.5 Long term measurements were made in terms of L_{Aeq} , L_{Amax} , and L_{A90} in consecutive 15 minute periods. Attended measurements were conducted in 5 minute periods.
- 3.2.6 Noise measurements were made using the equipment detailed in the following table:

Item	Manufacturer	Type
Sound Level Analyser	Norsonic	118
Acoustic Calibrator	Norsonic	1251
Sound Level Analyser (x3)	Rion	NL-52
Acoustic Calibrator (x3)	Rion	NC-74
Weatherproof windshield (x3)	Rion	WS-15

T2 Equipment used during 2019 noise survey

- 3.2.7 The sound level analysers were fitted with windshields and were calibrated before and after the measurements, to ensure that acceptable levels of accuracy were maintained throughout.
- 3.2.8 The weather conditions over the survey period were dry and mild, with almost no wind. The sky was cloudy on the 16th and clear on the 17th.

4 Results

- 4.1 Results for the long term unattended measurements at L1, L2 and L3 in 2013 can be seen in attached figures 13/1580/TH1.1, TH2.1 and TH3.1 respectively. The corresponding results at L1, L2a and L3a in 2019 can be seen in figures 13/1580/TH1.2, TH2.2 and TH3.2 respectively.
- 4.2 Attended measurement results can be seen in attached schedules 13/1580/SCH1 for 2013 and 2019.
- 4.3 The noise climate across the great majority of the site was dominated by traffic on the A50. Measurements made at L1 and L2/L2a were entirely dominated by the A50 and the results indicate that both day and night time noise levels were reasonably steady over the course of the measurement period. Noise levels close to the railway and other roads were affected by those noise sources. Observations indicated that even small increases in distance away from the other roads lead to the A50 again becoming dominant.
- 4.4 Daytime and night time noise levels measured at each of the unattended positions can be seen in the table below. The typical maximum noise levels derived from inspection of the 5- to 15-minute period noise levels are also shown in the tables.
- 4.5 It should be noted that a single 15-minute period in the 2019 L2a data has been excluded from the analysis, due to unusually high noise levels which are likely to have been caused by a



Environmental Noise Survey

non-typical noise source such as farm machinery passing very close to the microphone. The excluded data remains visible on attached figure 13/1580/TH1.2.

Position	2013 Measured Day and Night Period Noise Levels		
	$L_{Aeq, 16 \text{ hour}}$ Day	$L_{Aeq, 8 \text{ hour}}$ Night	Typical L_{Amax} Night
L1	65	61	72
L2	63	58	71
L3	67	60	88

T3 Measured noise levels at unattended locations in 2013

Position	2019 Measured Day and Night Period Noise Levels		
	$L_{Aeq, 16 \text{ hour}}$ Day	$L_{Aeq, 8 \text{ hour}}$ Night	Typical L_{Amax} Night
L1	65	61	72
L2a	56	50	61
L3a	64	63	89

T4 Measured noise levels at unattended locations in 2019

4.6 Comparing tables T3 and T4, it can be seen that:

- Noise levels at L1 have not changed.
- Noise levels at L2a appear to have reduced, even accounting for the additional distance from the A50 in comparison to L2. The reason for this is not known; it is possible that wind may be a contributing factor, since there was virtually no wind in the 2019 survey but a light breeze from the south / west in 2013 (and given that the A50 to the south west was subjectively the dominant part of the road in both years). To ensure a robust approach, it is intended that any assessments based on the data presented on this report make use of the higher noise levels measured in 2013.
- Noise levels at L3 have not changed significantly, although night time period levels have increased slightly while daytime levels have decreased slightly (this may be due to variations in the timings of freight trains passing the site, which would correlate with the indication on the time histories that in 2019 trains passed the site between midnight and 05:00h, whereas in 2013 none did). To ensure a robust approach, it is intended that any assessment in the vicinity



Environmental Noise Survey

of the railway line is based upon the higher of each of the day and night period noise levels measured in 2013 and 2019.

- 4.7 Results from the attended measurements were converted to $L_{Aeq, 16 \text{ hour}}$ and $L_{Aeq, 8 \text{ hour}}$ noise levels using the DEFRA conversion method ¹ and are displayed in the tables below.

2013 Derived Day and Night Period Noise Levels		
Position	$L_{Aeq, 16 \text{ hour}}$ Day	$L_{Aeq, 8 \text{ hour}}$ Night
S1	66	58
S2	67	59
S3	48	41
S4	47	40
S5	59	52
S6	66	58
S7	71	63
S8	68	60

T5 Derived noise levels at attended locations in 2013

2019 Derived Day and Night Period Noise Levels		
Position	$L_{Aeq, 16 \text{ hour}}$ Day	$L_{Aeq, 8 \text{ hour}}$ Night
S7a	70	62

T6 Derived noise levels at attended locations in 2019

- 4.8 Comparison of noise levels at S7 and S7a indicates that there has been no significant change in noise levels in the vicinity of Stenson Road. This is the case even taking account of the fact that the 2019 measurements were 3 m from the kerb, whereas the 2013 measurements were 1 m from the kerb (equating to a 1 to 2 dB difference).

¹ DEFRA: Method for Converting the UK Road Traffic Noise Index LA10,18h to the EU Noise Indices for Road Noise Mapping (January 2006)



Environmental Noise Survey

5 Summary

- 5.1 Attended and unattended noise measurements were conducted at various points across the site to quantify the existing noise climate in 2013. Measurements at key locations were repeated in 2019 to gauge whether any significant changes in noise climate had occurred in the interim. The results indicate that this is the case, except at one locations where noise levels have reduced (but it is the intention to use the higher noise levels measured in 2013 as the basis of any assessment).
- 5.2 Noise levels are controlled mainly by the A50 dual carriageway except at locations close to other roads and the railway, where those noise sources have an influence.
- 5.3 While noise levels are high in places, they are not of a magnitude that is likely to prevent residential development. This will however be subject to the layout and design of any development.

 End of Section



Environmental Noise Survey

Glossary of Acoustic Terms

L_{Aeq} :

The notional steady sound level (in dB) which over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measurement over that period. Values are sometimes written using the alternative expression dB(A) L_{eq} .

L_{Amax} :

The maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise when occasional loud noises occur, which may have little effect on the L_{Aeq} noise level. Unless described otherwise, L_{Amax} is measured using the “fast” sound level meter response.

L_{A10} & L_{A90} :

If non-steady noise is to be described, it is necessary to know both its level and degree of fluctuation. The L_{An} indices are used for this purpose. The term refers to the A-weighted level (in dB) exceeded for n% of the time specified. L_{A10} is the level exceeded for 10% of the time and as such gives an indication of the upper limit of fluctuating noise. Similarly L_{A90} gives an indication of the lower levels of fluctuating noise. It is often used to define the background noise.

L_{A10} is commonly used to describe traffic noise. Values of dB L_{An} are sometimes written using the alternative expression dB(A) L_n .

L_{AX} , L_{AE} or SEL

The single event noise exposure level which, when maintained for 1 second, contains the same quantity of sound energy as the actual time varying level of one noise event. L_{AX} values for contributing noise sources can be considered as individual building blocks in the construction of a calculated value of L_{Aeq} for the total noise. The L_{AX} term can sometimes be referred to as Exposure Level (L_{AE}) or Single Event Level (SEL).

■ End of Section

Figure 13/1580/SP1

Title:

Site plan showing noise measurement positions



Short Term
Measurement
Position



Long Term (24 hour)
Measurement
Position



Project:

Land at Wragley Way, Derby

Date:

May 2019

Revision:

2

Scale:

Not to scale

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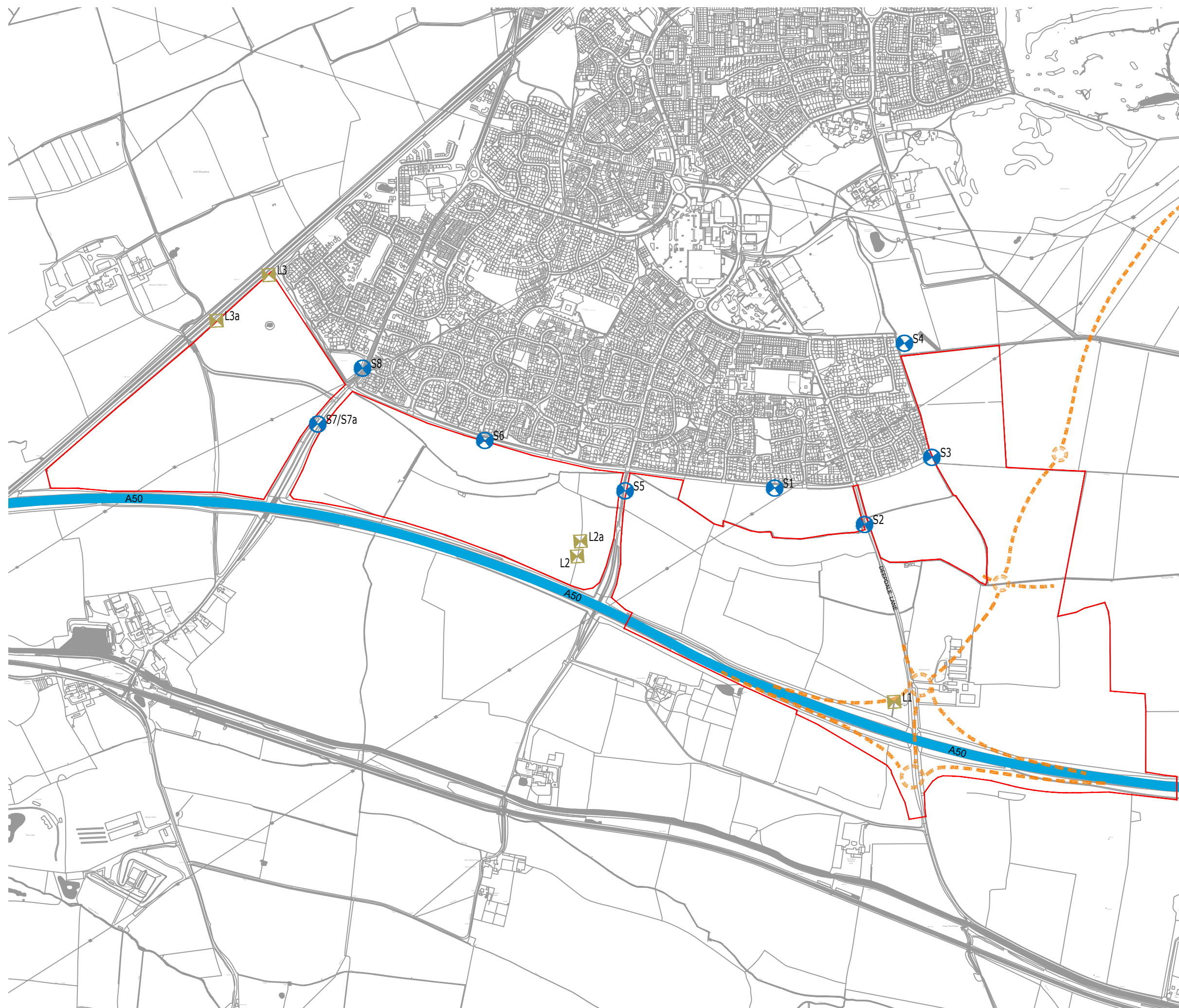




Figure 13/1580/TH1.1

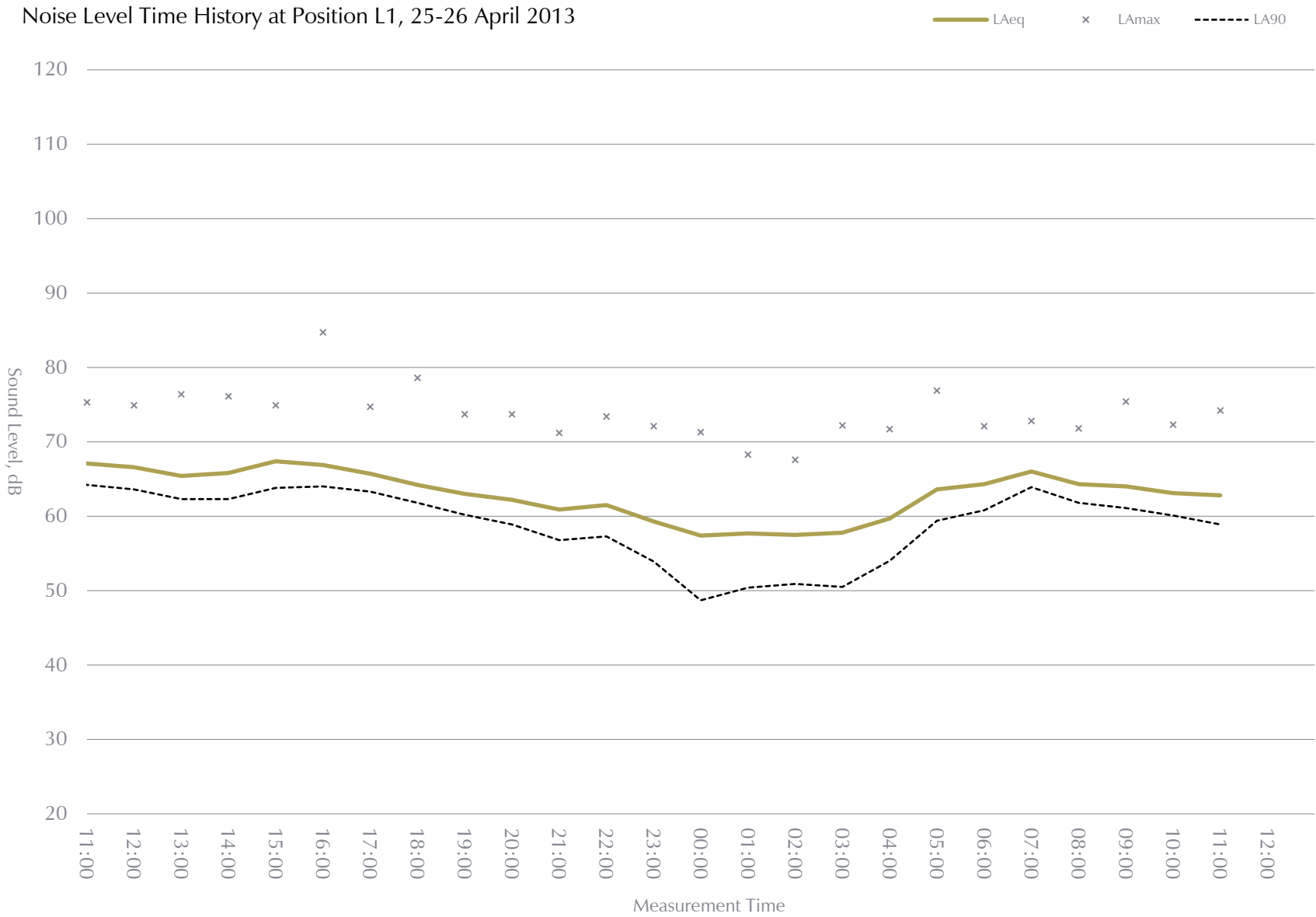




Figure 13/1580/TH1.2

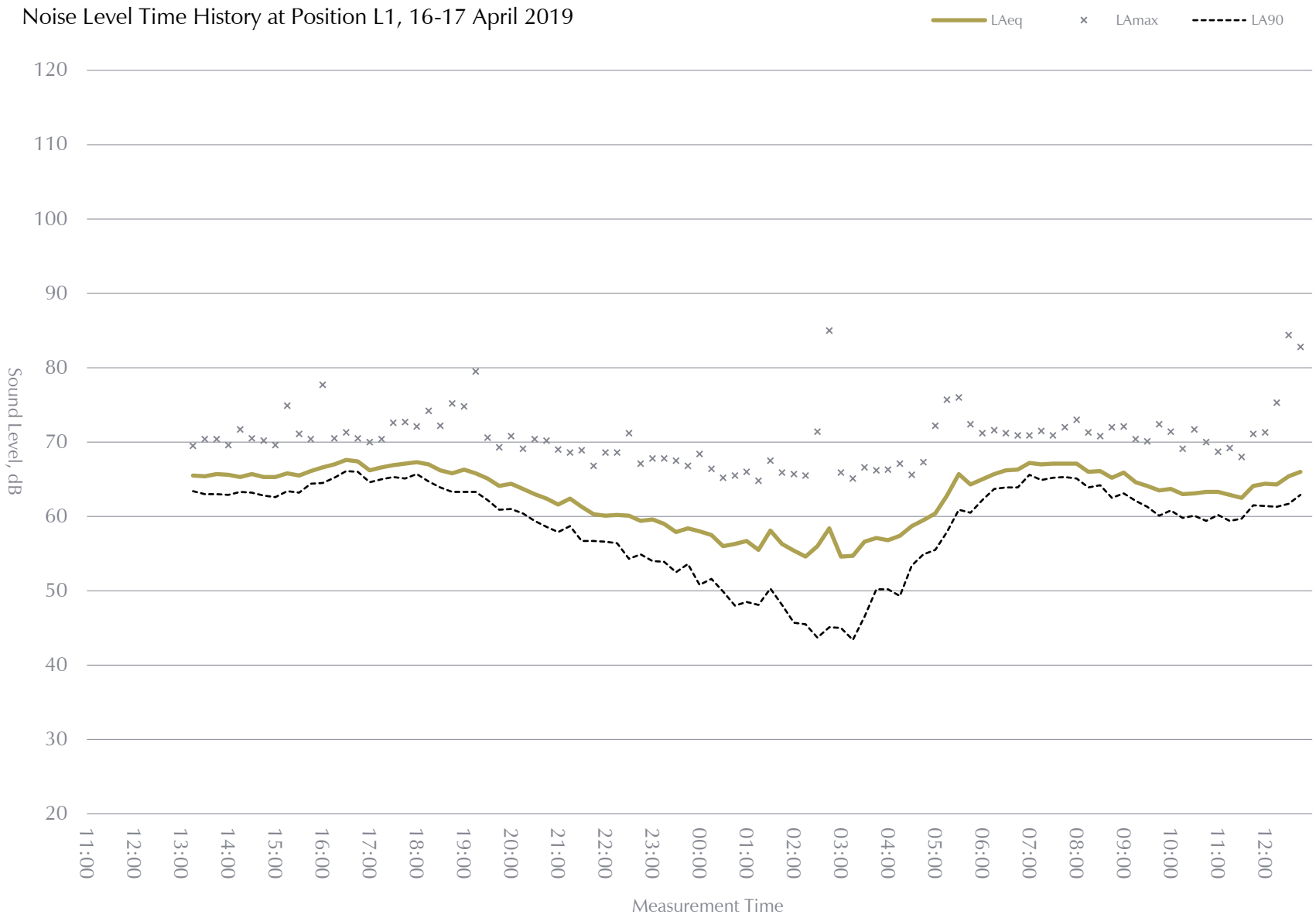




Figure 13/1580/TH2.1

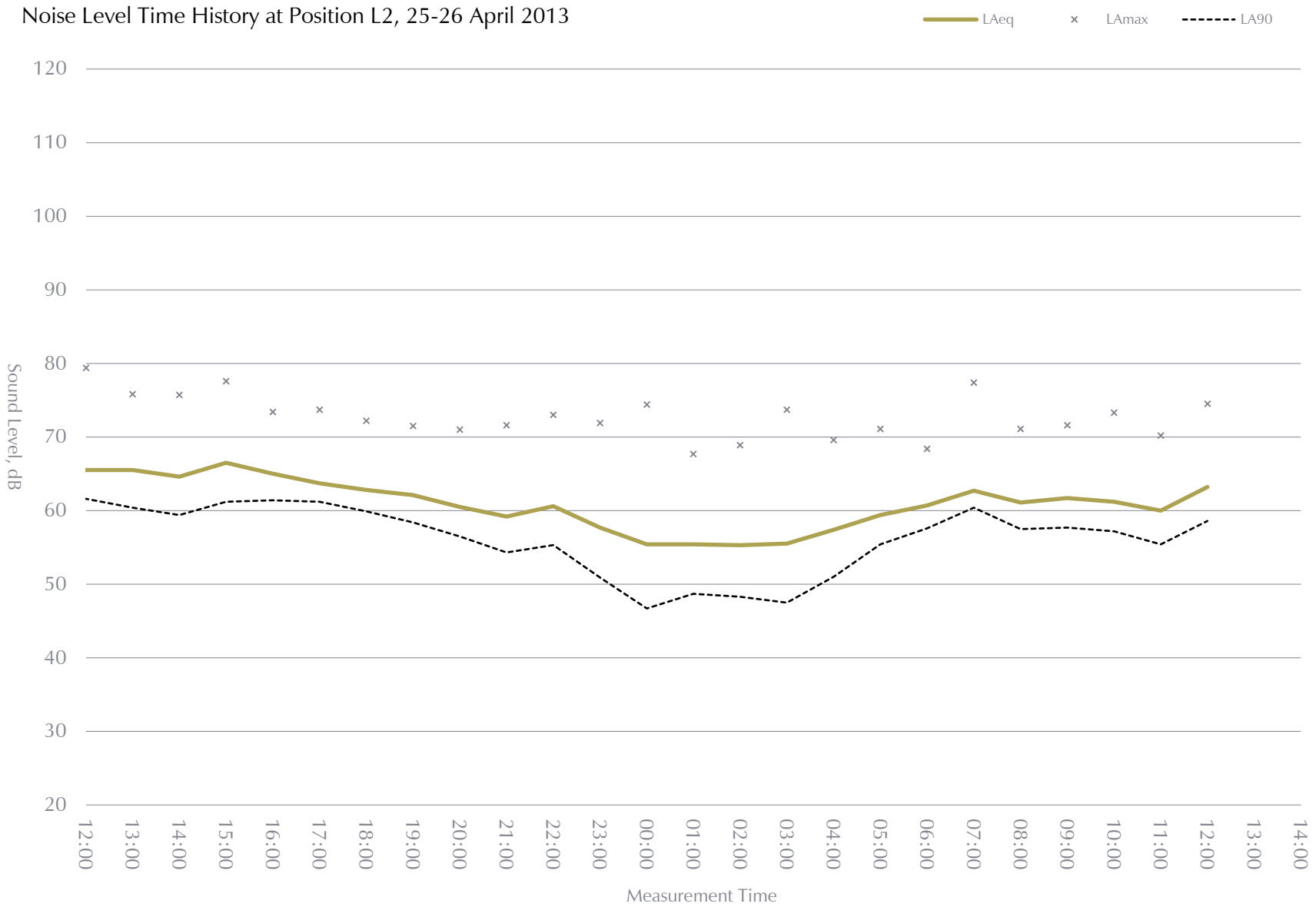




Figure 13/1580/TH2.2

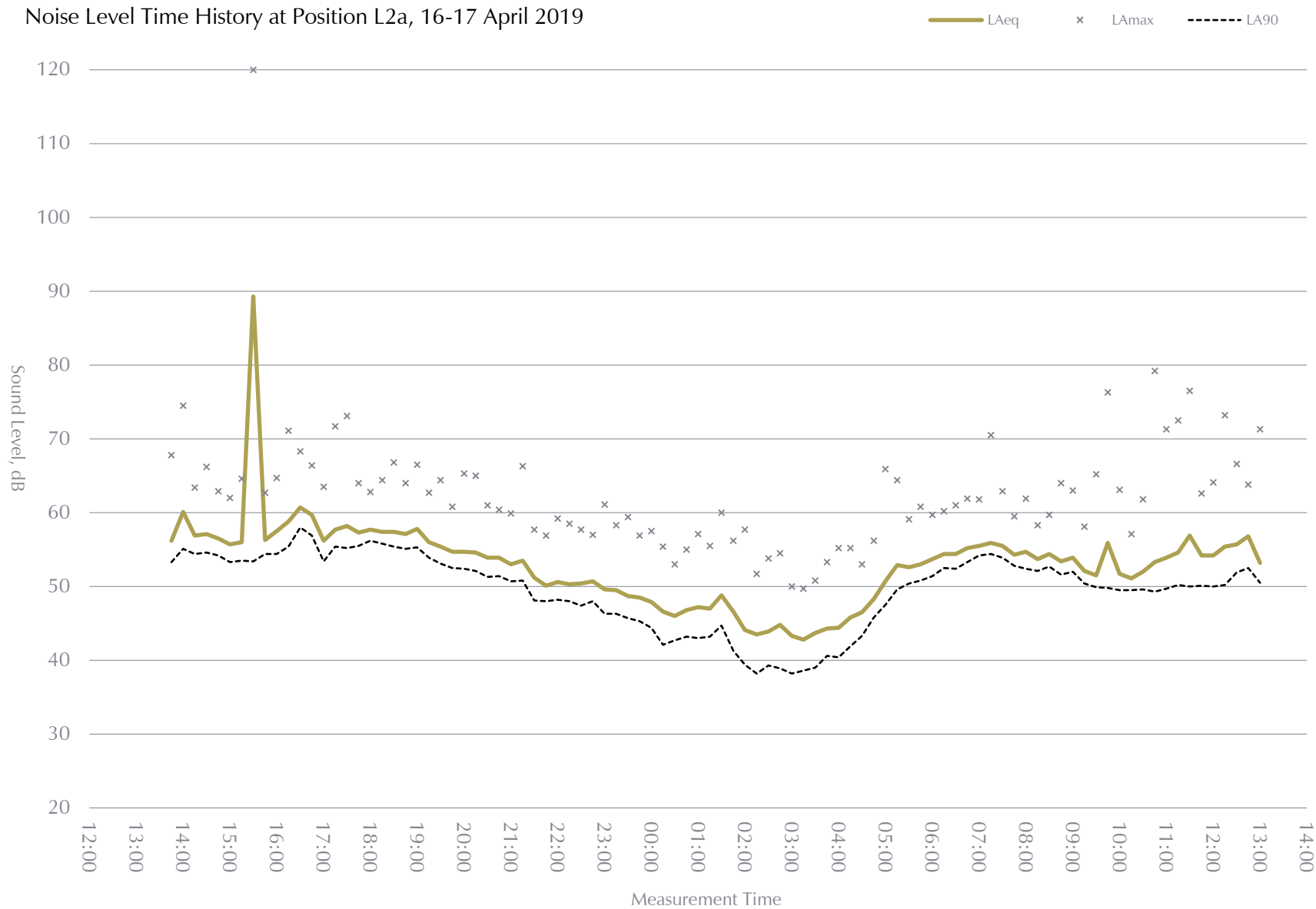




Figure 13/1580/TH3.1

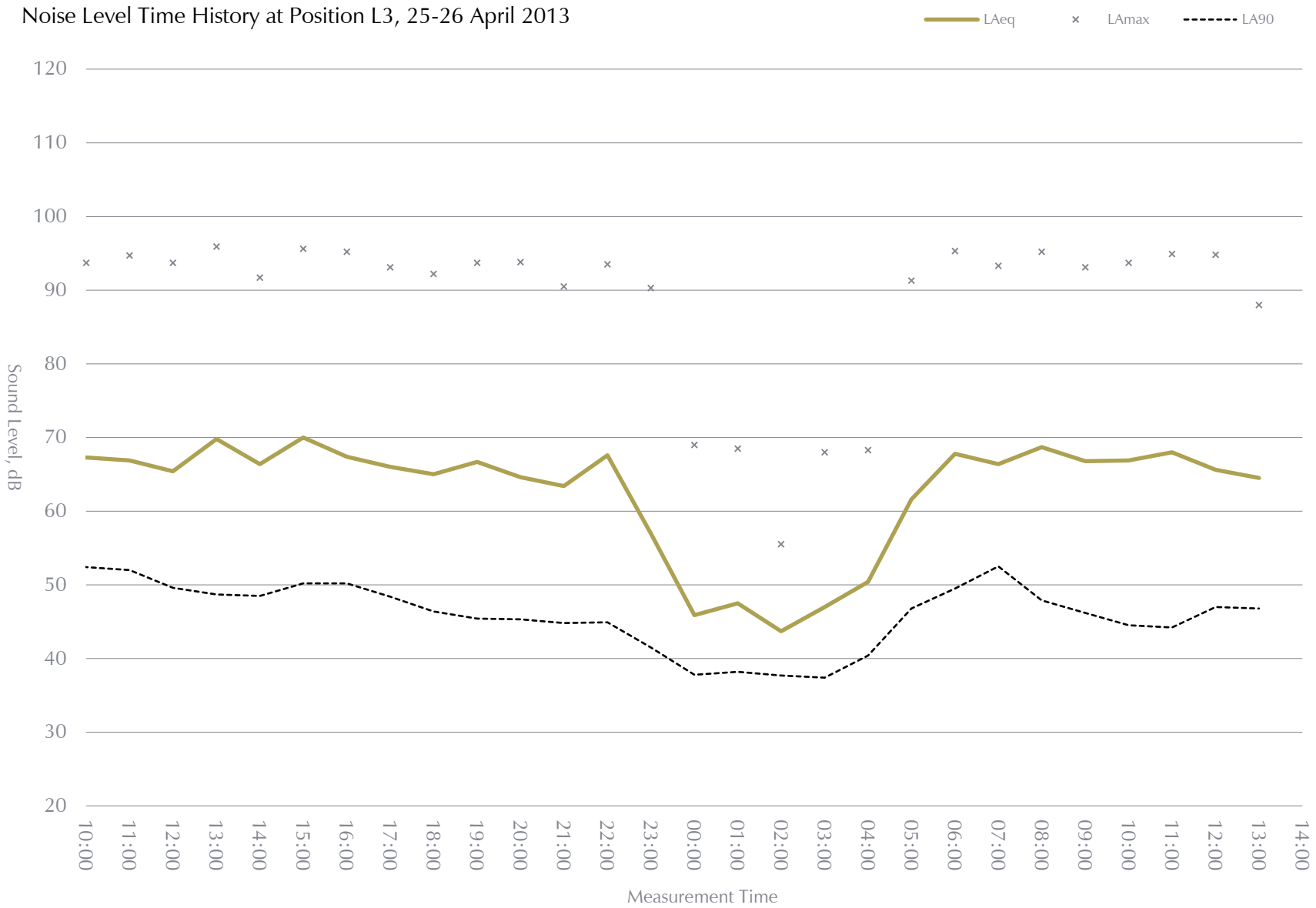
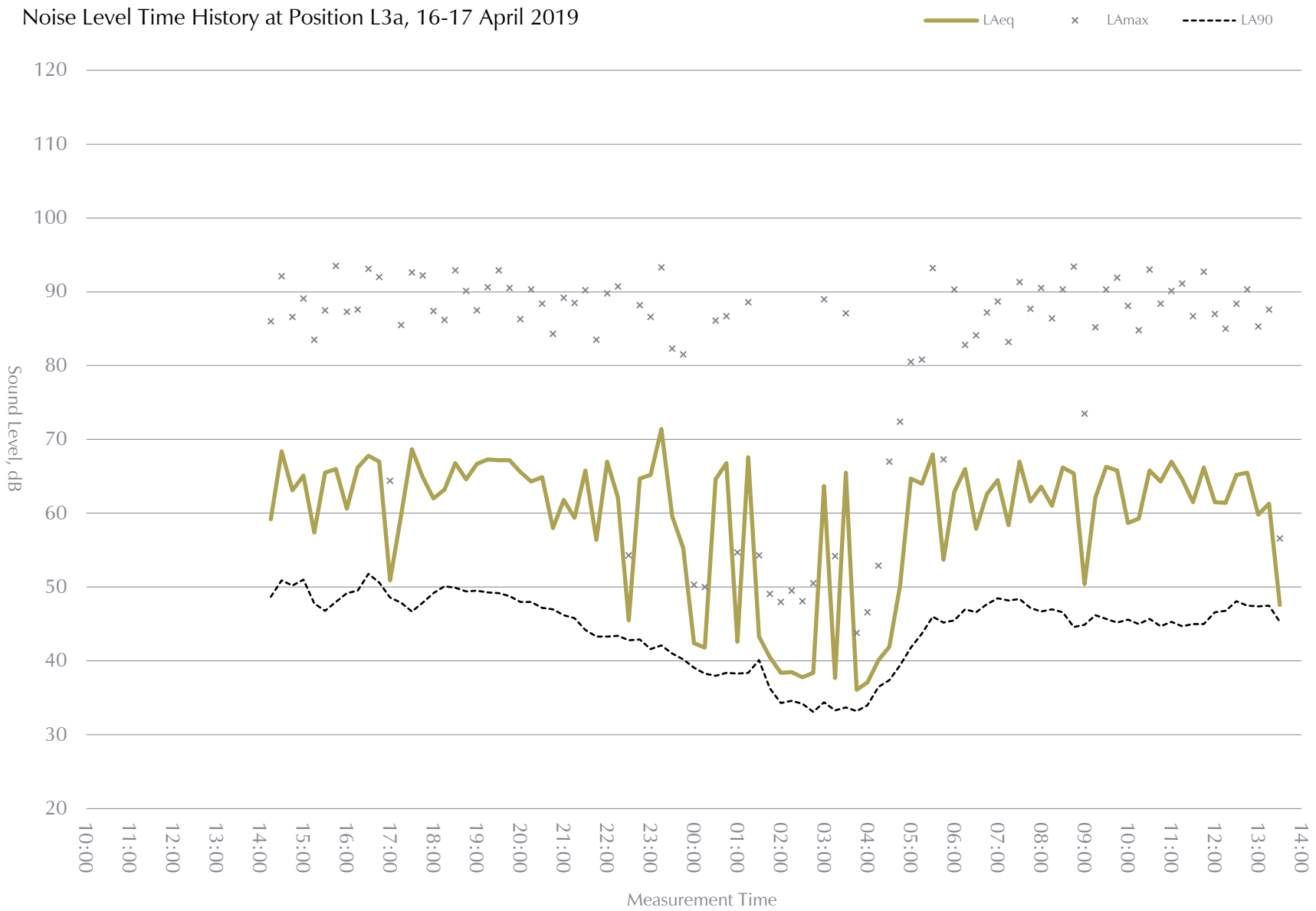




Figure 13/1580/TH3.2





Schedule

13/1580/SCH01-1

Noise Survey Results

2013 Short Term Measurement

Measurement Position S1

Date/Time	L_{Aeq}	L_{Amax}	L_{A10}
25/04/2013 14:24	66	90	67
25/04/2013 15:22	66	81	70
25/04/2013 16:22	66	80	70

Measurement Position S2

Date/Time	L_{Aeq}	L_{Amax}	L_{A10}
25/04/2013 14:06	65	81	69
25/04/2013 15:04	66	80	71
25/04/2013 16:04	68	84	73

Measurement Position S3

Date/Time	L_{Aeq}	L_{Amax}	L_{A10}
26/04/2013 10:23	49	69	52
26/04/2013 11:21	47	63	50
26/04/2013 12:21	47	63	50

Measurement Position S4

Date/Time	L_{Aeq}	L_{Amax}	L_{A10}
26/04/2013 10:00	46	63	49
26/04/2013 11:00	47	66	50
26/04/2013 12:00	48	63	50



Schedule

13/1580/SCH01-1

Measurement Position S5

Date/Time	L_{Aeq}	L_{Amax}	L_{A10}
25/04/2013 14:43	59	78	61
25/04/2013 15:42	62	80	64
25/04/2013 16:41	60	69	62

Measurement Position S6

Date/Time	L_{Aeq}	L_{Amax}	L_{A10}
25/04/2013 10:42	68	87	71
25/04/2013 11:40	66	84	69
25/04/2013 12:40	67	92	69

Measurement Position S7

Date/Time	L_{Aeq}	L_{Amax}	L_{A10}
25/04/2013 10:04	70	85	75
25/04/2013 11:03	69	86	75
25/04/2013 12:02	69	83	74

Measurement Position S8

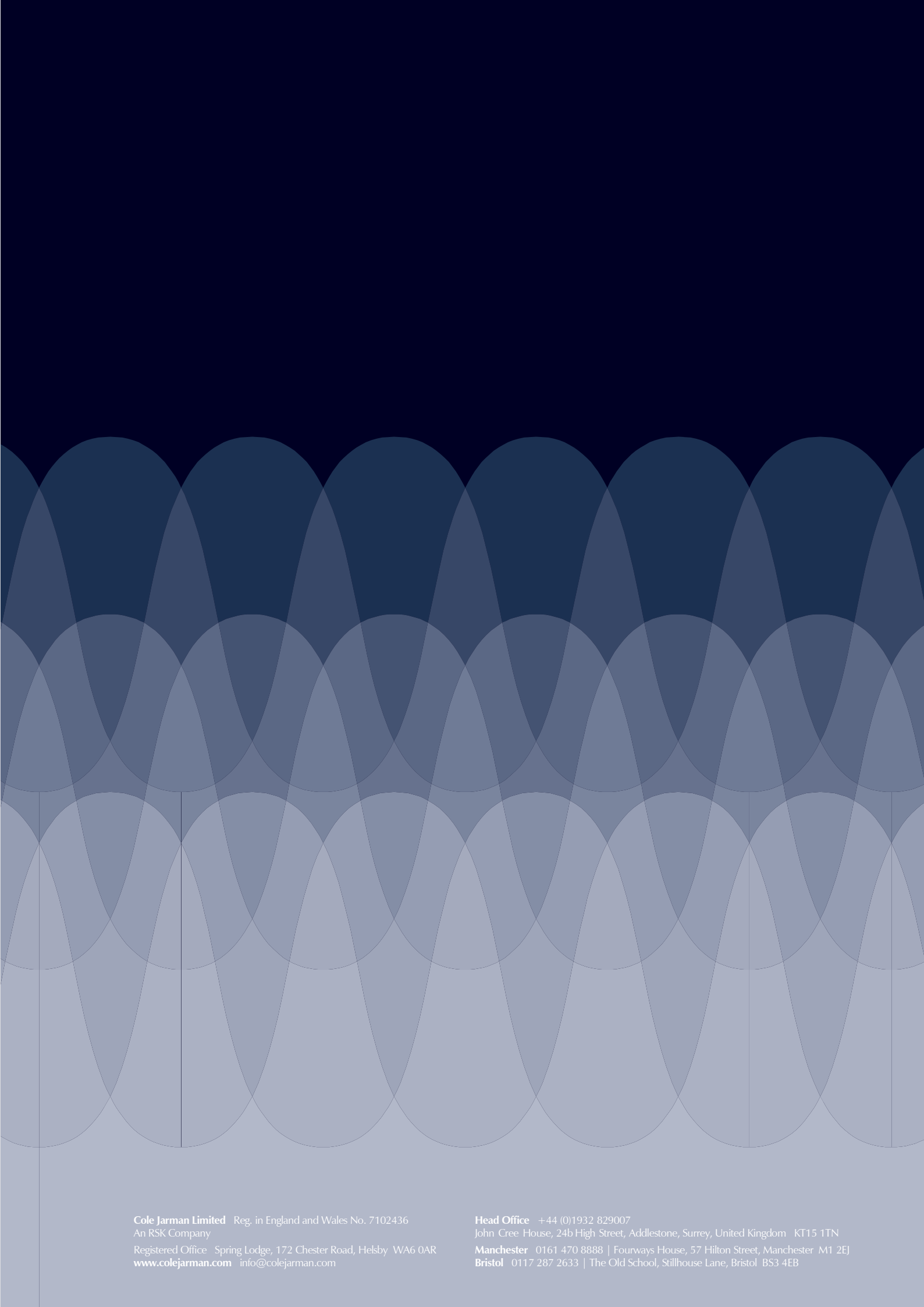
Date/Time	L_{Aeq}	L_{Amax}	L_{A10}
25/04/2013 10:22	67	86	71
25/04/2013 11:20	68	83	73
25/04/2013 12:20	67	81	71



2019 Short Term Measurement

Measurement Position S7a

Date/Time		L_{Aeq}	L_{Amax}	L_{A10}
25/04/2013	14:24	73	96	74
25/04/2013	15:22	71	96	74
25/04/2013	16:22	69	83	74



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Infinity Garden Village

Noise Assessment: Residential

Report 13/1580/R06

Infinity Garden Village

Noise Assessment: Residential

Report 13/1580/R06

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Revision	Description	Date	Prepared	Approved
0	First Issue	31 May 2019	Richard Masey	Ben Holcombe
1	Minor Amendments	4 June 2019	Richard Masey	Ben Holcombe

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Noise Assessment: Residential

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Noise Assessment: Residential

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Attachments

Glossary of Acoustic Terms

13/1580/SP01

Site plan showing noise survey measurement positions

13/1580/R6/F1

Baseline daytime noise contours in terms of dB $L_{Aeq,16h}$ (daytime) at 1.5m above local ground level

13/1580/R6/F2

Baseline night time noise contours in terms of dB $L_{Aeq,8h}$ (night time) at 1.5m above local ground level

Appendix A

Cole Jarman Environmental Noise Survey Report 13/1580/R1//2

 End of Section



Noise Assessment: Residential

1 Introduction

- 1.1 A planning application is to be submitted for the development of a section of land adjacent to the A50 and to the south of Wragley Way, Derby. The scheme is to comprise up to 1850 residential units, a primary school, a local centre and other associated infrastructure.
- 1.2 This report provides an overview of the methodology and results of noise surveys undertaken at the site (full detail provided in Cole Jarman Report 13/0158/R1//2, included as Appendix A) and subsequent assessment of the potential effect of prevailing environmental noise upon the proposed development, with reference to guidance in the NPPF¹, NPSE², NPPG³, BS 8233⁴ and local planning policy.

2 Site Description

- 2.1 The site is located immediately to the north of the A50 and south of Wragley Way, Derby. It is flanked by a railway line to the west and agricultural land to the east. The extents of the site are indicated on the attached site plan 13/1580/SP01.
- 2.2 To the north of Wragley Way is a large residential area. All other areas on and around the proposed site consist of agricultural land. Three roads also pass through the site, these being Stenson Road, Arleston Lane and Deep Dale Lane.
- 2.3 At the time of the measurements in both 2013 and 2019, the A50 was observed to be the dominant noise source across the site. Only at locations close to the other roads around the site did those roads have any significant effect on noise levels. Similarly, near the north western boundary of the site the railway made a significant contribution to noise levels.

3 Planning Policy and Guidance

3.1 National Planning Policy Framework (NPPF, 2012)

- 3.1.1 The National Planning Policy Framework (NPPF), published in March 2012 and updated in July 2018 and February 2019, is currently the relevant document for defining the national policy toward noise sensitive development. It refers to the Noise Policy Statement for England (NPSE), which is discussed in the subsequent section.
- 3.1.2 The current policy on sustainable development influences the emphasis of any noise assessment. The development of a quiet, rural site is by most measures less sustainable than the

¹ National Planning Policy Framework (2012)

² Noise Policy Statement for England (2010)

³ National Planning Practice Guidance (2014)

⁴ BS 8233:2014 Guidance on sound insulation and noise reduction for buildings



Noise Assessment: Residential

development of a site located near existing infrastructure and facilities. The rating of development sites based on prevailing noise levels should reflect this.

3.1.3 Specifically, on the subject of noise, paragraph 180 of NPPF states:

“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- a. mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
- b. identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;”*

3.1.4 Paragraph 180 references the Noise Policy Statement for England and no other particular standards.

3.1.5 On the general issue of amenity, paragraph 127 states that planning policies and decisions should ensure that developments:

“create places that [...] promote health and well-being, with a high standard of amenity for existing and future users...”

3.1.6 Further to this, paragraph 170 states that planning policies and decisions should:

“prevent new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution”

3.1.7 A notable inclusion in the July 2018 edition of NPPF is the ‘agent of change’ principle in paragraph 182. In terms of noise, this principle requires that those proposing a new noise sensitive development incorporate sufficient mitigation such that the operation of existing premises in the area is not unreasonably restricted in order to control noise impact upon the new development:

“Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.”



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3.2 Noise Policy Statement for England (NPSE)

3.2.1 This document does not set quantitative guidelines for the suitability of noise sensitive development in an area depending on the prevailing levels of noise. Absent, therefore, is reference to specific noise thresholds which determine whether noise sensitive development is suitable and, if so, whether particular mitigation factors need to be considered.

3.2.2 Instead, the NPSE sets out three aims:

The first aim of the Noise Policy Statement for England

Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

The second aim of the Noise Policy Statement for England

Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

The third aim of the Noise Policy Statement for England

Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

3.2.3 In essence, therefore, each development site must be judged on its ability to deliver on each of these aims, and while rating the prevailing noise against predefined thresholds is no longer necessary, defining the prevailing noise levels is an essential first step in assessing a given site under the current regime.

3.3 Planning Practice Guidance (PPG)

3.3.1 The Department for Communities and Local Government 'National Planning Practice Guidance' (PPG) expands upon the NPPF and NPSE and sets out more detailed guidance on noise assessment. Like the NPPF and NPSE, the guidance does not include any specific noise levels but sets out further principles that should underpin an assessment.

3.3.2 The PPG includes a section on noise, which states:

"Local planning authorities' plan-making and decision taking should take account of the acoustic environment and in doing so consider:

- *whether or not a significant adverse effect is occurring or likely to occur;*
- *whether or not an adverse effect is occurring or likely to occur; and*
- *whether or not a good standard of amenity can be achieved."*



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- 3.3.3 It then refers to the NPSE and states that the aim is to identify where the overall effect of the noise exposure falls in relation to Significant Observed Adverse Effect Level ⁵ (SOAEL), the Lowest Observed Adverse Effect Level ⁶ (LOAEL) and the No Observed Effect Level ⁷ (NOEL).
- 3.3.4 The guidance then presents a table, which is reproduced as table T1 overleaf. The implication of the final line of the table is that only the 'noticeable and very disruptive' outcomes are unacceptable and should be prevented. All other outcomes (i.e. all other lines in the table) can be acceptable, depending upon the specific circumstances and factors such as the practicalities of mitigation.
- 3.3.5 Under the topic of further considerations relating to mitigating the impact of noise on residential developments, the PPG states:

“The noise impact may be partially off-set if the residents of those dwellings have access to:

- a relatively quiet facade (containing windows to habitable rooms) as part of their dwelling, and/or;*
- a relatively quiet external amenity space for their sole use, (e.g. a garden or balcony). Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced with increasing noise exposure and could be such that significant adverse effects occur, and/or;*
- a relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings, and/or;*
- a relatively quiet, protected, external publically accessible amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance).”*

- 3.3.6 This is not to say that access to the above items is mandatory, rather that it can help to offset any noise impacts.

⁵ The level of noise exposure above which *significant* adverse effects on health and quality of life occur.

⁶ The level of noise exposure above which adverse effects on health and quality of life can be detected.

⁷ The level of noise exposure below which no effect at all on health or quality of life can be detected.



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Effect Level (increasing)	Perception	Examples of Outcomes	Action
<i>No Observed Effect</i>	Not noticeable	No effect	No specific measures required
NOEL (<i>No Observed Effect Level</i>)			
<i>No Observed Adverse Effect</i>	Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No specific measures required
LOAEL (<i>Lowest Observable Adverse Effect Level</i>)			
<i>Observed Adverse Effect</i>	Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Mitigate and reduce to a minimum
SOAEL (<i>Significant Observed Adverse Effect Level</i>)			
<i>Significant Observed Adverse Effect</i>	Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Avoid
<i>Unacceptable Adverse Effect</i>	Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Prevent

T1 Summary of Noise Exposure Hierarchy (from PPG)

- 3.3.7 Under the topic of further considerations relating to mitigating the impact of noise on residential developments, the PPG states:



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“The noise impact may be partially off-set if the residents of those dwellings have access to:

a relatively quiet facade (containing windows to habitable rooms) as part of their dwelling, and/or;

a relatively quiet external amenity space for their sole use, (e.g. a garden or balcony). Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced with increasing noise exposure and could be such that significant adverse effects occur, and/or;

a relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings, and/or;

a relatively quiet, protected, external publically accessible amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance).”

- 3.3.8 This is not to say that access to the above items is mandatory, rather that it can help to offset any noise impacts

4 Acoustic Design Criteria

4.1 Noise levels within dwellings

- 4.1.1 BS 8233:2014 is a Code of Practice for sound insulation and noise reduction for buildings. For dwellings BS 8233 gives the following guidance on internal ambient noise levels:

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16\text{hour}}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16\text{hour}}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16\text{hour}}$	30 dB $L_{Aeq,8\text{hour}}$

Note 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.

T2 Table 4 of BS 8233:2014

- 4.1.2 In potentially noisy environments with good transport connections, suitable levels of amenity should still be achieved when applying the 5 dB relaxation as allowed under note 7 of the above table within BS 8233:2014. The aim in this case though is to achieve the main standards set out in the table.



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- 4.1.3 Meeting these criteria will ensure that indoor noise levels will be below the *Lowest Observed Adverse Effect Level* defined in the NPSE and referred to in the PPG.

4.2 Noise Levels in External Amenity Areas

- 4.2.1 External areas cannot, by definition, be contained or benefit from the levels of noise mitigation that are available to internal spaces within buildings. As a consequence, design standards for external noise cannot be considered as thresholds that determine whether a high quality design has been implemented and a good level of amenity achieved. Rather, the external noise standards should be used to establish whether mitigation is appropriate as a means of minimising the adverse impacts of environmental noise.

- 4.2.2 Paragraph 7.7.3.2 of BS 8233:2014 indicates that in external amenity spaces it is desirable that the steady noise levels should not exceed 50 dB $L_{Aeq,T}$ and 55 dB $L_{Aeq,T}$ should be regarded as an upper guideline value. The paragraph continues to state the following:

“... it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.”

- 4.2.3 It can be seen that external noise levels are not proposed to be a controlling index by which suitability of a residential site is defined.
- 4.2.4 The BS 8233 criteria are based upon the WHO document ‘Guidelines for community noise’ (although this document is dated 1999, it was originally released in 1995). A National Physical Laboratory report (CMAM16⁽⁸⁾) which reviews various criteria of the time (i.e. the 1995 version of the WHO document), states in section 5.4:

“Exceedances of the WHO guideline values do not necessarily imply significant noise impact and indeed, it may be that significant impacts do not occur until much higher degrees of noise exposure are reached.”

“...it would be unwise to use the WHO guidelines as targets for any form of strategic assessment, since, given the prevalence of existing noise exposure at higher noise levels, there might be little opportunity for and little real need for any across the board major improvements. On the other hand, the most constructive use for the WHO guidelines will be to set thresholds above which greater attention should be paid to the various possibilities for noise control action when planning new developments. It is important to make clear at this point that exceedances

⁸ Health based noise assessment methods – a review and feasibility study (September 1998)



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do not necessarily imply an over-riding need for noise control, merely that the relative advantages and disadvantages of noise control action should be weighed in the balance."

- 4.2.5 Therefore, when designing a dwelling or other noise sensitive development that incorporates gardens or other external amenity areas, there should be an ambition to provide an area (or some areas) in which the noise levels are consistent with the WHO / BS8233 standards. However, where these standards cannot be achieved, then consideration should be given to the potential for mitigation so as to minimise the noise levels in the external amenity areas. These measures should also be weighed against other factors of sustainable development.
- 4.2.6 A further point to consider with regard to sustainability is that the BRE's UK National Noise Incidence Study (2000/2001) ⁽⁹⁾ assessed that 54% of the population are already exposed to daytime noise levels above 55dBA. Therefore, where potential sites are close to existing transport infrastructure, it is likely that the aspirational WHO guidelines will already be exceeded.
- 4.2.7 The important principle here is that sustainable development sites will often be exposed to relatively high levels of environmental noise, and while means are available to insulate internal spaces, they are not always available to protect external spaces. This is why the external standards shall be viewed as aspirational targets or triggers where mitigation measures should be considered rather than thresholds not to be exceeded in all circumstances.
- 4.2.8 Strict adherence to the enforcement of such external noise criteria as rigid thresholds above which development should not take place could preclude development in the majority of areas considered for development in semi-urban or urban environments or in areas in the vicinity of transportation noise sources. This further demonstrates why the external noise standards should be viewed as aspirational targets or triggers of mitigation rather than thresholds not to be exceeded in all circumstances.
- 4.2.9 Where the BS 8233 / WHO Guidelines outdoor noise level aim of 55dB $L_{Aeq,16h}$ can be achieved, this will ensure that outdoor noise levels will be below the *Lowest Observed Adverse Effect Level* in terms of the PPC. Levels up to 60dB $L_{Aeq,16h}$ are deemed to be acceptable but efforts should be made to avoid reduce noise levels external to as close to 55dB $L_{Aeq,16h}$ as reasonably practicable.

4.3 Noise at Proposed Primary School

- 4.3.1 Acoustic design criteria for new and refurbished schools is contained within the Department for Education document *Building Bulletin 93 – Acoustic design of schools: performance standards* (BB93), the latest version of which, at the time of writing, was published in February 2015. Adhering to the design criteria contained within BB93 for teaching spaces is necessary for compliance with Building Regulations.

⁹ BRE Client Report: The National Noise Incidence Study 2000 (England and Wales). Prepared for Department for the Environment, Food and Rural Affairs, February 2000. Client report number 203938f.



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- 4.3.2 In addition to BB93, a supporting guidance document named *Acoustics of Schools: a design guide* (2015) has been produced by the *Institute of Acoustics* (IOA) and the *Association of Noise Consultants* (ANC). The scope of this document is to provide guidance with regard to how the design of schools and educational facilities should be approached, in respect of the design criteria outlined in BB93.
- 4.3.3 It is understood that a detailed design for the proposed school facilities is yet to be developed. Instead, an outline assessment of the site's suitability for the inclusion of a school has been conducted.
- 4.3.4 *Acoustics of Schools: a design guide* provides the following advice with regard to external noise levels at proposed school sites:

"For new schools, 60 dB $L_{Aeq,30min}$ should be regarded as an upper limit for external noise at the boundary of external areas used for formal and informal outdoor teaching and recreation."

- 4.3.5 This infers that where external noise levels are below the 60dB $L_{Aeq,30min}$ it should be possible to meet the internal noise levels required by BB93 in the various teaching spaces within a school, using relatively typical building envelope construction and schemes of ventilation.
- 4.3.6 It does go on to say however that:

"It may be possible to meet the specified indoor ambient noise levels on sites where external noise levels are as high as 70 dB $L_{Aeq,30min}$ but this will require considerable building envelope sound insulation, or screening."

- 4.3.7 With regard to outdoor teaching areas, *Acoustics of Schools: a design guide* makes the following comment:

"Noise levels in unoccupied playgrounds, playing fields and other outdoor areas should not exceed 55 dB $L_{Aeq,30min}$ and there should be at least one area suitable for outdoor teaching activities where noise levels are below 50 dB $L_{Aeq,30min}$ ".

- 4.3.8 It should be borne in mind that the design guide does not form part of the requirements which need to be met to comply with Building Regulations; rather it represents guidance only.
- 4.3.9 It is therefore proposed that an aspirational, external noise criterion of 55 dB $L_{Aeq,30min}$ be adopted to determine the site's suitability for the inclusion of a school. It is noted however that the design of the school will need to be considered at the detailed design stage to ensure that the full requirements of BB93 and therefore Building Regulations are met.
- 4.3.10 Noise levels above 55 dB $L_{Aeq,30min}$ should however not be taken to be prohibitive, rather it should be acknowledged that enhanced acoustic mitigation measures may have to be incorporated as part of the design of the school's building envelope and to outdoors areas.
- 4.3.11 Where the criterion for external noise at any proposed school premises of 55 dB $L_{Aeq,30min}$ can be achieved, this will ensure that noise levels will be below the *Lowest Observed Adverse Effect*



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Level in terms of the PPG. Values above this are not necessarily unacceptable, but indicate that enhanced mitigation should be considered where reasonably practical.

4.4 Mixed Use Local Centre

4.4.1 It is not yet known what the mixed use local centre is to comprise however the following should be taken into account when approaching its design:

- Any residential elements should meet the same design criteria as defined in section 4.1 and 4.2 for internal and external noise levels respectively.
- The acoustic design of other community buildings within the mixed use local centre is likely to be less onerous than for residences, however the exact requirement for such spaces will be dependent on each particular use. This should be considered at detailed design stage.

4.5 Summary of Proposed Noise Criteria

4.5.1 Based on the above, the following noise level criteria are proposed:

- Daytime internal $L_{Aeq,16h}$ to all habitable rooms no greater than 35 dB;
- Night time internal $L_{Aeq,8h}$ to all bedrooms no greater than 30 dB;
- **Aspirational** daytime $L_{Aeq,16h}$ in outdoor amenity areas ideally no greater than 55 dB with noise levels up to 60 dB being acceptable, providing levels are mitigated as far as is reasonable practicable;
- **Aspirational** $L_{Aeq,30min}$ during school opening hours ideally no greater than 55dB. School design should be fully considered at the detailed design stage.

5 Environmental Noise Surveys

5.1 Overview

5.1.1 Environmental noise survey works were undertaken in April 2013 and again in April 2019 to quantify the prevailing noise climate, with the more recent survey undertaken to determine any potential changes since the original works.

5.1.2 Full details of the noise survey works undertaken for the Infinity Garden Village site can be found in Cole Jarman report 13/1580/R01//2, attached to this report as Appendix A.

5.2 Summary of Noise Survey Results

5.2.1 As discussed in Appendix A, higher noise levels were measured in 2013 than in 2019 at a number of areas across the proposed development site. The 2013 noise levels have therefore been used as a basis for this assessment, to ensure a robust approach.



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- 5.2.2 The noise survey measurement positions are shown on the attached site plan 13/1580/SP01 with a summary of the results for the key unattended monitoring positions shown below:

Position	2013 Measured Day and Night Period Noise Levels		
	$L_{Aeq, 16h}$ Day	$L_{Aeq, 8h}$ Night	Typical L_{Amax} Night
L1	65	61	72
L2	63	58	71
L3	67	60	88

T3 Measured noise levels at unattended locations in 2013

- 5.2.3 The following table shows a summary of the results from various attended measurement positions across the site (converted to day and night time average noise level using the DEFRA conversion method¹⁰)

Position	2013 Derived Day and Night Period Noise Levels	
	$L_{Aeq, 16h}$ Day	$L_{Aeq, 8h}$ Night
S1	66	58
S2	67	59
S3	48	41
S4	47	40
S5	59	52
S6	66	58
S7	71	63
S8	68	60

T4 Derived noise levels at attended locations in 2013

¹⁰ DEFRA: Method for Converting the UK Road Traffic Noise Index LA10,18h to the EU Noise Indices for Road Noise Mapping (January 2006)



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6 Noise Modelling

6.1 Overview

- 6.1.1 An acoustic model has been developed to provide a means to calculate the noise levels across the site. A computer based noise prediction program (IMMI 2018) was utilised, drawing from the Calculation of Road Traffic Noise (CRTN¹¹) and the Calculation of Railway Noise (CRN¹²) as the basis to determine noise propagation paths throughout the model.
- 6.1.2 The use of such software allows for the calculation of noise levels at specific points around a model from a large number of noise sources simultaneously. The program takes into account the effects of distance, directivity, screening, ground absorption, divergence, reflections from surfaces within the model and site topography where appropriate.
- 6.1.3 At time of assessment, a detailed masterplan was not available however the expected boundaries of the proposed residential parcels have been set out. Indicative building layouts have therefore been assessed within the noise model, based on the expected layout of the site.

6.2 Assumptions and Limitations

- 6.2.1 To allow for the noise modelling to be undertaken effectively, a number of assumptions must be made. These assumptions have been used to define the baseline model and are maintained through each additional variant of the model. These assumptions are described below.

Marginally Adverse Wind Conditions

- 6.2.2 The calculations have been carried out under standard wind conditions as defined in the relevant calculation procedure¹³. Under that definition, the wind direction is assumed to be from source to receiver and within an angle of $\pm 45^\circ$ of the line connecting the two. The wind speed is assumed to be 1 to 5 m/s (as measured 3m to 11m above ground). It is important to note that when considering receptors in various directions around a site, these modelled conditions can never occur in reality because it would require the wind to be blowing in different directions simultaneously. It therefore represents a slightly pessimistic assessment.

Building Heights

- 6.2.3 To investigate the potential screening provided by building plots across the development the effects of 2 and 3 storey dwellings have been reviewed (discussed later). The exact height of these buildings is yet to be established and therefore the following heights have been assumed:

¹¹ Calculation of Road Traffic Noise 1988 - Department of Transport

¹² The Calculation of Railway Noise 1995 - Department of Transport

¹³ ISO 9613-2: Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation (International Organization for Standardization, 1996)



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- 2 Storey buildings – 8 metres;
- 3 Storey buildings – 11 metres.

6.3 Verification and Calibration

- 6.3.1 The model accuracy has been verified by comparing calculated noise levels at the relevant noise survey positions within the noise model against the measured levels recorded at those same positions on site. Generally speaking, a tolerance of ± 1.5 dB was deemed an acceptable margin of error within the model.
- 6.3.2 Where larger differences occurred, the model was over predicting in every case in comparison to the measured noise levels. This approach ensures a robust approach to the selection of noise mitigation measures.

6.4 Baseline Modelling Results

- 6.4.1 Noise contours representative of the day and night time noise climate across the site are presented in the attached figures 13/1580/R6/F1 and 13/1580/R6/F2 respectively.

7 Proposed A50 Junction

7.1 Overview

- 7.1.1 A new road junction is proposed to link Deep Dale Lane to the A50. This junction is also to connect to new link roads which are expected to extend to the north east of Wragley Way. At time of writing the new junction was pending consideration by the local authority by (Derbyshire County Council) under application reference CD19/0319/110.
- 7.1.2 An environmental statement chapter has been prepared by *BWB Consulting* which assesses the impact of the proposed road junction. The chapter includes details of a noise modelling exercise and makes reference to a number of publically available noise contour plots.
- 7.1.3 Cole Jarman has review the information covering the expected effects of the proposed access road to allow for commentary to be make on the potential consideration which must be taken into account the in the design of the Infinity Garden Village Site.
- 7.1.4 It is noteworthy that all resulting guidance and recommendations made on the basis of the *BWB* assessment rely on the accuracy and correctness of their assessment. Cole Jarman are in no way responsible for the accuracy of the *BWB* assessment.

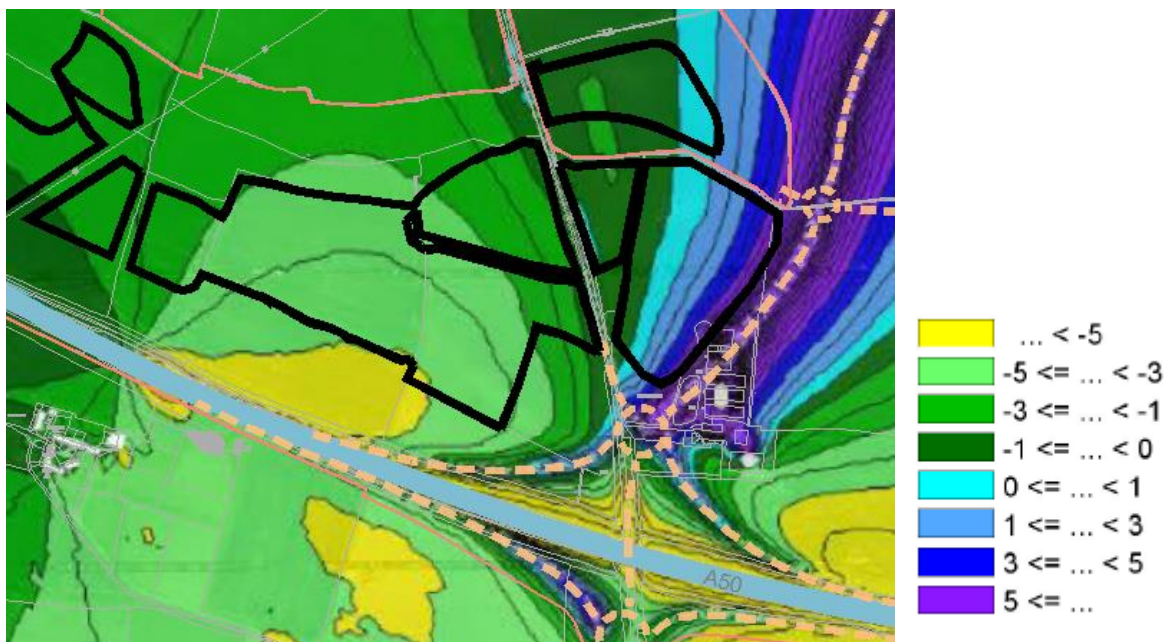
7.2 Difference Noise Contours

- 7.2.1 Two noise contour figures have been produced by *BWB* which set out the predicted difference between existing conditions and conditions with the introduction of the new junction and connected link roads.



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- 7.2.2 The worst case figure (in terms of the magnitude of change) represents the change in $L_{A10,18h}$ noise levels at 4 metres above local ground level, based on 2020 predicted traffic flows on the new access road. As the contours represent a change in level, the fact that the levels are presented in terms of $L_{A10,18h}$ is irrelevant and the same or very similar change can be expected in the $L_{Aeq,16h}$ noise levels.
- 7.2.3 An excerpt from the *BWB* 2020 noise contour difference figure is shown below, with the boundaries of the nearest proposed Infinity Garden Village residential plots shown as black lines:

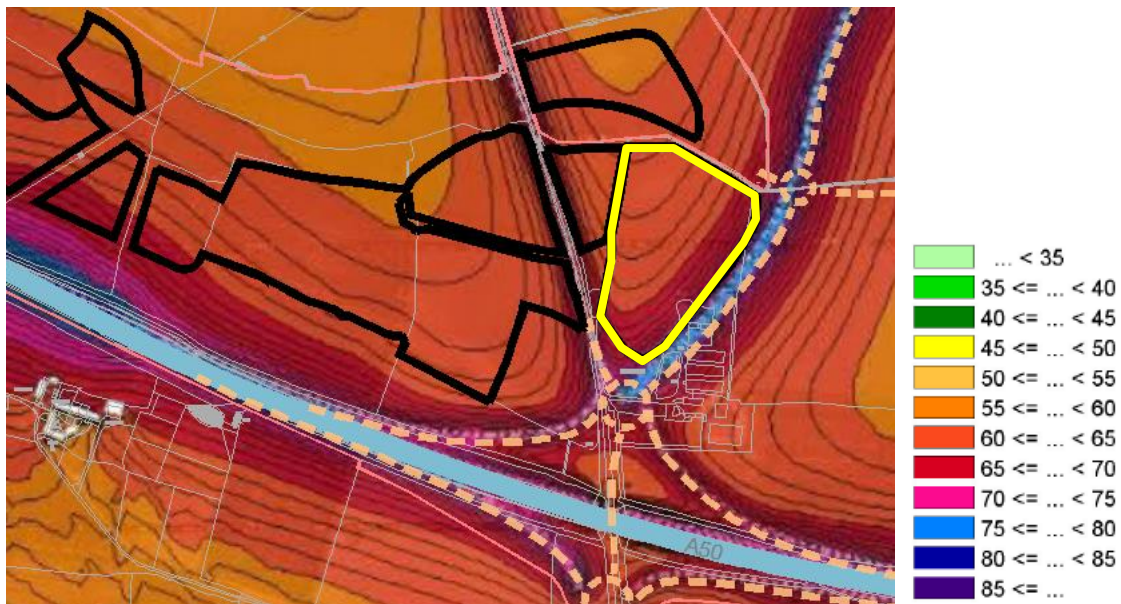


BWB Difference Noise Contour (2020) showing effects of proposed A50/Deep Dale Lane Junction (difference in key in dB)

- 7.2.4 It can be seen that within the majority of residential plots, the introduction of the proposed junction and link roads is expected to reduce noise levels. Therefore, for the majority of the site, recommendations for appropriate noise mitigation measures based on the noise levels surveyed/modelled by Cole Jarman can be considered robust.
- 7.2.5 The only area of the site where noise levels are expected to rise due to the proposed junction is directly adjacent to the proposed link road extending from the junction to the north east. Therefore, recommendations for mitigation measures in this area must take into account the expected effects of the proposed link road.
- 7.2.6 To determine the absolute expected noise levels directly adjacent to the proposed north-east link road, it is necessary to review the *BWB* 2020 with development scenario noise contour plot in terms of $L_{A10,18h}$ at 4 metres above local ground level. The relevant excerpt is shown below:



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BWB Noise Contour (2020) showing effects of proposed A50/Deep Dale Lane Junction (noise level in key in terms of $L_{A10,18h}$ dB)

- 7.2.7 Based on the *BWB* difference contours, it is only development within the parcel identified by the yellow boundary above that is expected to observe a rise in noise levels compared to pre-development conditions.
- 7.2.8 The noise contour lines progress in steps of 1 dB with colour change thresholds at 5 dB intervals. At the boundary of the parcel identified in yellow, closest to the new north-east link road, a noise level of approximately 70 dB $L_{A10,18h}$ is predicted by *BWB*. BS 8233:2014 provides a method for estimating the noise level attributed to a road in terms of $L_{Aeq,16h}$ dB, based on $L_{A10,18h}$ noise levels¹⁴. Using this method, a noise level of approximately 68 dB $L_{Aeq,16h}$ is expected at the most exposed boundary of the plot above, based on predictions made by *BWB*.
- 7.2.9 The effects of the expected noise levels attributed to the proposed link road have been taken into account in the discussion regarding required mitigation in the following section.

8 Control of Internal Noise Levels

8.1 Overview

- 8.1.1 The assessment is based on the *P&DG* parameter plan drawing 13.060/19 and the results of the noise survey, noise modelling exercise and A50 junction assessment review.

¹⁴ Noise levels in terms of $L_{Aeq,16h} = L_{A10,18h} - 2\text{dB}$



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- 8.1.2 It is noteworthy that no building layout is currently proposed and therefore octave band noise levels have been assessed at the boundaries of the most exposed development parcels to determined, subsequently taken to be representative of the most-exposed proposed dwellings.
- 8.1.3 The assessment therefore serves to demonstrate the principles of noise control to proposed residences across the site. Noise levels to indicative proposed receptors in the following location have been assessed to:
- Proposed A: 80m from A50 to west of site
 - Proposed B: 94m from A50 centre of southern boundary
 - Proposed C: 20m from Stenson Road
 - Proposed D: 15m from Deep Dale Lane
 - Proposed E: 70m from Proposed A50 junction – north-east link road. This distance takes into account the buffer zone indicated on the parameters plan.
- 8.1.4 It is noteworthy that current proposals are for Arleston Lane to be pedestrianised and therefore it is assumed that noise output from this thoroughfare would be negligible.
- 8.1.5 Point calculations have been undertaken within the noise model to determine the expected free-field, day and night time noise levels at the positions described above. Generally speaking, point calculations were undertaken to two storey height, with the exception of proposed receptors A and B which were to 3 storeys. This was to reflect that fact that taller buildings may be required in these areas to provide screening to their associated garden areas, as discussed later in this report.
- 8.1.6 The intention of this exercise is not necessarily to prescribe exactly what will be required in terms of mitigation for the final layout, rather to demonstrate the principles of how acceptable levels of amenity can be provided. It is expected that further assessment works will be required at the detailed design stage for each of the residential parcels to ensure the proposed design criteria are met as appropriate.
- 8.1.7 In the absence of building construction details at this stage, it has been assumed that the dwellings will utilise a typical cavity masonry construction with tiled roofs. This does not preclude the use of lightweight building materials; however, if this construction method is utilised, the exact build-up adopted will need to be reviewed by an acoustic consultant to ensure acceptable levels of sound insulation are offered.
- 8.1.8 Living room and bedroom dimensions and areas of glazing for the proposed dwellings are yet to be established. Therefore, the following assumptions have been made:
- Living Rooms: Length – 5m, Width – 4m, Height – 2.5m, Glazing Area – 6.0m²;
 - Bedrooms: Length – 4m, Width – 3m, Height – 2.5m, Glazing Area – 1.8m².



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8.1.9 These dimensions are provided for information only, to illustrate the assumptions made for the purpose of assessment. They should not be taken as constraints in terms of the design of the proposed dwellings. However, should the finalised room or glazing dimensions vary significantly from the figures above, further assessment may be required.

8.2 Glazing

8.2.1 In order to meet the proposed internal noise limits it will be necessary to install glazing with an enhanced acoustic performance in some of the areas identified above. It is noteworthy that the proposed mitigation configurations apply to the road-facing facades, at first or second floor levels facades (i.e. the most exposed). Facades facing away from nearby noise source could utilise glazing and ventilation elements with a lower performance. This mitigation requirement for the proposed dwellings across the site should be reviewed at the detailed design stage.

8.2.2 Glazing meeting the following performance specifications will be required in various locations across the site (discussed later):

Glazing Type	Sound Reduction Index (<i>R</i> dB) at Octave Band Centre Frequency (Hz)					
	125	250	500	1k	2k	4k
Type G1	29	33	44	46	49	57
Type G2	26	27	34	40	39	46
Type G3	20	21	30	35	32	37
Type G4	<i>R_w</i> 30					

T5 Required Glazing Performance

8.2.3 The above performances can typically be achieved by glazing of the following configurations:

Glazing Type	Typical Glazing Configuration
Type G1	10mm glass – 16mm gas space – 9.1mm laminated glass
Type G2	10mm glass – 16mm gas space – 6mm glass
Type G3	6mm glass – 16mm gas space – 6mm glass
Type G4	4mm glass – 16mm gas space – 4mm glass (Standard thermal double glazing)

T6 Typical glazing configurations



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- 8.2.4 It is noteworthy that the above configurations are not prescriptive and other glazing build-ups may be suitable providing the performance specifications in table T5 are met. The performance specifications should be met by the glazing system as a whole inclusive of frames and blanking panels etc. No part of the glazing system should cause the required performance not to be achieved.
- 8.2.5 Glazing may be rationalised into fewer configurations providing the minimum performance requirements are met for a given area. For example, Type G1 maybe be used in place of Type G2, but not the other way around.
- 8.2.6 There is no specific requirement for bathroom or toilet areas however it is recommended that for en-suites the Type G3 glazing is used as the noise intrusion via the en-suite window to the connected bedroom has the potential to affect receptors within.
- 8.2.7 Windows may be openable for purge ventilation but due to the noise levels prevailing across the site, it is necessary to consider a means other than openable windows to provide background ventilation. This is discussed in the following section.

8.3 Ventilation

- 8.3.1 As previously noted, it is not possible to rely on openable windows to provide background ventilation for the proposed dwellings and therefore alternative means of ventilation must be considered.
- 8.3.2 The first option would be to utilise passive acoustic trickle ventilators providing the performance set out below (when open).

Ventilator Type	Element Normalise Level Difference ($D_{n,e}$ dB) at Octave Band Centre Frequency (Hz)					
	125	250	500	1k	2k	4k
Type V1	48	39	44	52	66	61
Type V2	40	38	39	41	50	60

T7 Required Ventilator Performance

- 8.3.3 Calculations have assumed that two ventilators would be required to bedrooms and three ventilators required to living rooms areas. If the ventilation consultant advised that more ventilators are required per room, it may be necessary for *Cole Jarman* to review this assessment.
- 8.3.4 The above performances can typically be achieved by the following example ventilator products. Other products may be acceptable providing they are capable of providing an acoustic performance equal to or in excess of that stated above.



Noise Assessment: Residential

Ventilator Type	Example Ventilator Product
Type V1	Glidevale Fresh 80dB
Type V2	Glidevale Fresh 100dB

T8 Example ventilator products

- 8.3.5 It is noteworthy that high performance ventilators such as the above may not be able provide the required airflow rates in a passive configuration. One option therefore, would be to utilise a mechanically assisted system with acoustic trickle ventilators providing supply air to each habitable room, with the air then extracted mechanically.
- 8.3.6 The best option acoustically would be to remove the need for openings in the façade through the use of a full MVHR (Mechanical Ventilation and Heat Recovery) system which provides ducted supply and extract and can incorporate any necessary attenuation to control external noise ingress within the ducts.
- 8.3.7 It is expected that these systems would only be required to the most exposed dwellings within each parcel and that dwellings behind would benefit from screening leading to lower noise levels.

8.4 Mitigation Requirements for Example Assessment Dwellings

- 8.4.1 The following table shows the required glazing and ventilation configurations at each of the proposed example assessment dwelling previously identified:

Example Dwelling Location Reference	Required Glazing Type	Required Ventilator Type
A	Type G1	Type V1
B	Type G2	Type V1
C	Type G3	Type V1
D	Type G2	Type V2
E	Type G4	Type V2

T9 Required mitigation configurations

- 8.4.2 It is again important to note that the above mitigation required simply serve as an example of how the required internal noise criteria can be achieved for the most exposed building facades



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around the development. Further assessment works will be required at the detailed design stage to revise the mitigation requirement based on proposed building layouts.

Internal Noise Level Summary

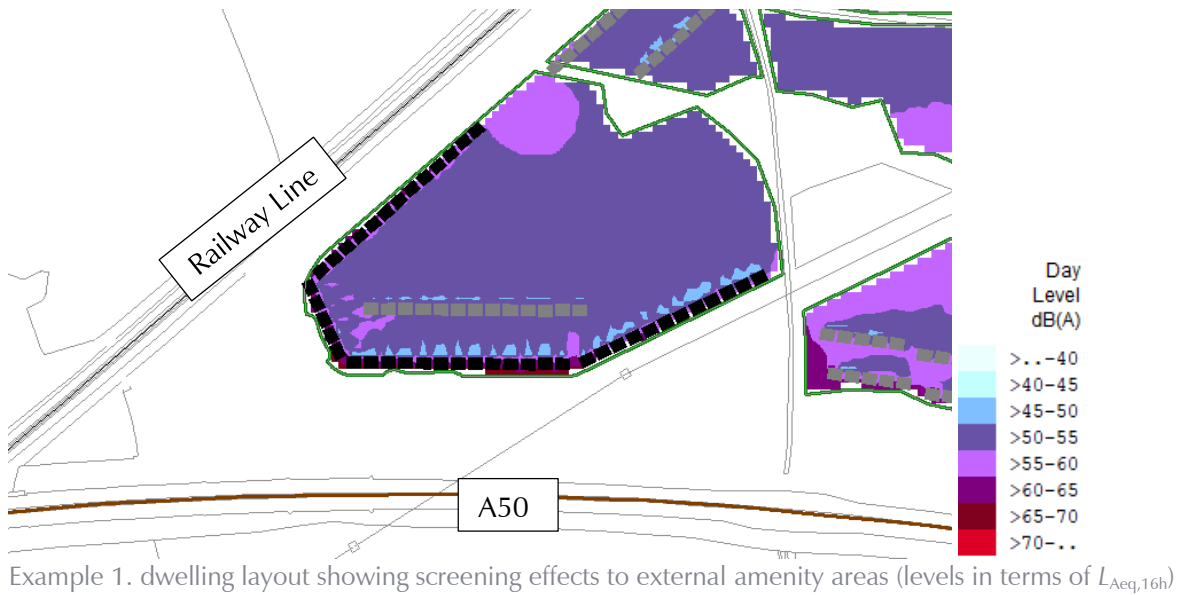
- 8.4.3 With the recommended glazing and ventilation strategy in place, noise levels within the proposed dwellings in the most exposed areas of the site can be controlled to meet the criteria for internal noise levels as detailed in section 4.1 and therefore are considered to be below the *Lowest Observed Adverse Effect Level* defined in the NPSE and referred to in the PPC. It is noted however that further assessment will be required once a finalised masterplan has been developed.

9 Noise Levels in External Amenity Areas

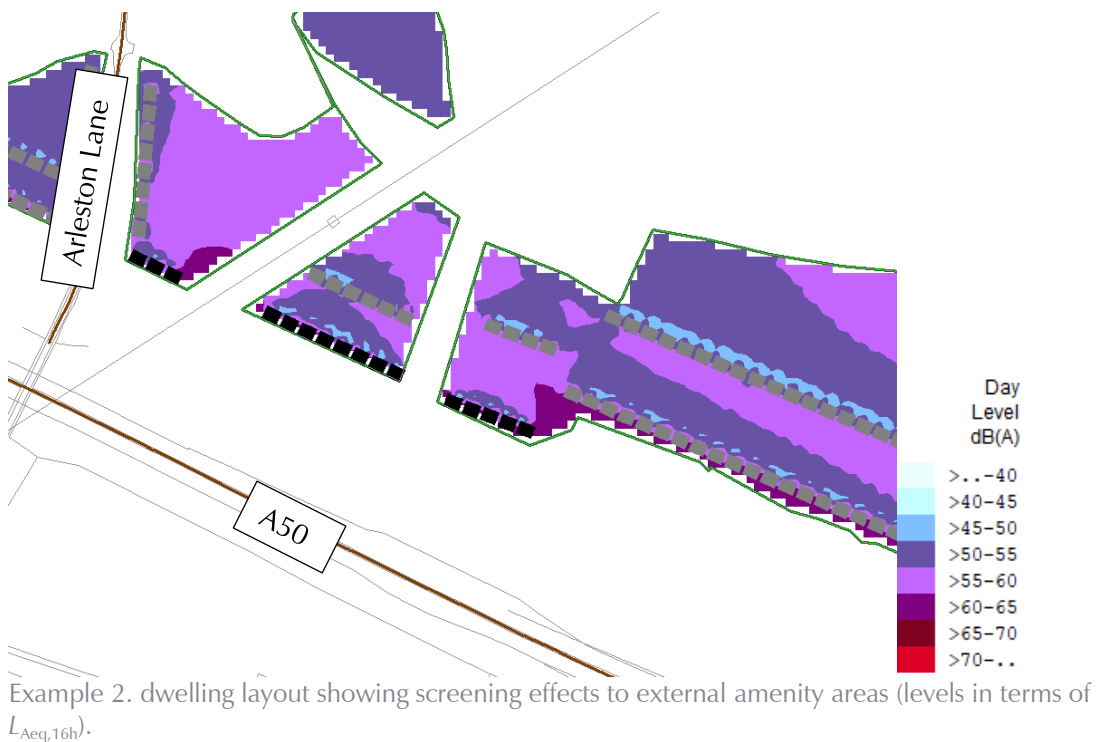
- 9.1 It can be seen on the attached noise contour figures 13/1580/R6/F1 and 13/1580/R6/F2, that noise levels across the majority of the site (pre-development) are expected to be above the proposed 55 dB $L_{Aeq,16h}$ design criteria. It will therefore be necessary to consider means to mitigate noise levels in the external amenity areas of the proposed dwellings across the site.
- 9.2 Generally speaking, external mitigation measures are expected to take the form of careful orientation of dwellings and associated gardens with respect to roads, and screening along garden boundaries. As the design develops, an assessment of the noise impact based on the detailed design proposals and residual effects on existing dwellings can be undertaken.
- 9.3 The provision of 2.5 or 3 storey dwellings in some areas of the site (i.e. those exposed to higher noise levels) may be necessary to provide additional screening to garden areas, compared to standard 2 storey dwellings, to ensure the external noise targets are met.
- 9.4 As with the internal noise assessment, the proposed site layout is not yet known and therefore the daytime noise levels to indicative dwelling plots have been assessed, assuming they are located on the boundaries of the most exposed development parcels.
- 9.5 To show how this can be achieved, indicative layouts have been input into the previously discussed noise model. Sound propagation is calculated taking into account of factors such as divergence, screening and ground absorption. Moderate downwind conditions are assumed, which represents a reasonable worst case.
- 9.6 The image below shows the south western corner of the proposed site, adjacent to both the A50 and the railway line. This corner of the site is expected to observe the highest external noise level. A number of indicative 2- (in grey) and 3-storey (in black) dwellings are shown to demonstrate the screening that can be offered to potential external amenity areas behind:



Noise Assessment: Residential



- 9.7 It can be seen that behind the dwellings (relative to the road and railway line), noise levels are predicted to be below the 55 dB $L_{Aeq,16h}$ design criteria.
- 9.8 Further along the A50 to the east, it can be seen that a mixture of two and three storey dwellings can be used to provide similar garden conditions (again assuming that buildings are placed between gardens and nearby noise sources):





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- 9.9 It is shown that through consideration of the layout within each parcel, the noise criteria for external amenity areas can be achieved. This is through the careful layout of the site and the possible provision of localised screening, as appropriate. Further work will be required at the detailed design stage to optimise the layout of each parcel.

10 Noise Levels at the Proposed Primary School

- 10.1 At time of writing, no detailed layout plans have been developed for the school. However, an approximate location has been identified in the centre of the site as shown in the excerpt from the proposed parameters plan below (area marked as PS):



Parameter plan excerpt (drawing reference 13.060/19)

- 10.2 It should be noted that before construction, suitable design advice should be sought to ensure that environmental noise break-in to the teaching and ancillary spaces is taken into account.
- 10.3 Taking into account the previously discussed means to provide acceptable noise levels in external residential amenity areas, it is reasonable to state that levels meeting the proposed design criteria can be provided through careful site layout development the provision of localised screening if deemed necessary.



Noise Assessment: Residential

- 10.4 It is noteworthy that the proposed primary school site would also benefit from inherent screening provided by proposed dwellings between the school at the A50. A detailed assessment of noise to the school site can be undertaken at the detailed design stage if required.
- 10.5 Taking the above comments into account it will in principle be possible to locate a proposed school facility on the site in a location observing noise levels close to or below the aspirational noise level targets stated in section 4.3

11 Mixed Use Local Centre

- 11.1 As noted previously, it is not yet known what the mixed used local centre will comprise however the following should be taken into account when considering the design:
- The mixed use local centre should be designed to suitably control noise intrusion to noise sensitive receptors from external source as appropriate. The extent of mitigation required will depend on the proposed usages of each space.
 - Where appropriate, the mixed use local centre should be designed to contain internally generated noise, so that unacceptable impacts upon existing and proposed residences are avoided. This can be done with suitable external building fabric (including windows), ventilation strategies and, if necessary, limiters that control internal noise levels generated. Further assessment will be needed once the proposed uses are known.



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12 Conclusions

- 12.1 Planning permission is being sought for a new residential development named Infinity Garden Village, adjacent to the A50 and south of Wragley Way.
- 12.2 An assessment of the viability of the development of the Application Site has been conducted, considering the requirements of the National Planning Policy Framework and the aims of the Noise Policy Statement for England.
- 12.3 The mitigation measures necessary to achieved to proposed acoustic design criteria, in a number of worst case indicative locations around the site, have been determined. The glazing and ventilation mitigation requirements represent a worst case, to demonstrate the site's suitability for development. Therefore, the specification of these elements should be reviewed at the detailed design stage, once layouts have been developed for each parcel.
- 12.4 It has been demonstrated that through careful orientation of dwellings and the use of 3 storey dwellings in some areas, noise levels in gardens are predicted to be within aspirational guidelines. The use of localised screening may also be appropriate in some areas. Further assessment will be required at a later stage to optimise the proposed development layouts for each parcel.
- 12.5 It will be possible to control noise levels at the proposed primary school such that they are within the proposed design criteria, therefore suggesting the site's suitability for incorporating such a facility. It is noted that the final positioning of the school is yet to be determined and the location, orientation and potential noise break in should be considered at the detailed design stage.
- 12.6 The principles of appropriate acoustic design relating to the proposed mixed use local centre have been outlined.
- 12.7 It has been demonstrated that the site is, in principle, suitable for residential development and that both the internal and external noise levels at the example proposed dwellings can be suitably controlled to meet the agreed design criteria and therefore noise levels are shown to be below the Lowest Observed Adverse Effect Level in terms of the Planning Policy Guidance.

 End of Section



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Glossary of Acoustic Terms

L_{Aeq} :

The notional steady sound level (in dB) which over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measurement over that period. Values are sometimes written using the alternative expression dB(A) L_{eq} .

L_{Amax} :

The maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise when occasional loud noises occur, which may have little effect on the L_{Aeq} noise level. Unless described otherwise, L_{Amax} is measured using the “fast” sound level meter response.

L_{A10} & L_{A90} :

If non-steady noise is to be described, it is necessary to know both its level and degree of fluctuation. The L_{An} indices are used for this purpose. The term refers to the A-weighted level (in dB) exceeded for n% of the time specified. L_{A10} is the level exceeded for 10% of the time and as such gives an indication of the upper limit of fluctuating noise. Similarly L_{A90} gives an indication of the lower levels of fluctuating noise. It is often used to define the background noise.

L_{A10} is commonly used to describe traffic noise. Values of dB L_{An} are sometimes written using the alternative expression dB(A) L_n .

L_{AX} , L_{AE} or SEL

The single event noise exposure level which, when maintained for 1 second, contains the same quantity of sound energy as the actual time varying level of one noise event. L_{AX} values for contributing noise sources can be considered as individual building blocks in the construction of a calculated value of L_{Aeq} for the total noise. The L_{AX} term can sometimes be referred to as Exposure Level (L_{AE}) or Single Event Level (SEL).

■ End of Section

Figure 13/1580/SP1

Title:

Site plan showing noise measurement positions



Short Term
Measurement
Position



Long Term (24 hour)
Measurement
Position



Project:

Land at Wragley Way, Derby

Date:

May 2019

Revision:

2

Scale:

Not to scale

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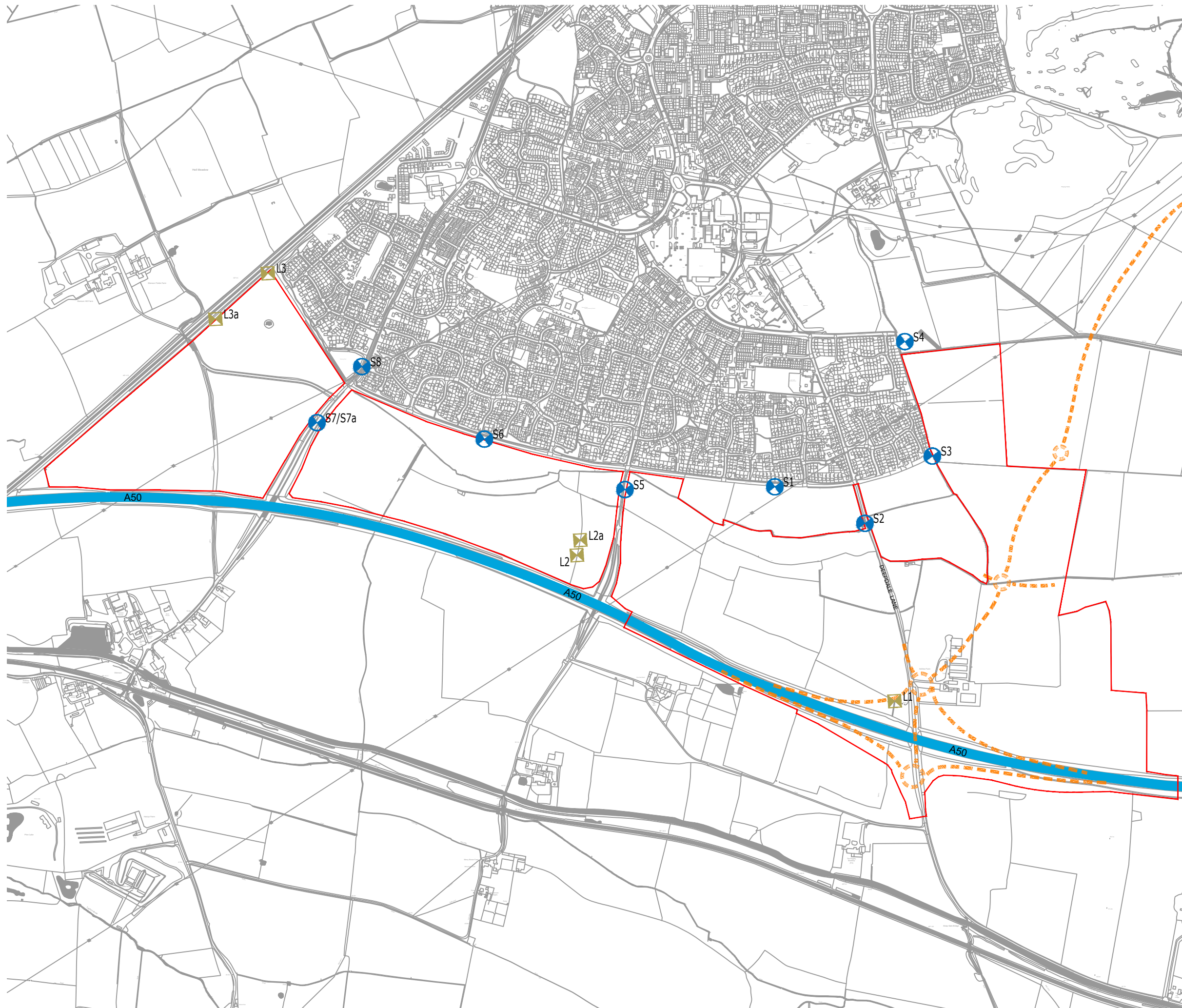


Figure 13/1580/R6/F1

Title:

Baseline daytime noise contours in terms of $\text{dB } L_{\text{Aeq},16\text{h}}$ (daytime) at 1.5m above local ground level



Project:

Infinity Garden Village

Date:

30 May 2019

Scale:

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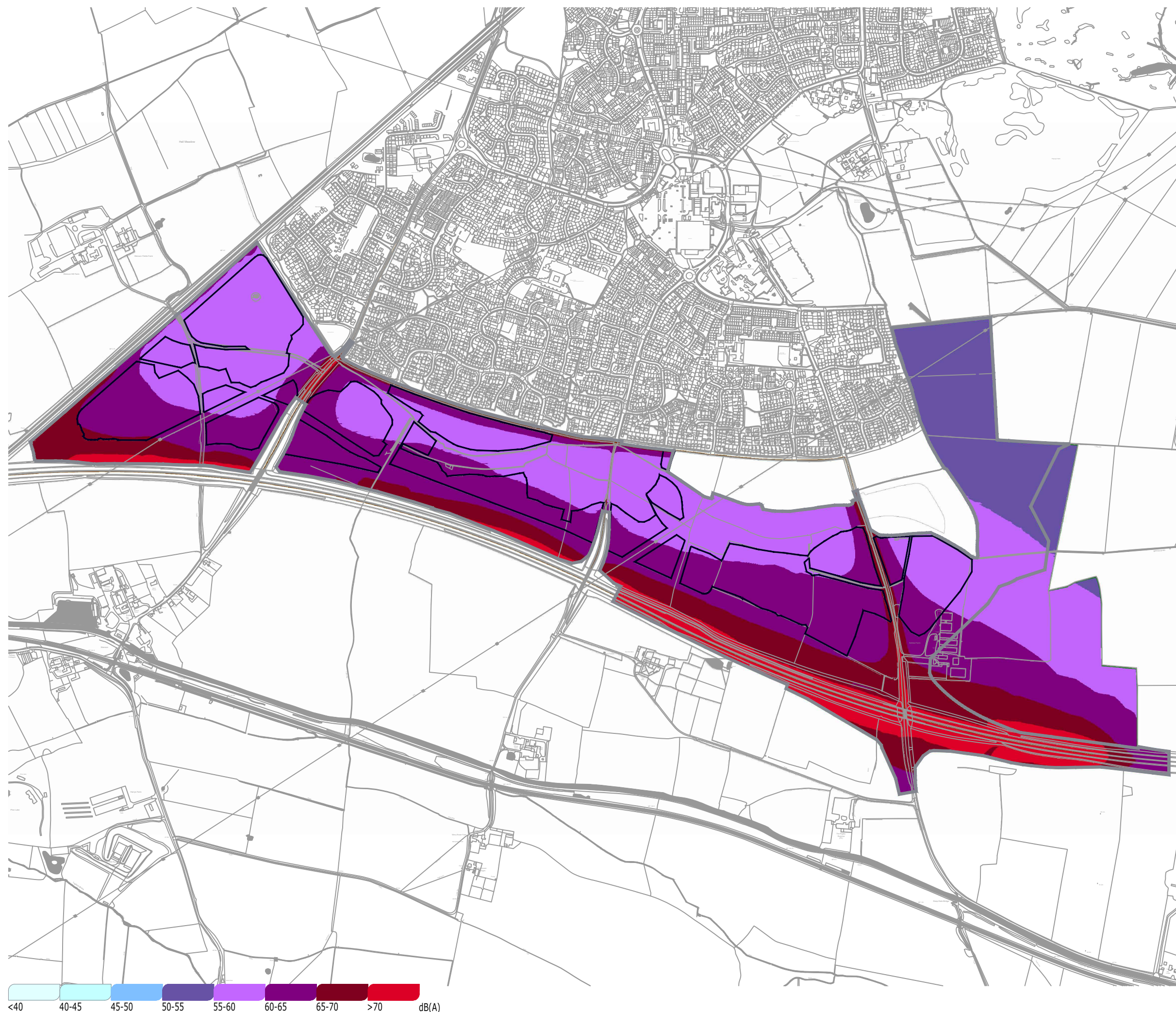


Figure 13/1580/R6/F2

Title:

Baseline night time noise contours in terms of $\text{dB } L_{\text{Aeq},8\text{h}}$ (daytime) at 1.5m above local ground level



Project:

Infinity Garden Village

Date:

30 May 2019

Scale:

Not to scale

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Infinity Garden Village

Noise Assessment: Employment

Report 13/1580/R07

Infinity Garden Village

Noise Assessment: Employment

Report 13/1580/R07

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Revision	Description	Date	Prepared	Approved
0	First Issue	24 May 2019	Richard Masey	Tim Fox

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Noise Assessment: Employment

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Noise Assessment: Employment

Attachments

Glossary of Acoustic Terms

13/1580/SP01

Site plan showing noise survey measurement positions

 End of Section



Noise Assessment: Employment

1 Introduction

- 1.1 A number of the proposed development parcels at the proposed Infinity Garden Village site, immediately to the north of the A50, have been designated for use as potential B1, B2 and B8 employment land.
- 1.2 The final form and exact usage of the employment land is yet to be determined however it is necessary to develop a strategy to ensure nearby sensitive receptors are protected from noise from this source.
- 1.3 This report sets out a means to assess and the principles of controlling noise from the proposed employment site. Further work will be required at the reserved matters stage to ensure that noise from the proposed employment late is appropriately mitigated.

2 Site Description

- 2.1 The site is located immediately to the north of the A50 and south of Wragley Way, Derby. It is flanked by a railway line to the west and agricultural land to the east. The extents of the site are indicated on the attached site plan 13/1580/SP01.
- 2.2 To the north of Wragley Way is a large residential area. All other areas on and around the proposed site consist of agricultural land. Three roads also pass through the site, these being Stenson Road, Arleston Lane and Deep Dale Lane.
- 2.1.1 At the time of the measurements in both 2013 and 2019, the A50 was observed to be the dominant noise source across the site. Only at locations close to the other roads around the site did those roads have any significant effect on noise levels. Similarly, near the north western boundary of the site the railway made a significant contribution to noise levels.

3 Planning Policy and Guidance

3.1 National Planning Policy Framework

- 3.1.1 The National Planning Policy Framework (NPPF), published in March 2012 and updated in February 2019, is currently the relevant document for defining the national policy toward noise sensitive development. It refers to the Noise Policy Statement for England (NPSE), which is discussed in the subsequent section.
- 3.1.2 The current policy on sustainable development influences the emphasis of any noise assessment. The development of a quiet, rural site is by most measures less sustainable than the development of a site located near existing infrastructure and facilities. The rating of development sites based on prevailing noise levels should reflect this.
- 3.1.3 Specifically, on the subject of noise, paragraph 180 of NPPF states:



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“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- a. mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
- b. identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;”*

3.1.4 Paragraph 180 references the Noise Policy Statement for England and no other particular standards.

3.1.5 On the general issue of amenity, paragraph 127 states that planning policies and decisions should ensure that developments:

“create places that [...] promote health and well-being, with a high standard of amenity for existing and future users...”

3.1.6 Further to this, paragraph 170 states that planning policies and decisions should contribute to and enhance the natural and local environment by:

“preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution”

3.1.7 A notable inclusion in the July 2018 edition of NPPF is the ‘agent of change’ principle in paragraph 182. In terms of noise, this principle requires that those proposing a new noise sensitive development incorporate sufficient mitigation such that the operation of existing premises in the area is not unreasonably restricted in order to control noise impact upon the new development:

3.1.8 “Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.”

3.2 Noise Policy Statement for England

3.2.1 The Noise Policy Statement for England (NPSE, which pre-dates and is reflected by the NPPF) does not set quantitative guidelines for the suitability of development in an area depending on



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the prevailing or expected levels of noise. Absent, therefore, is reference to specific noise thresholds which determine whether noise sensitive or noise generating development is suitable and, if so, whether particular mitigation factors need to be considered. Instead, the NPSE sets out three aims as below.

3.2.2 The first aim of the Noise Policy Statement for England:

“Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.”

3.2.3 The second aim of the Noise Policy Statement for England:

“Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.”

3.2.4 The third aim of the Noise Policy Statement for England:

“Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.”

3.2.5 Each development site should be judged on its ability to deliver on each of these aims. In this context defining the prevailing noise levels is an essential first step in assessing a given site.

3.2.6 The NPSE includes the concept of the Significant Observed Adverse Effect Level (SOAEL) and states:

“It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times.”

3.2.7 It is therefore necessary to assess each site and situation on its own merits and establish SOAEL's etc which relate specifically to those circumstances.

3.3 Planning Practice Guidance (PPG)

3.3.1 The Department for Communities and Local Government 'Planning Practice Guidance' (PPG) was published on 06 March 2014. The PPG is intended to be read alongside the NPPF and we set out below the guidance that is most relevant to the consideration of noise.

3.3.2 Part ID30 of the PPG gives guidance on the relevance of noise to a planning decision. Paragraph 003 (ID: 30-003-20140306) states that decision taking should take account of the acoustic environment and in doing so consider the degree of effect associated with the proposal.



Noise Assessment: Employment

- 3.3.3 Paragraph 006 (ID: 30-006-20140306) states that various factors need to be considered when assessing the relationship between noise levels and the potential impact on those affected. Paragraph 008 (ID: 30-008-20140306) identifies that noise can be mitigated through engineering, layout, planning conditions/obligations and finally through measures at receivers in areas likely to be affected by noise.
- 3.3.4 The PPG makes reference to the NPSE and states at Paragraphs 003 and 004 (ID: 30-003-20140306 and ID: 30-004-20140306) that the aim is to identify where the overall effect of the noise exposure falls in relation to Significant Observed Adverse Effect Level ¹ (SOAEL), the Lowest Observed Adverse Effect Level ² (LOAEL) and the No Observed Effect Level ³ (NOEL).
- 3.3.5 Under Paragraph 005 (ID: 30-005-20140306) the guidance then presents a table, which is reproduced as table T1 overleaf. The implication of the final line of the table is that only the 'noticeable and very disruptive' outcomes are unacceptable and should be prevented. All other outcomes (i.e. all other lines in the table) can be acceptable, depending upon the specific circumstances and factors such as the practicalities of mitigation, although effects corresponding to the penultimate line should be avoided.
- 3.3.6 Under the topic of further considerations relating to mitigating the impact of noise on residential developments (paragraph 009; ID: 30-009-20140306) the PPG states that the noise impact may be partially off-set if residents of affected dwellings have access to:
- a relatively quiet facade (containing windows to habitable rooms) as part of their dwelling, and/or;
 - a relatively quiet external amenity space for their sole use, (e.g. a garden or balcony). Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced with increasing noise exposure and could be such that significant adverse effects occur, and/or;
 - a relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings, and/or;
 - a relatively quiet, protected, external publically accessible amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance).
- 3.3.7 This is not to say that access to the above items is mandatory, rather that it can help to offset any noise impacts.

¹ The level of noise exposure above which significant adverse effects on health and quality of life occur.

² The level of noise exposure above which adverse effects on health and quality of life can be detected.

³ The level of noise exposure below which no effect at all on health or quality of life can be detected.



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Effect Level (increasing)	Perception	Examples of Outcomes	Action
No Observed Effect	Not noticeable	No Effect	No specific measures required
NOEL (No Observed Effect Level)			
No Observed Adverse Effect	Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No specific measures required
LOAEL (Lowest Observed Adverse Effect Level)			
Observed Adverse Effect	Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Mitigate and reduce to a minimum
SOAEL (Significant Observed Adverse Effect Level)			
Significant Observed Adverse Effect	Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Avoid
Unacceptable Adverse Effect	Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Prevent

T1 Summary of Noise Exposure Hierarchy (from PPG)



Noise Assessment: Employment

4 Assessment Criteria and Methodology

4.1 Ambient Noise Levels

BS 4142 Assessment

4.1.1 Regarding noise impact from a distribution centre, BS 4142:2014 provides an assessment methodology and criteria relating to:

- a) sound from industrial and manufacturing processes;
- b) sound from fixed installations which comprise mechanical and electrical plant and equipment;
- c) sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
- d) sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

4.1.2 The application of the standard is detailed below:

"This standard is applicable to the determination of the following levels at outdoor locations:

- a) rating levels for sources of sound of an industrial and/or commercial nature; and*
- b) ambient, background and residual sound levels,*

for the purposes of:

- 1) investigating complaints;*
- 2) assessing sound from proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature; and*
- 3) assessing sound at proposed new dwellings or premises used for residential purposes."*

4.1.3 Therefore, where onsite activity is concerned, the approach taken is in accordance with BS 4142:2014. The rating level of noise from the facility is calculated, over a set time period, at each of the nearest noise sensitive locations. This rating level is then compared with the existing background sound level.

4.1.4 The standard recommends the following reference time period, T_r , over which the specific sound should be evaluated, for each of the day and night periods:

- $T_r = 1$ hour during the day; and
- $T_r = 15$ minutes during the night.



Noise Assessment: Employment

4.1.5 The standard states that daytime is typically between 07:00 h and 23:00 h. Accordingly night-time is between 23:00 h and 07:00 h.

4.1.6 The reason for the shorter night time period is identified in the standard as follows:

“The shorter reference time interval at night means that short duration sounds with an on time of less than 1 h can lead to a greater specific sound level when determined over the reference time interval during the night than when determined during the day.”

4.1.7 The rating level of noise for the assessment periods, L_{A,r,T_r} is the calculated noise level at the nearest receiver location, adjusted depending on the acoustic characteristic of the noise source. Adjustment factors are based on any tonality, impulsivity, intermittency and other sound characteristics present in the resultant noise level at the receiver position. The level or appropriateness of any penalty will depend both on the type of noise source and the context in which it is perceived. Similarly, in accordance with BS 4142, the period of time for which an individual noise source is active during the relevant reference time period will also be considered in establishing the rating level.

4.1.8 The rating level, including appropriate correction factors, will be considered and applied to each source and receiver path individually.

4.1.9 It will also be necessary to consider the existing noise climate and what sound sources contribute to it. For example, where a noise generating activity is proposed adjacent to an existing identical noise generating site, the impact of the new noise source would be less than if it were to be planned in a location where its character and type is different to and more noticeable than any existing noise source nearby.

4.1.10 With regard to the background sound level against which the rating level is compared, the standard states the following:

“In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods.”

4.1.11 The periods of interest over a 24 hour day are usually related to day time activities (07:00-23:00 h) and night time (23:00-07:00 h). However, the standard makes the following statement:

“Among other considerations, diurnal patterns can have a major influence on background sound levels and, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night-time period for sleep purposes. Furthermore, in this general context it can also be necessary to separately assess weekends and weekday periods.”



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- 4.1.12 Therefore, the periods of time which are typically considered 'waking up' and 'falling asleep' stages, for example 06:00 to 07:00 h and 23:00 to 24:00 h, may need to be considered independently. Alternative periods may also be identified where breakdown beyond the standard day and night time analysis will be necessary, for example where background sound levels are shown to be regularly elevated. Similarly, both weekend and weekday periods may need to be considered separately, with criteria set for both. The requirement to analyse specific time periods will be considered for each site individually.
- 4.1.13 Once the rating level at each receptor has been calculated reference can be made to the following commentary on BS 4142 in relation to assessing the impact based on the difference between the rating level of the noise source and the pre-existing background sound level.
- a) Typically, the greater this difference [between industrial site noise rating level and baseline background level], the greater the magnitude of the impact.*
- b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
- d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*
- 4.1.14 In addition to the above, BS 4142 also states:
- "For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.*
- Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."*
- 4.1.15 When assessing whether the existing sound levels are low, it is relevant to refer to other standards which provide absolute thresholds for suitable noise levels inside buildings. These are detailed below.
- 4.1 Amenity and Sleep Disturbance**
- 4.1.16 Where existing ambient noise levels in an area are low at night it has been recognised that these noise levels can be increased without significant detriment to residential amenity.



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WHO Guidelines 1999

- 4.1.17 In 1999 the World Health Organisation (WHO) published its Guidelines for Community Noise. For outdoor amenity area noise levels during the daytime period the recommendation was to not exceed 50 dB $L_{Aeq, 16 \text{ hour}}$ to avoid people being moderately annoyed and 55 dB $L_{Aeq, 16 \text{ hour}}$ to avoid people being seriously annoyed. This latter level may be viewed as the Significant Observed Adverse Effect Level (SOAEL), above which the noise causes a material change in behaviour and/or attitude, avoiding certain activities during periods of intrusion; quality of life is diminished due to change in acoustic character of the area.
- 4.1.18 For indoor noise levels during the daytime period, the recommendation was to avoid exceeding 35dB $L_{Aeq, 16 \text{ hour}}$ to ensure the noise does not interfere with normal speech. With open windows, this would correspond to approximately 45dB $L_{Aeq, 16 \text{ hour}}$ as an external free field noise level. Where there are no other means of ventilation than opening windows, this level can be viewed as the Lowest Observed Adverse Effect Level, below which “noise can be heard but does not cause any change in behaviour or attitude” and above which “noise can be heard and causes small changes in behaviour and/or attitude, e.g. speaking more loudly”.
- 4.1.19 In order to define a level at which effects become unacceptable, it is useful to refer to the Scottish Government Technical Advice Note on Assessment of Noise. Although this advice does not form part of planning policy or guidance in England, it nevertheless contains useful information to put absolute noise levels in context. The advice note indicates at various points that a major adverse impact does not occur in residential areas until daytime noise levels are at least 10 dB above the WHO guideline level of 55 dB $L_{Aeq, 16 \text{ hour}}$. A level of 65 dB $L_{Aeq, 16 \text{ hour}}$ could therefore be viewed as corresponding to an unacceptable observed adverse effect.

WHO Night Noise Guidelines 2009

- 4.1.20 In 2009 the WHO published its Night Noise Guidelines for Europe (NNG), following a draft published in 2007). The abstract includes the following statement:
- “These guidelines ... may be considered as an extension to, as well as an update of, the previous WHO Guidelines for community noise (1999).”*
- 4.1.21 Table 3 of the executive summary of the NNG sets out effects of different levels of night noise on the population’s health. It indicates that an external level of 30 dB $L_{Aeq, 8 \text{ hour}}$ corresponds to the No Observed Effect Level (NOEL) and that 40 dB $L_{Aeq, 8 \text{ hour}}$ corresponds to the Lowest Observed Adverse Effect Level (LOAEL). Although it does not explicitly specify a level corresponding to the Significant Observed Adverse Effect Level (SOAEL), the indication is that it is likely to occur at 55 dB $L_{Aeq, 8 \text{ hour}}$.

Planning Precedence

- 4.1.22 In dealing with planning appeals for retail superstores there is precedence that night-time service yard operations can be allowed even in the quietest areas, provided that noise levels do not exceed 45 dB $L_{Aeq, 1 \text{ hour}}$ due to operations within the service yard at the façades of the nearest residential properties. This corresponds to the daytime threshold for absolute noise



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levels stated elsewhere in this report. However, the proposed night time threshold is lower, to ensure it is as robust as possible and in line with national planning guidance and WHO guidelines.

4.2 Absolute Noise Level Assessment Criteria

- 4.2.1 It is worth noting that the WHO guidelines distinguish various types of noise sources including road, rail and air traffic, as well as industry. They do not set industrial noise apart from the others and they do not exclude industrial noise from the sources which can be covered by the guideline values.
- 4.2.2 It should also be noted that the WHO guideline noise levels discussed above are in terms of day and night period noise levels ($L_{Aeq, 16 \text{ hour}}$ and $L_{Aeq, 8 \text{ hour}}$ respectively). BS 4142 uses shorter assessment periods for both the day ($L_{Aeq, 1 \text{ hour}}$) and night ($L_{Aeq, 15 \text{ minute}}$). Comparison of such shorter period noise levels with the WHO guideline values can often result in quite different outcomes than comparison of the full day and night period noise levels. When noise sources are not entirely steady, examination of shorter periods will indicate higher specific noise levels than examination of the full day or night period. Using specific noise levels derived from the shorter assessment periods for comparison with the WHO guidelines therefore represent a more stringent method than using the full day and night periods. Reference should also be made to paragraph 4.1.6 above.
- 4.2.3 In addition, the BS 4142 rating level then includes adjustments for the character of the sound where appropriate. For example, if a sound source is highly impulsive, a penalty of 3 dB may be applied if the impulsivity is just perceptible at the receptor, 4dB where it is clearly perceptible and 6dB where it is highly perceptible. Comparison of a rating level derived in this way with the WHO guideline levels is therefore more stringent than a simple comparison of the specific sound level (without having applied any penalties) with the guideline levels.
- 4.2.4 For the reasons presented in the preceding two paragraphs, comparison of BS 4142 rating levels ($L_{Ar, Tr}$) with the WHO guideline values represents a robust methodology.
- 4.2.5 Based on the above discussion, absolute ambient noise level thresholds are proposed along with corresponding recommended actions in table T2 overleaf. It can be seen from the table that where day and night rating levels are equal to or below 45 and 40dB respectively, no further action or assessment is required. In certain cases, a conservative approach has been taken in deriving thresholds; for example it could be argued with reference to the NNG that the SOAEL at night could be 50 or 55 dB $L_{Aeq, 8 \text{ hour}}$ but a conservative level of 45 dB has been used in line with planning appeal precedents.



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BS 4142 Rating Level, dB		Equivalent PPG Effect Level	Action
Day	Night		
$L_{A_{r,Tr}} < 40$	$L_{A_{r,Tr}} < 30$	No observed effect	No specific measures required
$L_{A_{r,Tr}} = 40$	$L_{A_{r,Tr}} = 30$	NOEL	No specific measures required
$40 < L_{A_{r,Tr}} < 45$	$30 < L_{A_{r,Tr}} < 40$	No observed adverse effect	No specific measures required
$L_{A_{r,Tr}} = 45$	$L_{A_{r,Tr}} = 40$	LOAEL	No specific measures required
$45 < L_{A_{r,Tr}} < 55$	$40 < L_{A_{r,Tr}} < 45$	Observed adverse effect	Mitigate and reduce to a minimum
$L_{A_{r,Tr}} = 55$	$L_{A_{r,Tr}} = 45$	SOAEL	Mitigate and reduce to a minimum
$55 < L_{A_{r,Tr}} \leq 65$	$45 < L_{A_{r,Tr}} \leq 55$	Significant observed adverse effect	Avoid
$L_{A_{r,Tr}} > 65$	$L_{A_{r,Tr}} > 55$	Unacceptable observed adverse effect	Prevent

T2 Proposed BS4142 assessment criteria for absolute noise levels

- 4.2.6 It should be noted that the absolute noise levels relating to the SOAEL, significant observed adverse effects, and unacceptable observed adverse effects in table T2 above are only appropriate in situations when background noise levels are relatively low.
- 4.2.7 In addition to these lower-level absolute limits it may be necessary to consider alternative absolute or relative criteria where existing representative background sound levels are particularly high (see paragraph 4.1.14 above). These would be considered on a site by site basis.
- 4.2.8 Once background noise levels approach or exceed the absolute noise levels in the table, a comparative assessment (against prevailing noise levels) can be more appropriate.
- 4.2.9 In this case, the assessment basis presented in table T3 is proposed where rating noise levels exceed the thresholds identified above, by correlating the impact descriptions in BS 4142 (paragraph 4.1.13 above) and the effect descriptions in planning policy guidance (table T1 under paragraph 3.3.7 above). The table sets out equivalent PPG effect levels and actions



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required for various relationships between the rating level of the noise source at the receptor ($L_{Ar,Tr}$) and the background sound level at a location representative of the receptor ($L_{A90,T}$).

BS4142 Assessment	Equivalent PPG Effect Level	Action required
$L_{Ar,Tr} < L_{A90,T}$	No observed effect	No specific measures required
$L_{Ar,Tr} = L_{A90,T}$	NOEL	No specific measures required
$L_{A90,T} < L_{Ar,Tr} < L_{A90,T} + 5$	No observed adverse effect	No specific measures required
$L_{Ar,Tr} = L_{A90,T} + 5$	LOAEL	No specific measures required
$L_{A90,T} + 5 < L_{Ar,Tr} < L_{A90,T} + 10$	Observed adverse effect ⁴	Mitigate and reduce to a minimum ⁵
$L_{Ar,Tr} = L_{A90,T} + 10$	SOAEL ⁴	Mitigate and reduce to a minimum ⁵
$L_{Ar,Tr} > L_{A90,T} + 10$	Significant observed adverse effect ⁴	Avoid ⁵

T3 BS 4142 assessment criteria for comparative noise levels

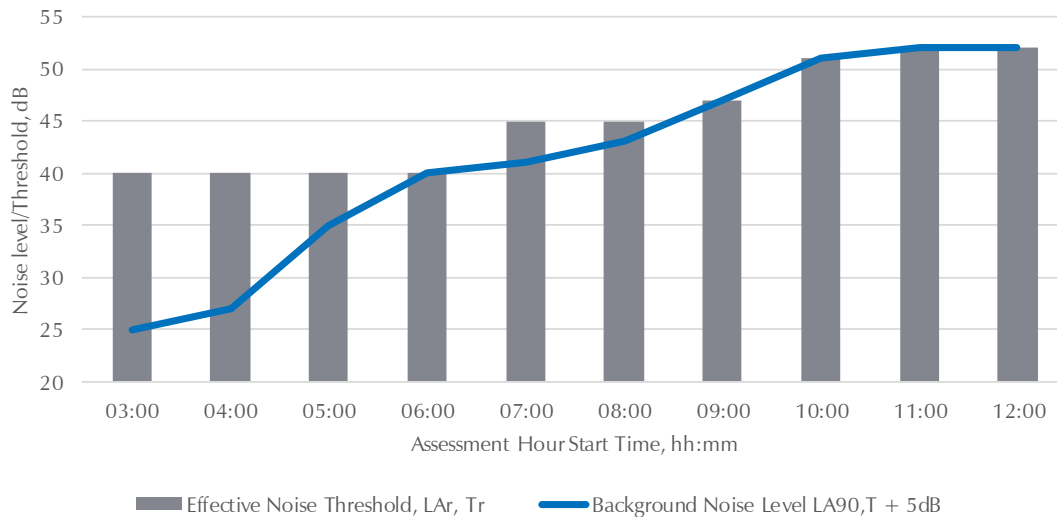
- 4.2.10 It can be seen from the above table that where the rating level is less than or equal to 5 dB above the background level, no action is required.
- 4.2.11 On the basis of the above, where the representative background noise level (at a given receptor) plus 5 dB (over the relevant assessment period) exceeds the absolute thresholds previously defined, the “background+5 dB” level may be adopted as the effective noise threshold (i.e. the LOAEL). This approach is in line with BS 4142. The principle of this approach is shown in the chart below:

⁴ Except where $L_{Ar,1hour} \leq 45$ during the day or $L_{Ar,15minute} \leq 40$ dB during the night, in which the effect is equivalent to LOAEL or NOEL.

⁵ Except where $L_{Ar,1hour} \leq 45$ during the day or $L_{Ar,15minute} \leq 40$ dB during the night, in which case no specific measures are required for noise occurring during the relevant day or night period



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- 4.2.12 The figures displayed in the chart above are all strictly indicative and not representative of conditions at this proposed development site
- 4.2.13 It is noted again that noise thresholds should not be set below the 45 and 40 dB thresholds for the day and night periods respectively.
- 4.2.14 Tables T2 and T3 together therefore represent the proposed overall BS 4142 noise assessment methodology in terms of L_{Aeq} (upon which the rating level $L_{Ar,Tr}$ is based).

4.3 General Noise Events of Short Duration

- 4.3.1 BS 4142:2014 only calculates the impact of ambient noise levels generated by industrial activities at the nearest noise sensitive dwellings over periods of 15 minutes at night (when potential sleep disturbance is a factor which often needs to be considered). The standard accounts for the impulsivity of noise sources by including methods for adding a penalty, the magnitude of which depends on the degree to which the impulsivity is perceptible at a given receptor.
- 4.3.2 However, in order to provide adequate protection to people trying to sleep in dwellings at night it is often appropriate to consider noise events of short duration with reference to sources of guidance other than BS 4142.

WHO Guidelines for Community Noise, 1999

- 4.3.3 Table 1 of the 1999 WHO document provides guideline values for community noise in specific environments. The relevant guideline value in this situation is 60 dB L_{Amax} as a façade incident level outside bedrooms (which corresponds to approximately 57 dB as a free field level) during the night time, and is based upon the requirement to minimise sleep disturbance.
- 4.3.4 However, this criterion is considered to be an aspirational goal and in many locations is regularly exceeded by common environmental and road traffic noise sources.



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WHO Night Noise Guidelines, 2009 (NNG)

4.3.5 The NNG does not propose any new or updated outdoor L_{Amax} criteria beyond those stated in the 1999 Guidelines for Community Noise.

4.3.6 In Table 1 under the heading “Thresholds for Observed Effects” (page XIII) various levels corresponding to the onset of observable effects are cited, from 32 to 42 dB $L_{Amax, inside}$. It is stressed that these correspond to the points at which effects start to become observable. In many cases they may not start to become significant until sound levels are much higher.

4.3.7 However, below table 3 on page XVII the following is stated:

“A number of instantaneous effects are connected to threshold levels expressed in L_{Amax} . The health relevance of these effects cannot be easily established. It can be safely assumed, however, that an increase in the number of such events over the baseline may constitute a subclinical adverse health effect by itself leading to significant clinical health outcomes.”

4.3.8 Under the heading “Relation with the Guidelines for Community Noise (1999)” (page XVIII) the following statements are made:

“The thresholds are now known to be lower than L_{Amax} of 45 dB for a number of effects.”

“...to prevent sleep disturbances one should consider the equivalent sound pressure level and the number of sound events. The present guidelines allow responsible authorities and stakeholders to do this. Viewed in this way, the night noise guidelines for Europe are complementary to the 1999 guidelines. This means that the recommendations on government policy framework on noise management elaborated in the 1999 guidelines should be considered valid and relevant for the Member States to achieve the guideline values of this document.”

4.3.9 The phrase “guideline values of this document” refers to the night period ambient noise level guidance ($L_{Aeq, 8 \text{ hour}}$) in the NNG. There are no guideline values expressed in terms of L_{Amax} in the NNG.

4.3.10 Taking the above into account it is considered appropriate to continue to refer to the aspirational guideline L_{Amax} level in the 1999 WHO document, whilst also evaluating the number of occurrences of elevated L_{Amax} levels generated by the new sound source in comparison with pre-existing L_{Amax} noise levels and occurrences. Other guidance should also be referred to, as set out below.

BS 8233:2014 - Sound Insulation and Noise Reduction for Buildings

4.3.11 BS 8233 states the following regarding maximum noise levels within houses:

“Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$ depending on the character and number of events per night.”



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4.3.12 The previous edition of BS 8233 included quantitative guidance with respect to night-time L_{Amax} noise levels in bedrooms within dwellings. BS 8233:2014 does not provide such guidance. However, in paragraph 7.7.5.1.1 it is noted that the recommendations for ambient noise in hotel bedrooms are similar to those for living accommodation and Table H.3 in Annex H.3 gives example night-time L_{Amax} limits in hotel bedrooms of 45-55 dB. It is noted that night time specifically relates to the period 23:00-07:00 h.

4.3.13 BS 8233:2014 states the following regarding alternative means of ventilation:

“If relying on closed windows to meet the guide values, there needs to be appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.”

4.3.14 Therefore, in the case of areas already subject to high existing maximum noise levels it is understood that achieving an internal noise level of 45-55 dB L_{Amax} with windows open is not considered reasonable. This is because the residents will already be used to the high prevailing noise levels and are likely to already be shutting windows, if required. The addition of new maximum noise levels of a similar or lower level would not alter this behaviour.

4.3.15 In relation to free field external noise levels, sound insulation from typical single or double glazed windows can be expected to vary between 25 and 30 dB(A) for road traffic type noise sources. Adding this to the minimum L_{Amax} criterion of 45 dB gives an external criterion of between 70 and 75 dB L_{Amax} .

4.3.16 Finally, with respect to BS 8233:2014 it should be noted that in the scope it advises that:

“It is applicable to the design of new buildings, or refurbished buildings undergoing a change of use but does not provide guidance on assessing the effected of changes in the external noise levels to occupants of an existing building.”

Other Guidance

4.3.17 In 1991 HMSO published ‘Railway Noise - the report of the committee formed to recommend to the secretary of state for transport, a national noise insulation standard for new railway lines’.

4.3.18 Whilst the document is concerned with railway noise it also reviewed research with respect to sleep disturbance generally. It drew in particular from research by Rice and Morgan, 1982. This noted that in general about 20% of the population have sleeping difficulties that are totally non noise related. They concluded that it was unrealistic to set noise limits to ensure sleep would not be affected in any way by noise. Reviewing various studies they suggested that sleep disturbance is significant when 25% of the population are likely to suffer some disturbance from all causes. Depending upon the noise source, thresholds of 75-85 dB L_{Amax} were proposed. For road traffic noise sources during the night time period 75 dB L_{Amax} was the proposed threshold.



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- 4.3.19 On other projects where noise impacts from similar activities were considered, the following statement has been upheld at planning appeal.

"Noise levels for short periods should not exceed 75 dB L_{Amax} ."

- 4.3.20 In conclusion, there are a number of L_{Amax} criteria relating to external night time noise. The lowest of these, 60 dB from the World Health Organisation, represents an aspirational figure, corresponding to approximately 57 dB as a free field level. Other criteria can be derived varying between 70 and 85 dB.

4.4 Reversing Sounders

- 4.4.1 Reversing sounders represent a different type of noise source again and constitute a special case. The principles set out in this section therefore apply only to reversing sounders and not to any other sound sources.
- 4.4.2 Reversing sounders are specifically designed to attract attention and they often comprise an intermittent tone. An assessment of L_{Aeq} noise levels is not always appropriate for such an intermittent and distinctive source. Similarly, the previously discussed L_{Amax} criteria may also not be appropriate on their own, due to fact that the noise source is specifically designed to attract attention and has integral tonal and intermittent characteristics.
- 4.4.3 Although assessment in accordance with BS 4142 can take account of tonality and intermittency (by making allowance for penalties to account for such features), it may result in a misrepresentation of the noise impact where reversing sounders are concerned. Therefore the principle of adding penalties set out in BS 4142 is used alongside consideration of L_{Amax} for reversing sounders⁶, with reference to the WHO Guidelines for Community Noise, which state:

"If the noise is not continuous, sleep disturbance correlates best with L_{Amax} and effects have been observed at 45 dB or less. This is particularly true if the background level is low. Noise events exceeding 45 dBA should therefore be limited if possible."

"To prevent sleep disturbances, one should thus consider the equivalent sound pressure level and the number and level of sound events. Mitigation targeted to the first part of the night is believed to be effective for the ability to fall asleep."

- 4.4.4 The above quotes indicate that effects can be observed at 45 dB. It does not necessarily indicate that noise levels of this order are likely to give rise to significant adverse effects, just that some effect can be observed. Although the 2009 WHO Night Noise Guidelines state that it is now known that effects can also be observable at lower levels, they do not propose any update to the L_{Amax} guidance in the 1999 Guidelines for Community Noise.

⁶ It should be noted that an L_{Amax} level from a reversing sounder can be thought of as akin to a short (e.g. 1 second) L_{Aeq} ; the L_{Amax} level is likely to be sustained for the duration for which the sounder actually sounds. This would not normally be the case for other noise sources.



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- 4.4.5 The internal L_{Amax} noise level of 45 dB in the above quote equates to 60 dB as an external façade incident level and to approximately 57 dB as an external free field level.
- 4.4.6 In addition to taking the above WHO guidance into account, it is reasonable to consider the tonality of reversing sounders. As these tonal sounders are specifically designed to attract attention, notable penalties can be applied in this combination of BS4142 and L_{Amax} assessment. A pessimistic total penalty of 12 dB (comprising 6 dB for highly perceptible tonality, 3 dB for intermittency and 3 dB to account for the fact that the sound is specifically intended to attract attention) can be applied to reversing sounders in accordance with BS4142, in order to give a worst case representation of the impact. These penalties are to be considered at each receptor and, where appropriate, applied to the calculated L_{Amax} levels, for subsequent assessment against the aspirational free field noise limit of 57 dB L_{Amax} .
- 4.4.7 It should again be borne in mind that each situation should be examined on its own merits and there may be cases where deviation from the above methodology is appropriate (for example in a case where conditions are such that the tonality of a reversing sounder would not be considered as highly perceptible at a given receptor).
- 4.4.8 It is stressed that the principles set out above are specific to the special case of reversing sounders and are not applicable to other sound sources.

4.5 Summary of Proposed Design Criteria

General Notes

- 4.5.1 It should be noted that the following refers to external free-field noise levels. It must also be noted that it is a guideline only; in certain situations, assessment criteria may be different. Any deviations from the proposed criteria should be agree with the local authority.

Rating Levels for Site Noise

- 4.5.2 Where the rating level of the development at any given receptor is below the Lowest Observable Adverse Effect Level (LOAEL) in absolute terms, no further action or assessment is necessary. The LOAEL is considered to correspond to free field levels of 45 dB $L_{Ar, 1 \text{ hour}}$ during the day and 40 dB $L_{Ar, 15 \text{ minute}}$ during the night.
- 4.5.3 It should be noted that this rating level will include all BS 4142 penalties for tonality and distinctive features. Therefore, comparison to the noise levels referred to in BS 8233 and WHO guidelines represents a robust assessment.
- 4.5.4 Where the rating levels exceed the thresholds identified above, further BS 4142 assessment is carried out with reference to table T3 under paragraph 4.2.9 above.
- Where background noise levels are considered to be low, overall employment site noise emissions should be kept below the thresholds of $\leq 45 \text{ dB } L_{Ar, 1 \text{ hour}}$ during the day and $\leq 40 \text{ dB } L_{Ar, 15 \text{ minute}}$ during the night when assessed at nearest noise sensitive receptors.



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- Where the representative background noise levels (at a given receptor) plus 5 dB (over the relevant assessment period) exceeds the absolute thresholds previously defined, the “background+5 dB” level may be adopted as the effective noise threshold (i.e. the LOAEL).

Apportionment

- 4.5.5 It is the intention that limits derived using the rating level methodology will apply to the total combined noise level from the employment site. This may include B1 (light industry), B2 (general industrial) and B8 (storage or distribution) uses, all of which may include items of fixed building services plant.
- 4.5.6 To provide maximum flexibility for B8 uses, it is often desirable to set limits for B1, B2 use and for fixed plant associated with the B1, B2 and B8 use at a level 10 dB lower than the overall limits for the site. This allows the B8 use to operate up to the overall site limit.
- Noise limits for B1, B2 and fixed plant items set at least 10 dB below the thresholds above and apportioned as appropriate.

Impulsive Noise

- 4.5.7 Where night time impulsive noise is concerned the Lowest Observable Adverse Effect Level (LOAEL) is considered to correspond to a free field level of 57 dB L_{Amax} .
- 4.5.8 Therefore, where development includes impulsive events giving rise to night time noise levels of 57 dB L_{Amax} or less, no action or mitigation is required.
- 4.5.9 Where development gives rise to night time noise levels in excess of 57 dB L_{Amax} mitigation should be implemented to reduce noise levels to 57 dB or less, or as close to 57 dB as reasonably practicable.
- 4.5.10 Where existing noise levels already typically exceed 57 dB L_{Amax} it would be reasonable to ensure development noise levels do not exceed existing L_{Amax} noise levels in both level and typical rate of occurrence.
- Impulsive noise from the employment site, during the night time, controlled to a level below 57 dB L_{Amax} or as close to this target as reasonable practicable (when assessed at the nearest sensitive receptors).

Reversing Sounders

- 4.5.11 Where development noise events from sources designed specifically to attract attention (such as reversing beepers) are concerned, night time noise levels should again not exceed 57 dB L_{Amax} to ensure the LOAEL is not exceeded. However, a penalty of up to 12 dB should be applied to account for the fact that reversing sounders are specifically designed to attract attention and they exhibit tonal and intermittent characteristics.



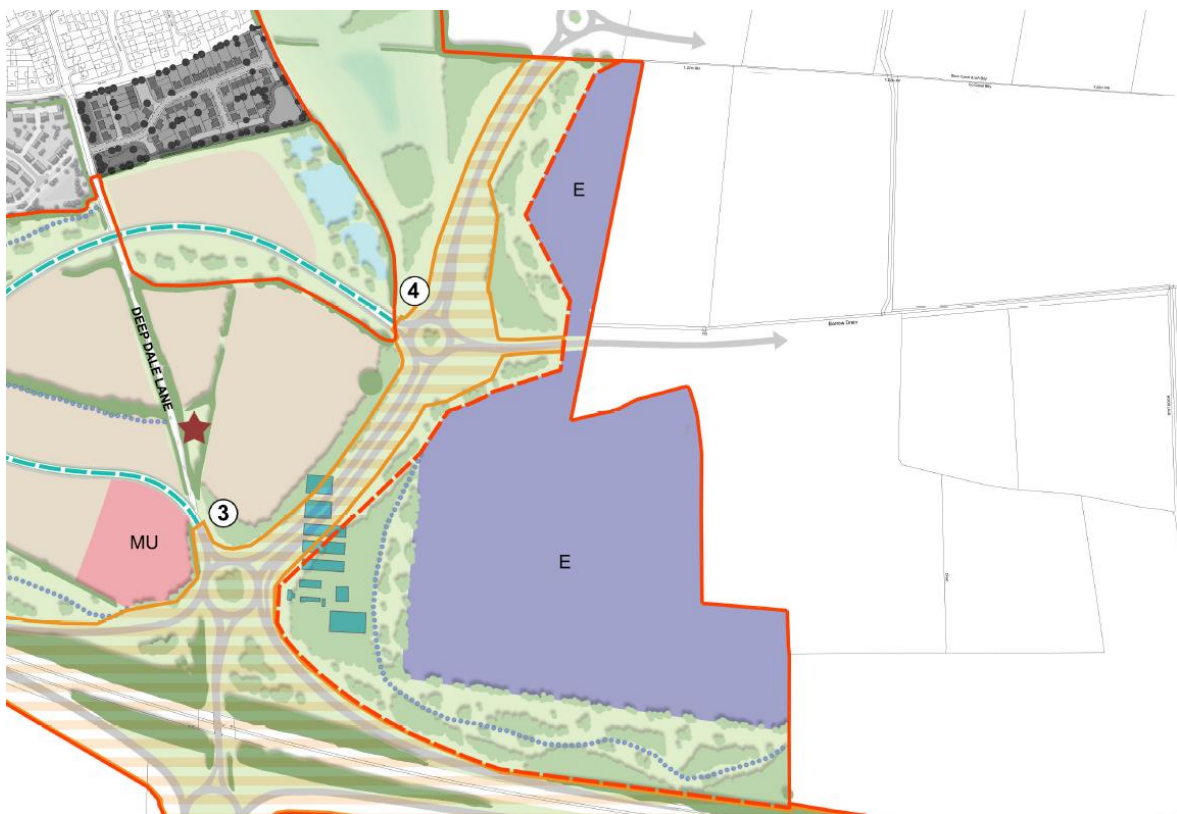
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- Noise from reversing sounders on the employment site, during the night time, controlled to a level below 57 dB L_{Amax} , inclusive of a 12 dB penalty (when assessed at the nearest sensitive receptors).

5 Commentary on Proposed Development

5.1 Overview

- 5.1.1 The area of the proposed Infinity Garden Village site identified for use as an employment area is shown on the plan excerpt below (noted with the letter E).



Location of proposed employment land

- 5.1.2 It is important to note that at time of writing, the proposed A50/Deep Dale Lane junction was not complete. The connecting link road running from the new junction to the north (as shown above) did also not exist.
- 5.1.3 As a result, surveys of the existing noise climate at the site cannot be taken as representative of the background noise conditions that both future residents of the Infinity Garden Village site, and existing residents of Wragley Way, may experience.



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- 5.1.4 Whilst the baseline absolute noise limits would apply regardless of future noise condition, further survey work will be required at a later stage to determine whether the prevailing background noise levels are such that limits above the baseline thresholds are appropriate.
- 5.1.5 In addition, the form, layout, proposed uses and operation regime of the employment area is not currently known. It is therefore not possible to conduct a meaningful assessment of noise from the site at this stage of the scheme's design.
- 5.1.6 However, from a noise perspective, it is expected that development of the land for employment use will be entirely possible providing appropriate noise management and mitigation measures are implemented at the employment site.
- 5.1.7 It is therefore recommended that an appropriately worded noise related condition be included within any decision notice granted for the proposed employment land which requires a full noise assessment to be undertaken at the detail design stage for the site.

5.2 Suggested Planning Condition

- 5.2.1 Wording for a suitable noise related planning condition is proposed below:

"No development shall commence until the local authority are provided details of how the noise limits derived from the proposed acoustic design criteria, as set out within Cole Jarman report 13/1580/R7-0 (or more recent revision submitted to the local authority), are met."

6 Noise Management and Mitigation Principles

6.1 Overview

- 6.1.1 The following section sets out a number of key principles which should be taken into consideration when developing the design of the employment land. The items set out are not necessarily prescriptive and the final noise mitigation and management requirements will depend on the proposed scheme to be implemented.

6.2 Noise Sources

- 6.2.1 The main noise sources associated with possible B8 (and to a lesser extent B1 and B2) operations are Heavy Goods Vehicle (HGV) movements. The key potential noise issues are stated below, along with recommendations for best practice operation to minimise noise impacts.

6.3 Vehicle Movements and Engine Noise

- 6.3.1 Once onsite, HGV engines should only be switched on when necessary for manoeuvring. At all other times engines should be switched off.
- 6.3.2 Unnecessary revving of engines should be avoided.



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- 6.3.3 HGV horns should not be used onsite at any time, except in emergencies.
- 6.3.4 Coupling and uncoupling of trailers should be minimised, through good planning, to avoid unnecessary repeat occurrences.
- 6.3.5 Drivers should be encouraged to plan ahead, to avoid unnecessary acceleration, braking and reversing.
- 6.3.6 If necessary, limitations on the number of HGV vehicle movements in a given period could be applied to reduce cumulative noise levels.

6.4 Reversing Sounders

- 6.4.1 Reversing beepers are designed to be noticeable and heard over background noise. They are necessary for health and safety reasons. However, noise levels due to reversing sounders are acceptable provided that they are within suitable limits.
- 6.4.2 To further minimise noise levels, it is good practice to reverse only when necessary i.e. when manoeuvring into a parking or loading bay.
- 6.4.3 “White noise” type reversing sounders are often considered less intrusive than the traditional “beeper” type. Whilst not essential, use of white noise sounders where possible may be beneficial.

6.5 Loading and Unloading Noise

- 6.5.1 When the trailers are at the dock leveller loading bays, it is important that they are properly docked, to ensure a good connection between the building and trailer, thereby minimising noise emission through any gaps.
- 6.5.2 Where level access loading bays are concerned, the trailers are loaded /unloaded using fork lifts. All fork lifts should be fitted with rubber tyres and should be gas powered, where possible, to minimise engine noise.
- 6.5.3 External fork lift activity should be minimised as far as possible.
- 6.5.4 Public address systems should be installed within the warehouse only, not externally (except if required for emergency use).
- 6.5.5 When bays are not in use, the doors must be closed, to avoid noise break out from the building through an open doorway.
- 6.5.6 All loading and unloading should be undertaken with suitable care and attention, in order to minimise unnecessary noise generation. Activities such as shouting and unnecessary dropping of items within trailers should be avoided.



Noise Assessment: Employment

6.6 Tugs / Tractors

- 6.6.1 Minimising or eliminating the use of tugs or tractors can help to reduce noise emissions

6.7 Screens, Bunds and Building Positioning

- 6.7.1 The layout of the proposed employment sites should be optimised such that as much screening between noise sources and nearby sensitivities is provided by the proposed buildings.
- 6.7.2 Where such layouts are not possible and future assessment shows that mitigation is required, the provision of acoustic screening or bunding may be required to reduce noise emissions to acceptable levels.
- 6.7.3 Mitigation can also be provided through the provision of appropriate buffer zones between proposed noise sources and nearby sensitivities.

6.8 Plant Noise Mitigation

- 6.8.1 Following the assessment of noise proposed fixed plant to be incorporated as part of the proposed employment area, the installation of noise mitigation measures such as silencers or enclosures may be required.
- 6.8.2 The specification of the mitigation measures will depend on the scale, hours of operation and position of the fixed plant upon the proposed employment site. Noise mitigation requirements can be assessed at a later stage, once layouts and plant selections have been confirmed.

7 Conclusion

- 7.1 A number of the proposed development parcels at the proposed Infinity Garden Village site, immediately to the north of the A50, have been designated for use as potential B1/B2 and B8 employment land.
- 7.2 The basis for appropriate acoustic design criteria have been proposed to allow for the assessment of noise from the site once the scheme design has been suitably progressed. The wording of a possible noise related planning condition has been proposed to ensure such assessment work is undertaken in the future.
- 7.3 Recommendations for best practices to control noise from the proposed employment land have been set out. Potential noise mitigation measures which could be considered have also been outlined.
- 7.4 By ensuring that future development is designed against the proposed acoustic design set out within this report, the amenity of nearby noise sensitive receptors can be maintained.



Noise Assessment: Employment

■ End of Section



Noise Assessment: Employment

Glossary of Acoustic Terms

L_{Aeq} :

The notional steady sound level (in dB) which over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measurement over that period. Values are sometimes written using the alternative expression dB(A) L_{eq} .

L_{Amax} :

The maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise when occasional loud noises occur, which may have little effect on the L_{Aeq} noise level. Unless described otherwise, L_{Amax} is measured using the “fast” sound level meter response.

L_{A10} & L_{A90} :

If non-steady noise is to be described, it is necessary to know both its level and degree of fluctuation. The L_{An} indices are used for this purpose. The term refers to the A-weighted level (in dB) exceeded for n% of the time specified. L_{A10} is the level exceeded for 10% of the time and as such gives an indication of the upper limit of fluctuating noise. Similarly L_{A90} gives an indication of the lower levels of fluctuating noise. It is often used to define the background noise.

L_{A10} is commonly used to describe traffic noise. Values of dB L_{An} are sometimes written using the alternative expression dB(A) L_n .

L_{AX} , L_{AE} or SEL

The single event noise exposure level which, when maintained for 1 second, contains the same quantity of sound energy as the actual time varying level of one noise event. L_{AX} values for contributing noise sources can be considered as individual building blocks in the construction of a calculated value of L_{Aeq} for the total noise. The L_{AX} term can sometimes be referred to as Exposure Level (L_{AE}) or Single Event Level (SEL).

■ End of Section

Figure 13/1580/SP1

Title:

Site plan showing noise measurement positions

 S Short Term Measurement Position

 L Long Term (24 hour) Measurement Position



Project:

Land at Wragley Way, Derby

Date:

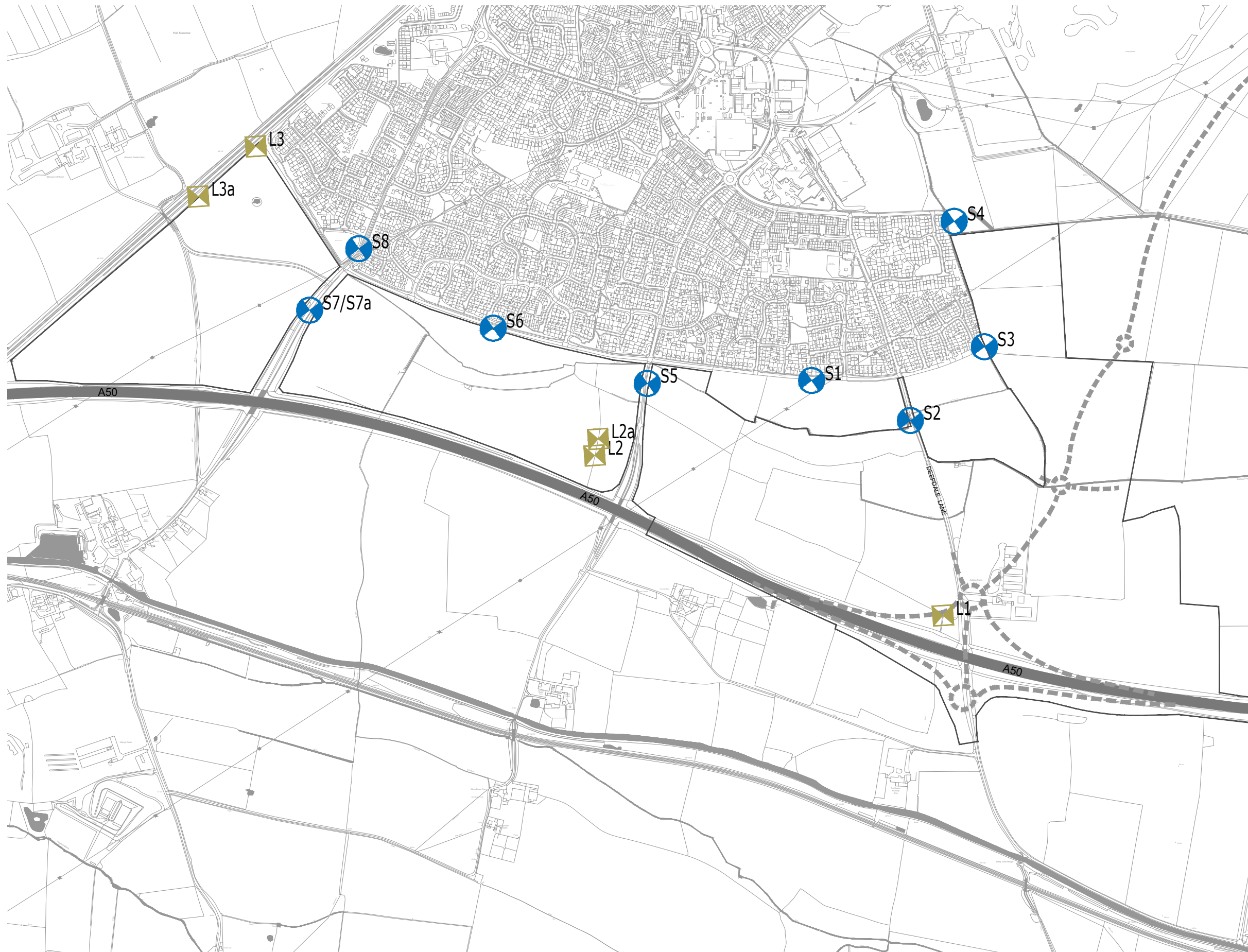
May 2019

Revision:

2

Scale:

Not to scale



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Assessment 1: DM25 vs .DS25(P1/2)

Short Term Effect

Link Ref.	Description	18-hour traffic flow		Change in Noise Level,	Short Term Effect
		DM25	DS25(P1/2)	dB $L_{A10, 18 \text{ hour}}$	
1	Deep Dale Lane (south)	4,373	5,070	+0.6	Neutral/Negligible
2	Deep Dale Lane (north)	4,116	4,399	+0.3	Neutral/Negligible
3	Wragley Way (west of Deep Dale Lane)	4,996	5,081	+0.5	Neutral/Negligible
4	Arleston Lane	4,405	5,099	+0.6	Neutral/Negligible
5	Wragley Way (west of Arleston Lane)	4,852	5,826	+0.6	Neutral/Negligible
6	Stenson Road (south of Wragley Way)	7,520	7,744	+0.1	Neutral/Negligible
7	Stenson Road (north of Wragley Way)	9,217	9,443	+0.0	Neutral/Negligible
8	Grampian Way (east of Stenson Road)	16,511	16,598	+0.0	Neutral/Negligible
9	Stenson Road (north of Grampian Way)	15,607	15,744	+0.0	Neutral/Negligible
10	Grampian Way (west of Sinfin Lane)	17,165	18,973	+0.4	Neutral/Negligible
11	Sinfin Lane (north of Grampian Way)	17,788	18,605	+0.2	Neutral/Negligible
12	Wilmore Road	15,885	16,032	+0.1	Neutral/Negligible
13	Sinfin Lane (north of Wilmore Road)	28,927	16,777	-1.7	Minor Beneficial
14	Stenson Road (north of Blagreaves Lane)	25,391	25,785	+0.1	Neutral/Negligible
15	Warwick Avenue	30,979	29,320	-0.1	Neutral/Negligible
16	Kenilworth Avenue	25,391	25,919	+0.1	Neutral/Negligible
17	Osmaston Park Road	27,343	27,724	+0.1	Neutral/Negligible
18	Link Road East of Junc 24	-	-	-	-
19	Link North of junction 25	-	-	-	-
20	West of junction 19	-	-	-	-
21	North East of Junc 20b	-	-	-	-
22	North West of Junction 20b	-	-	-	-
23	West of Junction 15	-	-	-	-



Assessment 2: DM25+A50 vs .DS25(P1/2)+A50

Short Term Effect

Link Ref.	Description	18-hour traffic flow		Change in Noise Level,	
		DM25+A50	DS25(P1/2)+A50	dB $L_{A10, 18 \text{ hour}}$	Short Term Effect
1	Deep Dale Lane (south)	19,023	19,720	+0.2	Neutral/Negligible
2	Deep Dale Lane (north)	7,825	8,108	+0.2	Neutral/Negligible
3	Wragley Way (west of Deep Dale Lane)	16,298	16,383	+0.2	Neutral/Negligible
4	Arleston Lane	2,904	3,597	+0.8	Neutral/Negligible
5	Wragley Way (west of Arleston Lane)	15,937	16,911	+0.2	Neutral/Negligible
6	Stenson Road (south of Wragley Way)	8,033	8,257	+0.1	Neutral/Negligible
7	Stenson Road (north of Wragley Way)	19,899	20,125	+0.0	Neutral/Negligible
8	Grampian Way (east of Stenson Road)	17,619	17,706	+0.0	Neutral/Negligible
9	Stenson Road (north of Grampian Way)	20,634	20,771	+0.0	Neutral/Negligible
10	Grampian Way (west of Sinfin Lane)	15,725	17,532	+0.4	Neutral/Negligible
11	Sinfin Lane (north of Grampian Way)	17,653	18,471	+0.2	Neutral/Negligible
12	Wilmore Road	16,205	16,352	+0.1	Neutral/Negligible
13	Sinfin Lane (north of Wilmore Road)	30,285	18,134	-1.6	Minor Beneficial
14	Stenson Road (north of Blagreaves Lane)	20,559	20,953	+0.2	Neutral/Negligible
15	Warwick Avenue	33,406	31,747	-0.1	Neutral/Negligible
16	Kenilworth Avenue	26,956	27,483	+0.1	Neutral/Negligible
17	Osmaston Park Road	29,199	29,580	+0.1	Neutral/Negligible
18	Link Road East of Junc 24	-	-	-	-
19	Link North of junction 25	-	-	-	-
20	West of junction 19	-	-	-	-
21	North East of Junc 20b	-	-	-	-
22	North West of Junction 20b	-	-	-	-
23	West of Junction 15	-	-	-	-



Long Term Effect

Assessment 3: DM25+A50 vs .DS40(Full)+A50+Emp.

Link Ref.	Description	18-hour traffic flow		Change in Noise Level,	
		DM25+A50	DS40(Full)+A50+Emp.	dB $L_{A10, 18 \text{ hour}}$	Short Term Effect
1	Deep Dale Lane (south)	19,023	4,508	-6.2	Moderate Beneficial
2	Deep Dale Lane (north)	7,825	4,523	-2.4	Neutral/Negligible
3	Wragley Way (west of Deep Dale Lane)	16,298	2,548	-7.5	Moderate Beneficial
4	Arleston Lane	2,904	7,277	+3.3	Minor Adverse
5	Wragley Way (west of Arleston Lane)	15,937	19,672	+0.9	Neutral/Negligible
6	Stenson Road (south of Wragley Way)	8,033	9,481	+0.7	Neutral/Negligible
7	Stenson Road (north of Wragley Way)	19,899	25,321	+1.0	Neutral/Negligible
8	Grampian Way (east of Stenson Road)	17,619	21,622	+0.9	Neutral/Negligible
9	Stenson Road (north of Grampian Way)	20,634	28,029	+1.3	Neutral/Negligible
10	Grampian Way (west of Sinfin Lane)	15,725	27,866	+2.2	Neutral/Negligible
11	Sinfin Lane (north of Grampian Way)	17,653	27,110	+1.8	Neutral/Negligible
12	Wilmore Road	16,205	19,688	+0.8	Neutral/Negligible
13	Sinfin Lane (north of Wilmore Road)	30,285	34,545	+0.6	Neutral/Negligible
14	Stenson Road (north of Blagreaves Lane)	20,559	37,256	+2.0	Neutral/Negligible
15	Warwick Avenue	33,406	38,657	+0.6	Neutral/Negligible
16	Kenilworth Avenue	26,956	28,629	+0.2	Neutral/Negligible
17	Osmaston Park Road	29,199	32,963	+0.5	Neutral/Negligible
18	Link Road East of Junc 24	-	20,131	-	-
19	Link North of junction 25	-	3,453	-	-
20	West of junction 19	-	8,838	-	-
21	North East of Junc 20b	-	30,244	-	-
22	North West of Junction 20b	-	17,830	-	-
23	West of Junction 15	-	3,484	-	-



Long Term Effect

Assessment 4: DM30+A50 vs .DS30(Full)+A50+Emp.

Link Ref.	Description	18-hour traffic flow		Change in Noise Level,	
		DM30+A50	DS30(Full)+A50+Emp.	dB $L_{A10, 18 \text{ hour}}$	Short Term Effect
1	Deep Dale Lane (south)	21,333	4,508	-6.7	Moderate Beneficial
2	Deep Dale Lane (north)	8,731	4,218	-3.2	Minor Beneficial
3	Wragley Way (west of Deep Dale Lane)	18,141	2,498	-7.3	Moderate Beneficial
4	Arleston Lane	3,079	7,716	+3.3	Minor Adverse
5	Wragley Way (west of Arleston Lane)	17,961	18,756	+0.1	Neutral/Negligible
6	Stenson Road (south of Wragley Way)	8,309	8,879	+0.3	Neutral/Negligible
7	Stenson Road (north of Wragley Way)	21,995	27,331	+0.9	Neutral/Negligible
8	Grampian Way (east of Stenson Road)	18,833	20,086	+0.3	Neutral/Negligible
9	Stenson Road (north of Grampian Way)	22,201	26,174	+0.7	Neutral/Negligible
10	Grampian Way (west of Sinfin Lane)	16,668	26,516	+1.7	Neutral/Negligible
11	Sinfin Lane (north of Grampian Way)	18,630	25,640	+1.3	Neutral/Negligible
12	Wilmore Road	17,027	18,421	+0.3	Neutral/Negligible
13	Sinfin Lane (north of Wilmore Road)	31,362	24,174	-0.8	Neutral/Negligible
14	Stenson Road (north of Blagreaves Lane)	21,042	35,523	+1.7	Neutral/Negligible
15	Warwick Avenue	34,352	36,116	+0.2	Neutral/Negligible
16	Kenilworth Avenue	27,914	28,629	+0.1	Neutral/Negligible
17	Osmaston Park Road	30,236	30,772	+0.1	Neutral/Negligible
18	Link Road East of Junc 24	-	18,502	-	-
19	Link North of junction 25	-	3,454	-	-
20	West of junction 19	-	7,983	-	-
21	North East of Junc 20b	-	28,759	-	-
22	North West of Junction 20b	-	16,340	-	-
23	West of Junction 15	-	3,485	-	-



Long Term Effect

Assessment 5: DS30(Full)+A50-Emp. vs .DS30(Full)+A50+Emp.

Link Ref.	Description	18-hour traffic flow		Change in Noise Level,		Short Term Effect
		DS30(Full) +A50-Emp.	DS30(Full) +A50+Emp.	dB	L _{A10} , 18 hour	
1	Deep Dale Lane (south)	3,903	4,508	+0.6		Neutral/Negligible
2	Deep Dale Lane (north)	4,218	4,218	-0.0		Neutral/Negligible
3	Wragley Way (west of Deep Dale Lane)	1,789	2,498	+3.0		Neutral/Negligible
4	Arleston Lane	6,523	7,716	+0.6		Neutral/Negligible
5	Wragley Way (west of Arleston Lane)	17,588	18,756	+0.3		Neutral/Negligible
6	Stenson Road (south of Wragley Way)	8,891	8,879	-0.0		Neutral/Negligible
7	Stenson Road (north of Wragley Way)	25,258	27,331	+0.3		Neutral/Negligible
8	Grampian Way (east of Stenson Road)	19,558	20,086	+0.1		Neutral/Negligible
9	Stenson Road (north of Grampian Way)	24,776	26,174	+0.2		Neutral/Negligible
10	Grampian Way (west of Sinfin Lane)	24,839	26,516	+0.2		Neutral/Negligible
11	Sinfin Lane (north of Grampian Way)	24,398	25,640	+0.2		Neutral/Negligible
12	Wilmore Road	18,210	18,421	+0.0		Neutral/Negligible
13	Sinfin Lane (north of Wilmore Road)	24,174	24,174	+0.0		Neutral/Negligible
14	Stenson Road (north of Blagreaves Lane)	32,886	35,523	+0.3		Neutral/Negligible
15	Warwick Avenue	35,723	36,116	+0.0		Neutral/Negligible
16	Kenilworth Avenue	28,629	28,629	+0.0		Neutral/Negligible
17	Osmaston Park Road	30,884	30,772	-0.0		Neutral/Negligible
18	Link Road East of Junc 24	17,458	18,502	+0.3		Neutral/Negligible
19	Link North of junction 25	2,411	3,454	+1.6		Neutral/Negligible
20	West of junction 19	7,803	7,983	+0.1		Neutral/Negligible
21	North East of Junc 20b	27,877	28,759	+0.1		Neutral/Negligible
22	North West of Junction 20b	16,340	16,340	+0.0		Neutral/Negligible
23	West of Junction 15	3,634	3,485	-0.2		Neutral/Negligible



Long Term Effect

Assessment 6: DM40+A50 vs .DS40(Full)+A50+Emp.

Link Ref.	Description	18-hour traffic flow		Change in Noise Level,	
		DM40+A50	DS40(Full)+A50+Emp.	dB $L_{A10, 18 \text{ hour}}$	Short Term Effect
1	Deep Dale Lane (south)	22,855	4,508	-7.0	Moderate Beneficial
2	Deep Dale Lane (north)	9,352	4,523	-3.2	Minor Beneficial
3	Wragley Way (west of Deep Dale Lane)	19,400	2,548	-8.2	Moderate Beneficial
4	Arleston Lane	3,675	7,277	+2.4	Neutral/Negligible
5	Wragley Way (west of Arleston Lane)	19,191	19,672	+0.1	Neutral/Negligible
6	Stenson Road (south of Wragley Way)	8,904	9,481	+0.3	Neutral/Negligible
7	Stenson Road (north of Wragley Way)	23,549	25,321	+0.3	Neutral/Negligible
8	Grampian Way (east of Stenson Road)	20,195	21,622	+0.3	Neutral/Negligible
9	Stenson Road (north of Grampian Way)	23,799	28,029	+0.7	Neutral/Negligible
10	Grampian Way (west of Sinfin Lane)	17,884	27,866	+1.6	Neutral/Negligible
11	Sinfin Lane (north of Grampian Way)	19,991	27,110	+1.2	Neutral/Negligible
12	Wilmore Road	16,640	19,688	+0.6	Neutral/Negligible
13	Sinfin Lane (north of Wilmore Road)	33,676	34,545	+0.1	Neutral/Negligible
14	Stenson Road (north of Blagreaves Lane)	21,795	37,256	+1.7	Neutral/Negligible
15	Warwick Avenue	36,876	38,657	+0.2	Neutral/Negligible
16	Kenilworth Avenue	29,975	28,629	-0.3	Neutral/Negligible
17	Osmaston Park Road	-	32,963	-	-
18	Link Road East of Junc 24	-	20,131	-	-
19	Link North of junction 25	-	3,453	-	-
20	West of junction 19	-	8,838	-	-
21	North East of Junc 20b	-	30,244	-	-
22	North West of Junction 20b	-	17,830	-	-
23	West of Junction 15	-	3,484	-	-



Long Term Effect

Assessment 7: DM40 vs .DS40(Full)+A50+Emp.

Link Ref.	Description	18-hour traffic flow		Change in Noise Level,		Short Term Effect
		DM40	DS40(Full) + A50+Emp.	dB $L_{A10, 18 \text{ hour}}$		
1	Deep Dale Lane (south)	4,885	4,508	-0.4		Neutral/Negligible
2	Deep Dale Lane (north)	4,626	4,523	-0.1		Neutral/Negligible
3	Wragley Way (west of Deep Dale Lane)	5,615	2,548	-3.1		Minor Beneficial
4	Arleston Lane	4,951	7,277	+1.4		Neutral/Negligible
5	Wragley Way (west of Arleston Lane)	5,420	19,672	+5.0		Minor Adverse
6	Stenson Road (south of Wragley Way)	8,453	9,481	+0.5		Neutral/Negligible
7	Stenson Road (north of Wragley Way)	10,296	25,321	+3.6		Minor Adverse
8	Grampian Way (east of Stenson Road)	18,558	21,622	+0.6		Neutral/Negligible
9	Stenson Road (north of Grampian Way)	17,542	28,029	+2.0		Neutral/Negligible
10	Grampian Way (west of Sinfin Lane)	19,293	27,866	+1.4		Neutral/Negligible
11	Sinfin Lane (north of Grampian Way)	19,993	27,110	+1.2		Neutral/Negligible
12	Wilmore Road	17,854	19,688	+0.3		Neutral/Negligible
13	Sinfin Lane (north of Wilmore Road)	32,513	34,545	+0.2		Neutral/Negligible
14	Stenson Road (north of Blagreaves Lane)	28,539	37,256	+0.9		Neutral/Negligible
15	Warwick Avenue	35,855	38,657	+0.3		Neutral/Negligible
16	Kenilworth Avenue	29,387	28,629	-0.2		Neutral/Negligible
17	Osmaston Park Road	30,733	32,963	+0.2		Neutral/Negligible
18	Link Road East of Junc 24	-	20,131	-		-
19	Link North of junction 25	-	3,453	-		-
20	West of junction 19	-	8,838	-		-
21	North East of Junc 20b	-	30,244	-		-
22	North West of Junction 20b	-	17,830	-		-
23	West of Junction 15	-	3,484	-		-

Appendix E

Subject: Construction Noise Criteria
Project: Infinity Garden Village
Date: May 2019

In order to assess the effects of construction noise and vibration, it is necessary to establish standards below which the impact is considered to be acceptable. Hence, if an assessment indicates that the standards are likely to be exceeded, alternative construction methods would need to be considered or specific means of mitigation adopted. Proposed construction noise criteria are set out in the table below. The construction noise criteria refer to the total ambient noise level including existing sources and construction noise. The criteria are based on guidance given in Annex E of BS 5228-1:2009.

		Total Noise Levels at Designated Noise Sensitive Locations	
Period	Hours	Ambient Construction Noise Level $L_{Aeq,T}$, dB(A)	Period T over which Ambient $L_{Aeq,T}$ is applicable, hours
Mondays to Fridays	0800-1800	75	any 4 hours
Mondays to Fridays (if permitted)	1800-2200	65	any 1 hour
Saturdays (if permitted)	0800-1300	75	any 4 hours
	1300-1800	65	any 1 hour
	1800-2200	65	
Sundays (if permitted)	0800-0900	65	any 1 hour
	0900-1700	65	
	1700-2200	65	
Any day (if permitted)	2200-0800	Construction Noise Levels subject to negotiation with EHO	

T1 Construction Noise limits



(i) Construction noise levels in the schedule relate to free-field conditions, where designated noise sensitive locations are located more than 3.5m from building façades or other reflective surfaces other than the ground. Where noise designated noise sensitive locations are located within 1.0m from building façades, the permitted noise levels can be increased by 3 dB(A).

(ii) The ambient noise level, $L_{Aeq,T}$ at a designated noise sensitive location is the total L_{Aeq} from all the noise sources in the vicinity over the specified period.

(iii) The existing ambient noise level, $L_{Aeq,T}$ at a designated noise sensitive location is the total L_{Aeq} from all the noise sources in the vicinity over the specified period prior to the commencement of the Works.

E.1 Vibration Criteria

With regard to standards for vibration during construction, these have been developed with reference to the documents and recommended values set out below.

Document	Onset of Effect of Vibration on People	Onset of Potential Cosmetic Damage to Buildings
BS 5228:1992:Part 4 ¹	0.15 – 0.30 mms^{-1} PPV	10.00 mms^{-1} PPV
DIN 4150:1986:Part 3 ²	0.20 mms^{-1} PPV	5.00 – 20.00 mms^{-1} PPV
BS 6472:2008 ³	0.20 $\text{ms}^{-1.75}$ VDV_{day} 0.10 $\text{ms}^{-1.75}$ $\text{VDV}_{\text{night}}$	N/A

T2 Vibration standards summary

It is worth noting that the 0.2 mms^{-1} PPV (Peak Particle Velocity) referred to in DIN 4150 and BS 6472 is around the human threshold of perception of vibration, although there is some variation between individuals.

Taking all these factors together, we propose that all construction processes that are likely to generate a vibration level in excess of 1.0 mms^{-1} PPV at any location within any nearby sensitive building, are subject to a more detailed assessment to determine whether mitigation measures are appropriate. That assessment should be undertaken with a view to establishing not only the levels of vibration likely to be generated but also the duration and frequency of their occurrence so that Vibration Dose Values (VDVs) can be calculated and compared to the

¹ British Standard 5228: 1992: Noise control on construction and open sites: Part 4.

² Deutsche Norm 4150: 1992: Erschütterungen im Bauwesen – Einwirkungen auf Menschen in Gebäuden.

³ British Standard 6472: 2008: Evaluation of human exposure to vibration in buildings (1Hz to 80Hz).



relevant standards. If these are also exceeded, then mitigation measures or alternative means of carrying out particular activities will need to be investigated.

We are not aware of any buildings near the site that are classified as Historic. However this should be verified in order that an appropriate assessment can be made in the event of the above suggested 1.0 mms^{-1} PPV being exceeded.

E.2 Section 61 Agreements and Code of Construction Practice

The Environmental Protection Act 1990 gives Local Authorities powers to control noise from construction sites by reference to Sections 60 and 61 of the Control of Pollution Act 1974 (COPA). Section 61 facilitates a process by which a Contractor agrees a method of working with a Local Authority, often stipulating hours and methods of working and occasionally agreeing specific noise limits at sensitive locations. The advantage of such an agreement is that compliance with it protects the Contractor from being served with a notice to cease works on account of the noise and vibration impact. The Local Authority has the power under Section 60 of COPA to serve such a notice if it deems the construction noise to be causing a nuisance.

As a means of minimizing the risk of noise disturbance and disruption, the Developer may make it a contractual obligation for the Contractor(s) to establish Section 61 Agreements (or similar) with the Local Planning Authority for the works to be carried out. The content of those agreements cannot as yet be defined in detail, but the following areas might be discussed and included.

- Hours of working: limited to those times when the sensitivity of affected parties nearby is not so acute.
- Methods and types of plant: particular construction or demolition methods may be disallowed on the site due to the severity of the noise typically generated, as may certain types of plant.
- Low noise plant and noise mitigation: directives on the selection of low noise plant where practical may be included as well as specific types of mitigation for equipment or processes which lend themselves to the same.
- Noise limits: occasionally and under specific circumstances it may be appropriate to set noise limits for certain periods and at certain locations.
- Monitoring, liaison and reporting: the agreement may specify that noise and vibration monitoring is required at certain locations for record keeping and evaluation purposes. Particular parties responsible for liaison and reporting to the local planning authority and other nominated parties may also be identified.

Section 61 Agreements can be a valuable tool which will enable the local authority to control the noise impact from construction activity while giving the Contractor an agreed framework within which the operations can be carried out. This minimises the risk of disruption to operations without leading to unacceptable consequences for noise sensitive parties. In order



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to demonstrate the method of control that would be imposed by the Employer on any Contractor undertaking construction works on the site, the next Appendix contains an example for a Code of Construction Practice dealing with noise and vibration

 End of Section

Appendix F

Subject: Construction Noise Criteria
Project: Infinity Garden Village
Date: May 2019

Operational Hours

The normal working hours within the site shall be Mondays to Fridays between 0800 and 1800 hours and Saturdays between 0800 and 1300 hours, with no working on Sundays or Public Holidays. Exceptionally, consent for work outside these hours may be given after any necessary consultation, particularly with the Environmental Health Officer (EHO). Fourteen days' notice should normally be required from the Contractor when seeking such consent.

The noise levels scheduled below for periods outside normal working hours shall only be permitted when consent has been given to exceptional working.

Ambient Noise Levels

The ambient noise level, $L_{Aeq,T}$ from all sources when measured 1.5m above the ground at any noise sensitive receiver position shall either not exceed the appropriate level given in the agreed Schedule or not exceed by more than 3dB(A) the existing ambient noise level, $L_{Aeq,T}$, at the receiver location measured over the same period, whichever is the greater.

If ambient noise levels are above or close to the limits set out in the schedule, it may be appropriate to carry out noise monitoring at or near the noise sensitive receiver locations prior to commencement of the works. The updated data should be made available to the Contractor. It should act as the baseline existing ambient noise level data with which compliance with the requirements set out is to be tested. The data should either be measured at or be corrected to be representative of the pre-existing noise levels at the noise sensitive positions and provided in terms of hourly L_{A90} , L_{Aeq} and $L_{Amax,S}$ noise indices.

Exceptionally, the Contractor may be given permission to carry out works which exceed the noise levels in the Schedule, provided that 14 days notice of the date and timing of the work is given and the Contractor demonstrates that he has taken all reasonable measures to mitigate the noise nuisance. After consultation with the Local Authority and any other interested bodies a decision would normally be given within 7 days of receipt of the notice.

If the need arises to measure noise levels at a location other than one of the designated noise sensitive locations, the permitted noise level shall be related to the nearest designated noise sensitive location. The permitted noise levels at another location shall take into account the



difference in distance, topography and screening between the noise source and the nearest designated noise sensitive location and the noise source and the measuring location.

Proposed construction noise criteria are set out in the table below.

Total Noise Levels at Designated Noise Sensitive Locations			
Period	Hours	Ambient Construction Noise Level $L_{Aeq,T}$, dB(A)	Period T over which Ambient $L_{Aeq,T}$ is applicable, hours
Mondays to Fridays	0800-1800	65	any 4 hours
Mondays to Fridays (if permitted)	1800-2200	55	any 1 hour
Saturdays (if permitted)	0800-1300	65	any 4 hours
	1300-1800	55	any 1 hour
	1800-2200	55	
Sundays (if permitted)	0800-0900	55	any 1 hour
	0900-1700	55	
	1700-2200	55	
Any day (if permitted)	2200-0800	Construction Noise Levels subject to negotiation with EHO	

T1 Construction Noise limits

(i) Construction noise levels in the schedule relate to free-field conditions, where designated noise sensitive locations are located more than 3.5m from building façades or other reflective surfaces other than the ground. Where noise designated noise sensitive locations are located within 1.0m from building façades, the permitted noise levels can be increased by 3 dB(A).

(ii) The ambient noise level, $L_{Aeq,T}$ at a designated noise sensitive location is the total L_{Aeq} from all the noise sources in the vicinity over the specified period.

(iii) The existing ambient noise level, $L_{Aeq,T}$ at a designated noise sensitive location is the total L_{Aeq} from all the noise sources in the vicinity over the specified period prior to the commencement of the Works.

The Contractor shall employ the best practical means to minimise the noise and vibration produced by his operations and shall have regard to the recommendations in BS5228:2009 "Code of practice for noise and vibration control on construction and open sites".



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Without prejudice to the generality of the Contractor's obligations set out above the Contractor shall comply in particular with the following requirements:-

- All vehicles and mechanical plant used for the purpose of carrying out the works shall be fitted with effective exhaust silencers and shall be maintained in good and efficient working order so that extraneous noises shall be reduced to a minimum.
- All compressors and generators shall be "sound reduced" models fitted with properly lined and sealed acoustic covers which shall be kept closed whenever the machines are in use. All ancillary pneumatic percussion tools shall be fitted with mufflers or silencers of the type recommended by the manufacturers. Generators shall be positioned and enclosed so as to minimise noise transmission to the inhabitants in the neighbourhood as agreed with the Employers Agent.
- All pumps shall be positioned and enclosed so as to minimise noise transmission to inhabitants in the neighbourhood.
- All machines in intermittent use shall be shut down in the intervening periods between work or, where this is impracticable, throttled down to a minimum.
- No machine shall be permitted which uses a system of dropping a heavy weight, power assisted or by gravity, for the purpose of breaking up paving or foundations.
- Access to the Site shall be such as to ensure a minimum of disturbance to persons in adjacent buildings by vehicles or plant entering or leaving the Site. No deliveries to Site shall take place outside the agreed working hours.
- Any work agreed to be carried out between 2200 and 0800 hours will be subject to agreement to noise levels with Environmental Health Officer. The Contractor shall provide details on work involved, machinery or plant used, exact location, and calculated noise levels at monitoring points.

Any fixed or static plant operating outside normally permitted working hours shall not give rise to a 'rating level', as defined in BS4142:1997 "Rating industrial noise affecting mixed residential and industrial areas," in excess of the existing free-field background L_{A90} noise levels at noise control stations. The existing baseline free-field background noise levels are to be provided as explained earlier.

Without prejudice to the foregoing and to requirements of particular clauses in the Conditions of Contract, the Contractor shall not be permitted to carry out works as stated below, except where such work is absolutely necessary for the saving of life or property and the safety of the Works or as is required under the terms of the Contract.

Piling, including sheet piling, by percussive methods outside the hours of 0800 to 1800 Mondays to Fridays.



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The maintenance of mechanical or other constructional plant in the proximity of noise sensitive buildings outside the hours of 0800 to 1800 on Mondays to Saturdays or at any time on Sundays and public holidays.

All construction operations shall be such that they do not exceed a peak particle velocity vibration level of 5 mm/s at any nearby sensitive location as well as the VDV's set out in the table below in the relevant areas.

Areas	VDV 07:00h to 23:00h, m/s ^{1.75}	VDV 23:00h to 07:00h m/s ^{1.75}
Residences	0.2	0.1
Commercial Buildings	0.2	0.4

T2 Construction Vibration Dose Value Criteria

 End of Section