ACOUSTIC DESIGN TECHNOLOGY
Noise and Vibration Consultants

ADT 3719

13 July 2024

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BARNSLEY ROAD, GOLDTHORPE

ENVIRONMENTAL NOISE IMPACT ASSESSMENT

ACOUSTIC CONSULTANCY REPORT ADT 3719/ENIA

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1.0 SUMMARY

The proposal is to develop the site to construct a McDonalds Drive-Thru restaurant, a Starbucks Drive-Thru café, and a set of electric vehicle charging points, with associated access, car parking and landscaping as indicated on the application drawings.

The assessment methodology has been discussed in general terms with the environmental health department at Barnsley Metropolitan Borough Council.

Acoustic Design Technology Limited have undertaken an environmental noise survey to determine the currently prevailing noise levels representative of surrounding noise sensitive properties.

BS 4142:2014+A1:2019 rating level limits have been proposed for the new fixed plant installations, set on a par with the otherwise prevailing background noise levels, defined as a 'low impact' in BS 4142, and equating to 'no observed effect' using the Planning Practice Guidance. The expectation is that the noise from the fixed plant would be subject to a planning condition along these or similar lines.

Acoustic screening is proposed along the entire length of the eastern site boundary, to mitigate the impact of noise from deliveries, drive thru customer vehicles and the ordering tannoy systems.

A BS 4142 assessment of the noise from servicing operations has been undertaken, with an initial assessment of adverse / significant adverse, modified to a low impact when the context is taken into account. The residual impact should equate to 'no observed adverse effect' using the Planning Practice Guidance.

Noise from drive thru customer vehicles has been assessed, and should be within appropriate limits (BS 8233:2014, ProPG: Planning & Noise) at the nearest dwellings. A noise limit has been defined for the ordering tannoy, to ensure no observed adverse effect on the dwellings.

The environmental noise impact of the proposed development should therefore be acceptable with the proposed noise control measures.

2.0 BASIS OF ASSESSMENT

2.1 Site Location

The site is located on Barnsley Rd, on the western edge of Goldthorpe, Rotherham, S63 9PJ.

The surrounding area includes houses directly to the east of the site on Mulberry Close and Holly Grove, an Aldi supermarket directly to the west, and agricultural fields across Barnsley Road to the south and the A635 to the north.

The Goldthorpe Industrial Estate is around 350 metres away to the south, including an Aldi distribution depot.

Apart from Barnsley Road and the A635, the closest main roads are the A6195 approximately 2 kilometres to the west, and the A1(M) approximately 7.5 kilometres away to the east.

2.2 Proposed Development

The proposal is to redevelop the site to create a McDonalds Drive-Thru restaurant, a Starbucks Drive-Thru Coffee shop, and a set of electric vehicle charging points, all with associated access, car parking and landscaping as indicated on the application drawings.

Acoustic screening along the eastern site boundary will be required to reduce the noise from vehicle movements. This should be a 2.5 metre high solid timber acoustic fence (notional minimum R_w 25), and typical details are provided in Appendix F. This is a substantial structure, and is the highest screen that can realistically be provided in terms of massing.

The opening hours and delivery hours are to be agreed, although the intention would be to operate both units 24 hours a day. Deliveries are small scale and are likely to take place during typical day time trading hours, while during the night the amount of customer activity will be significantly lower than during the day.

2.3 Planning Policy

The National Planning Policy Framework (NPPF) sets out the general terms of reference for sustainable development, including noise. Section 180 of the December 2023 edition states that:

> *180. Planning policies and decisions should contribute to and enhance the natural and local environment by:*
>
> *e) 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 or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;*

Parts a) to d) and f) are unrelated to noise, and not replicated here.

Section 191 of the same document states:

> *191. 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[69];

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;

Part c) of that Section is again unrelated to noise, and is not replicated in this report.

For this development the key principle to be applied from the NPPF is to protect existing noise sensitive properties from noise generated by the development.

The Noise Policy Statement for England (NPSE) published in March 2010 establishes the No Observed Effect Level (NOEL), Lowest Observed Adverse Effect Level (LOAEL) and Significant Observed Adverse Effect Level (SOAEL), although these are not linked to objective criteria, as Section 2.22 of the NPSE 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.

The Ministry of Housing, Communities and Local Government guidance on planning and noise as of July 2019 includes a noise exposure hierarchy table to help determine the NOEL, LOAEL and SOAEL. This is provided in Appendix A.

2.4 Assessment Criteria

The main environmental noise sources associated with retail premises are the noise from deliveries / servicing operations and the noise from fixed plant installations.

With ‘drive-thru’ units the noise from customer vehicles and the ordering tannoy system are also material considerations.

The appropriate assessment method for the servicing activities and the fixed plant is BS 4142:2014+A1:2019 (hereafter referred to in the short form BS 4142), as both of those sources are specifically mentioned in the scope of the standard. Key terminology from BS 4142 is provided in Appendix D.

The BS 4142 assessment method is based on the determination of a ‘rating level’ for the items of plant being assessed, expressed as $L_{Ar,Tr}$. For day time operations the reference interval T is 1 hour, while during the night the reference interval is 15 minutes.

BS 4142 also notes that certain acoustic features can increase the significance of the impact over that expected from a basic comparison between the specific sound level $L_{Aeq,T}$ and the background sound level. In such instances, character corrections may need to be applied to obtain the rating level.

The rating level is compared to the background sound level ($L_{A90,T}$) in the absence of noise from the source being assessed, to yield initial assessments of impact as follows:

- A difference of +10 dB is likely to be an indication of a significant adverse impact depending on the context.

- A difference of +5 dB is likely to be an indication of an adverse impact, depending on the context.

The lower the rating level is relative to the measured background 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 that plant noise would have a ‘low impact’ depending on the context of the prevailing noise climate.

BS 4142 does not provide definitive guidance on the severity of the initial assessment of impact for rating levels between 1 and 4 dB above the background sound level. The literal interpretation of the standard is that such an impact would be more than a 'low impact' but not an 'adverse impact', which could be considered comparable to the 'marginal significance' term in the former version of the standard (BS 4142:1997).

It is important to note that the significant criteria in Section 11 of BS 4142 are all defined as 'initial assessments of impact' and with the proviso 'depending on the context'. BS 4142 indicates that contextual factors could include the following:

i. the absolute level of sound

ii. the character and level of the residual sound compared to the character and level of the specific sound

iii. the sensitivity of the receptor and whether it has sound insulation measures that would secure good acoustic conditions

There is no definitive guidance in BS 4142 as to the extent to which these factors might change the initial assessment of impact, although there are several references to BS 8233:2014 in the examples provided in the standard, and it is therefore reasonable to assume that they can be used in the discussion of context.

The acoustic criteria for residential buildings from Section 7 of BS 8233 are summarised in the following table.

Location	$L_{Aeq,\ T}$ dB
Bedrooms, night (23:00 – 07:00)	30
Living rooms and bedrooms, day (07:00 – 23:00)	35
Outdoor living areas day (07:00 – 23:00)	50

It is generally accepted that a building facade with windows open for ventilation provides an overall noise reduction of up to 15 dB. On that basis, it would be reasonable to describe residual noise levels of <= 50 dB $L_{Aeq,\ 16\ hour}$ during the day and <= 45 dB $L_{Aeq,\ 8\ hour}$ during the night as 'low' for the purposes of assessing the context.

These are specifically defined as applicable to steady, anonymous noise sources such as road traffic which normally controls the residual sound levels in residential areas. For noise with a specific character, BS 8233 advises that 'lower noise limits might be appropriate', although the required reduction is not quantified. The World Health Organisation / ProPG: Planning & Noise threshold for sleep disturbance of 45 dB $L_{Amax,F}$ inside dwellings during the night is the most applicable parameter for considering absolute levels of commercially generated sound. This would translate to limit of 60 dB $L_{Amax,F}$ outside dwellings, assuming their windows are open.

There are no specific noise criteria relating to the environmental noise impact of customer vehicles and the tannoy system, and reference to the BS 8233 and ProPG: Planning & Noise criteria described above would therefore be appropriate.

2.5 Nearest Noise Sensitive Properties

The noise sensitive properties in the surrounding area are the houses on Mulberry Close and Holly Grove to the east.

These are the closest noise sensitive properties, with others located further from the site and in some cases screened by the intervening buildings. A satisfactory noise impact at the closest location should therefore ensure a satisfactory noise impact at other noise sensitive areas.

2.6 Strategy for Noise Impact Assessment

Based on the information in Sections 2.1 to 2.5 above, the strategy for the noise impact assessment has been broken down into the following stages:

i. undertake an environmental noise survey to obtain baseline noise data, as described in Section 3.0 below

ii. assess the impact of noise emissions from new fixed plant installations as described in Section 4.0 below

iii. assess the impact of noise from servicing operations, as described in Section 5.0 below

iv. assess the noise from customer vehicles and the drive-thru tannoy systems, as described in Section 6.0 below

3.0 ENVIRONMENTAL NOISE SURVEY

3.1 Purpose

The purpose of the survey was to determine the existing ambient noise levels at locations representative of the surrounding noise sensitive areas, over samples of the proposed operating periods.

3.2 Scope of Survey

A fully attended environmental noise survey was undertaken over two periods, between 21:00 and 23:00 on Tuesday 11 June 2024, and between 03:00 and 09:00 on Friday 14 June 2024, thereby covering the late evening opening period, the quietest part of the night, and morning opening / deliveries.

3.3 Instrumentation

The instrumentation used, and the field calibration values before and after the survey are detailed in Appendix B of this report.

3.4 Procedure

Three measurement positions were selected as described below and indicated on the attached site plan 3719/SP1:

i. at the south-east corner of the site, near the houses on Holly Grove

ii. on the eastern boundary of site, near the houses on Mulberry Close

iii. at the north-east corner of the site, near the houses at the north end of Mulberry Close

The measurement positions were selected in order to measure the range of noise levels at the nearby dwellings.

At all positions the microphone was mounted on a tripod approximately 1.2 metres above the ground and least 3.5 metres from any other acoustically reflective surface.

Measurements were taken hourly at each position using the Fusion sound level meter set to store the octave band and A-weighted 100ms short-term L_{eq} levels over a 15-minute sample of each hour for subsequent post processing.

3.5 Results

The logged data has been post processed to determine $L_{Aeq,T}$, $L_{A90,T}$, and L_{Amax} levels for each 15 minute period, and these have been set out in the attached tables 3719/T1 and 3719/T2 for the evening and night / morning periods respectively.

$L_{Aeq,T}$ residual sound levels averaged over the surveyed portions of the day time and night time periods for each position are set out in the following table:

Measurement position	Residual sound level $L_{Aeq,T}$	
	Day time 07:00 – 23:00 $L_{Aeq,\ 16\ hour}$	Night time 23:00 – 07:00 $L_{Aeq,\ 8\ hour}$
Position 1	60	57
Position 2	53	51
Position 3	52	52

The lowest measured background noise levels for each of the positions over a selection of key periods are set out in the following table. For the day time periods, the measured levels are assumed to be representative of the hour in which they were taken.

Measurement position	Minimum L_{A90} by period dB			
	Late evening 21:00 – 23:00 $L_{A90,\ 1\ hour}$	Night time 23:00 – 07:00 $L_{A90,\ 15\ mins}$	Early morning 06:00 – 07:00 $L_{A90,\ 15\ mins}$	Morning 07:00 – 09:00 $L_{A90,\ 1\ hour}$
Position 1	38	38	46	51
Position 2	35	38	44	49
Position 3	36	40	48	50

It should be apparent from the figures in the above table that the background levels during the last part of the night (06:00 – 07:00) are substantially higher than the those during the middle of the night, as the morning rush hour traffic begins to build.

The noise climate at this location was somewhat unique in the at the lowest background levels were during the late evening, and by the middle of the night there was more noise from the industrial estate to the south, as described in Section 3.7 below.

Please refer to Appendix C for explanation of the noise units and the A-weighting term used in this report.

3.6 Weather Conditions

At the start of the 21:00 – 23:00 survey period, weather conditions were overcast with periods of very mild drizzle and light rain showers. As the survey progressed, the rainfall steadily increased until the third measurement during the first hour when the weather was considered heavy enough to adversely impact measured levels and the measurement was halted.

Weather conditions calmed down soon after, allowing for measurements to take place again. However, once more, rainfall slowly increased and, as a result, the final

measurement had to be prematurely ended. Throughout the survey period, wind speeds did not exceed 5m/s.

For the duration of the 03:00 – 09:00 survey period the weather conditions were dry, with cloud coverage moving from completely overcast to some scattered cloud coverage, and wind speeds not exceeding 5m/s. It is therefore considered unlikely that weather conditions had a significant impact on measured levels.

3.7 Description of Existing Acoustic Environment

Throughout the evening survey period, the background noise levels were mostly controlled by traffic noise from the A1(M) and the A6195, with noise from the Aldi store faintly audible at positions 2 and 3. The L_{Aeq} and L_{max} levels were controlled by passing traffic on Barnsley Road and the A635.

There was sporadic noise from of planes overhead, birdsong and rustling of nearby bushes throughout the survey period.

During the first and second hours of the morning survey period, the background noise levels were mostly controlled by plant and vehicle noise from the Aldi Goldthorpe RDC depot to the south of the site, with some contribution from distant traffic and the nearby Aldi store.

As the survey period progressed, the traffic noise increased until it dominated the background noise climate at all positions. Throughout the entire survey period the L_{Aeq} and L_{max} levels were mainly controlled by passing traffic on Barnsley Road and the A635, with some sporadic noises of birdsong and rustling of nearby bushes throughout the survey.

4.0 NOISE IMPACT ASSESSMENT (NEW FIXED PLANT)

4.1 Basis of Assessment

At this stage none of the major fixed plant installations have been selected, so it is not possible to undertake a noise impact assessment of specific equipment.

Environmental noise limits have therefore been proposed, which can then be used in the future selection of plant and any associated attenuation.

4.2 Noise Limits

As described in Section 2.4 above, it is proposed that plant noise is assessed using the BS 4142 method, and a rating level on a par with the typically prevailing background level is defined as a 'low impact'. Please refer to Appendix C for definitions of the relevant terms from BS 4142.

At this site the lowest background sound levels were measured during the late evening. Proposed noise limits for fixed plant are therefore as follows, set equivalent to the background sound levels measured during the evening:

Position	BS 4142 rating level limit $L_{Ar,T}$ dB
1	38
2	35
3	36

Following selection of the new plant, cumulative noise levels can be calculated at the various noise sensitive properties and checked against the above limits. According to the planning guidance, this should equate to 'no observed effect'.

5.0 NOISE IMPACT ASSESMENT (SERVICING OPERATIONS)

5.1 Source Data

Typical operating procedure for a delivery to a small takeaway restaurant is for a small articulated lorry to drive into a portion of the car park that staff have set aside in advance.

The goods are then unloaded using trolleys directly into the service door of the building. While the deliveries are made using medium sized articulated lorries, the scale of the operation is substantially less than a supermarket delivery.

The noise generating operations are as follows:-

i. the lorry approaches the service area, turns and reverses up to the delivery area. For noise sensitive areas, the vehicle mounted refrigeration unit can be switched off on approach to the store and on again after rejoining the road network, and reversing bleepers are not necessarily required.

ii. approximately 25 minutes to unload fresh goods off the trailer and load the empty trolleys back onto the trailer.

iii. the lorry engine and refrigeration unit are turned off during the unloading. The driver starts the engine, with typically 30 seconds idling as they prepare to leave.

iv. the lorry sets off in a forward gear and rejoins the road network.

There is not expected to be any other significant activity outside the building, with unpacking, sorting, waste compaction and wrapping all taking place internally.

Typical noise data for the principal noise sources associated with servicing operations (sources i) to iv) above) is set out in Appendix E.

Noise from waste collections has not been specifically included in the assessment as it occurs relatively infrequently and the noise varies considerably according to the type of waste collected. For most retail developments in noise sensitive locations, it would be normal to schedule waste collection for non-sensitive day-time hours only.

5.2 Initial Assessment of Impact

Based on the information set out in Section 5.1 above, specific sound levels have been calculated at the surrounding noise sensitive areas using Cadna/A 2023 environmental noise mapping software, with first order reflections and ground absorption applied where appropriate.

The HGV manoeuvres have been modelled as moving point sources based on the vehicle track shown on the application drawings with a speed of 5 km/h for the forward components and 3 km/h for the reverse component. The vehicle engine has been assumed to be running with the vehicle stationary for 30 seconds before departing.

For the purposes of the assessment it is assumed that deliveries would be taking place to both the McDonalds and the Starbucks during the same hour.

The delivery noise is not tonal or intermittent, although there is an impulsive character. A correction of + 3 dB has been applied to the specific sound levels to account for the perceptible impulsivity of the sound, on the basis that it would be perceptible at the nearby dwellings.

Representative background levels for each noise sensitive area are provided in Section 3.5 above.

The initial assessment of impact for the evening period is set out in the following table:

Initial assessment of impact – day time period			
	Position 1	Position 2	Position 3
Specific Sound Level $L_{Aeq,\ 1\ hour}$ (dB)	44	45	42
Character correction (dB)	+ 3	+ 3	+ 3
Predicted Rating Level $L_{Ar,1\ hour}$ (dB)	47	48	45
Background level $L_{A90,1\ hour}$ (dB)	38	35	36
Excess of rating level over background sound level (dB)	9	13	9
Initial assessment of impact	adverse	significant adverse	adverse

5.3 Assessment of Context

As described in Section 2.4 above, BS 4142 notes that the impact may need to be modified to take account of factors including the absolute level of sound, the character and level of the residual sound compared with that of the specific sound, and the sensitivity of the receptor.

Noise from outdoor commercial operations such as deliveries are almost always audible above the background sound level beyond the site boundary, which yields the significant adverse initial assessment of impact. The question is whether this initial assessment over emphasises the significance of the noise.

In this case the main factor to consider is the absolute levels of sound.

The worst case specific sound level is 45 dB $L_{Aeq,\ 1\ hour}$ at the houses, primarily controlled by the sound of the lorries manoeuvring in the car park, and assuming 15 dB reduction for a building façade with windows open, this would yield noise levels just within the BS 8233 night time limits inside the houses.

It is notable that the existing traffic controlled $L_{Aeq,T}$ at the eastern site boundary are above this level during the day and the night, so the intrusion to the dwellings would be slightly lower, albeit less anonymous.

Further analysis of noise from the delivery operations using the L_{max} data in Appendix E indicates L_{Amax} of up to 63 dB at the houses as a lorry moves around the car park, and applying a 15 dB reduction again, the internal level of L_{Amax} 48 dB would be slightly above the ProPG: Planning & Noise limit of L_{Amax} 45 dB inside a dwelling during the night. But as those guidelines relate to noise occurring more than 10 times a night, a minor excess for a lorry passing once or twice a night should be acceptable.

It is worth noting that those predicted L_{Amax} are similar to the existing L_{Amax} measured on the eastern boundary, even during the middle of the night.

The more sustained L_{Amax} from the delivery itself would be around 58 dB at the houses during a delivery at McDonalds and a slightly lower level of 56 dB when a delivery is taking place at Starbucks. Those levels would be within the ProPG: Planning & Noise limit inside a dwelling, with windows open.

Taking all of the above into account, it is reasonable to conclude that the impact of noise from deliveries would be lower than that indicated by the initial assessment, and therefore 'no observed adverse effect' with the mitigation of the acoustic screening taken into account.

6.0 NOISE FROM DRIVE THRU UNIT

6.1 Customer Vehicle Noise

Measurements have been taken of noise from an existing McDonalds 'drive thru' restaurant, with results of 45 dB $L_{Aeq,\ 1\ hour}$ and 62 dB L_{Amax} at 25 metres distance from the customer vehicle lane. The vehicles are of course moving very slowly.

At this site the houses nearest a drive thru lane are a similar distance away (27 metres) but protected by the acoustic fence to the eastern site boundary. With this taken into account, the resultant noise levels at the nearest houses would be around 40 dB $L_{Aeq,\ 1\ hour}$ and 57 dB L_{Amax}.

These would translate to internal noise levels within the BS 8233 / WHO / ProPG based noise limits in the houses for traffic type sources outlined in Section 2.4 above and should therefore be acceptable.

6.2 Tannoy

The customer service point will have a small tannoy loudspeaker, and there are no details of the specific system that will be used at this stage, although the noise emissions this can be set to a suitable limit to ensure acceptable noise levels at the nearest houses.

The ordering points have been deliberately located towards the western end of the site, and are at least 80 metres from the houses. To achieve an L_{Amax} level of <= 54 dB outside the houses (the WHO guideline level of L_{Amax} 60 dB outside a dwelling with windows open, with an arbitrary 6 dB penalty to account for the distinctive character of the sound), the resulting maximum permissible sound level at 1 metre from the loudspeaker would be 92 dB(A).

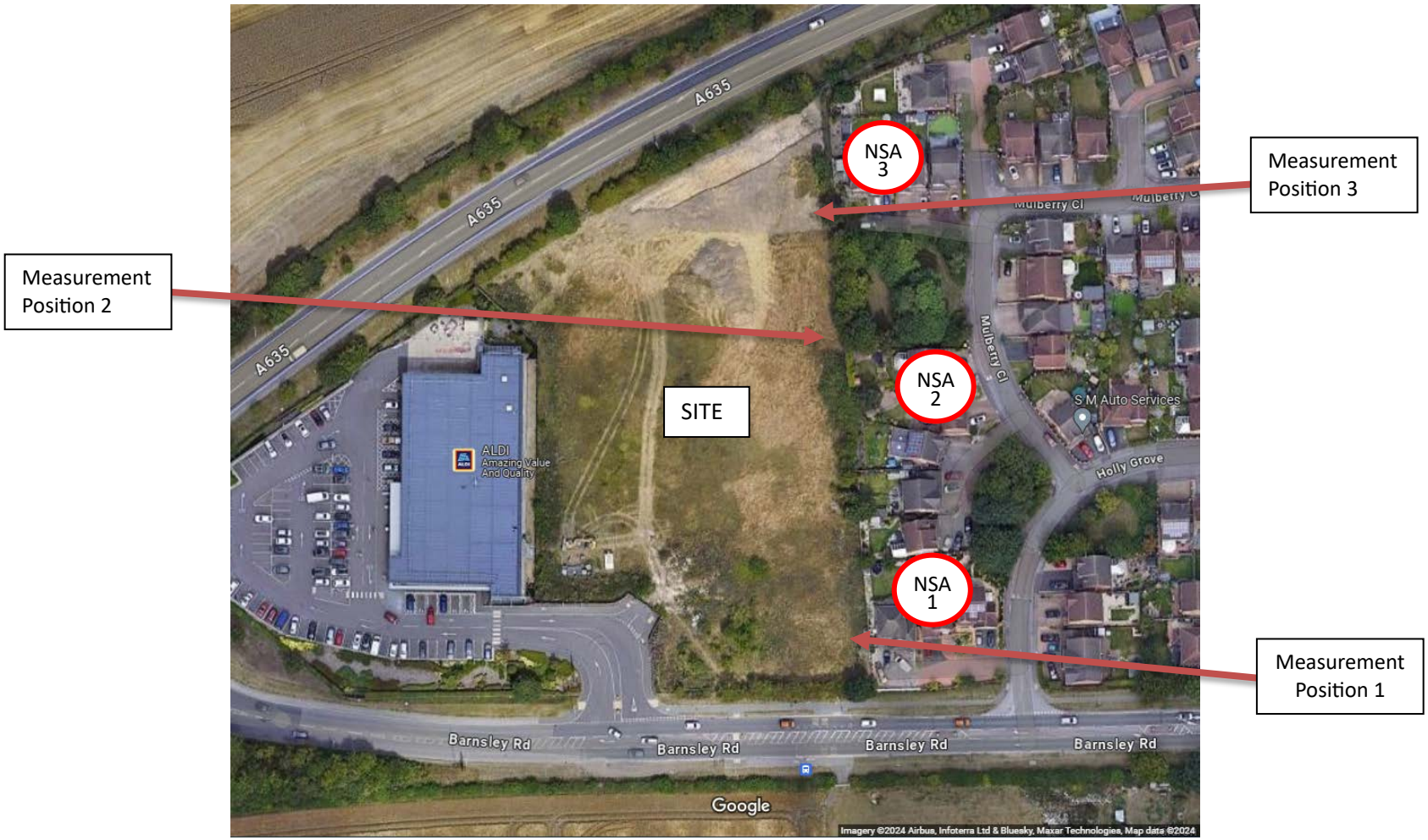
It should not be necessary to set the tannoy output to this level, and somewhere in the range 80 – 85 dB(A) at 1 metre should be more than sufficient to allow customers to hear the staff member above the sound of their engine idling, which is typically around 70 dB $L_{Aeq,T}$.

On that basis the noise from the customer ordering tannoy is unlikely to have any significant environmental noise impact in this context.

6.3 Summary

When the noise from customer traffic and the tannoy are assessed against the most relevant standards, it would be reasonable conclude that there is 'no observed adverse effect'.

FOR ACOUSTIC DESIGN TECHNOLOGY



Notes	**Description** Site Plan Showing Noise Monitoring Locations and Noise Sensitive Locations	
	Project Barnsley Road, Goldthorpe	
	Date 13 July 2024	**Drawing No.** 3719/SP1

Acoustic Design Technology
Noise and Vibration Consultants

EVENING SURVEY RESULTS (A WEIGHTED TIME HISTORY)

Position	Period	$L_{Aeq,\ 15mins}$ dB	L_{Amax} dB	L_{A90} dB
1	21:05 – 21:20	56	72	38
	22:05 – 22:20	56	71	43
2	21:25 – 21:40	49	64	35
	22:25 – 22:40	48	62	40
3	21:45 – 21:49	45	58	36
	22:45 – 22:58	47	73	37

TABLE 3719/T1

MORNING SURVEY RESULTS (A WEIGHTED TIME HISTORY)

Position	Period	$L_{Aeq,\ 15mins}$ dB	L_{Amax} dB	L_{A90} dB
1	03:05 – 03:20	53	69	38
	04:05 – 04:20	54	73	42
	05:05 – 05:20	59	74	45
	06:05 – 06:20	60	72	46
	07:05 – 07:20	61	74	53
	08:05 – 08:20	61	75	51
2	03:25 – 03:40	46	61	38
	04:25 – 04:40	51	66	41
	05:25 – 05:40	52	64	42
	06:25 – 06:40	53	62	44
	07:25 – 07:40	54	64	49
	08:25 – 08:40	55	70	50
3	03:45 – 04:00	46	64	40
	04:45 – 05:00	49	62	42
	05:45 – 06:00	54	79	44
	06:45 – 07:00	54	64	48
	07:45 – 08:00	55	63	50
	08:45 – 09:00	54	64	50

TABLE 3719/T2

APPENDIX A

NOISE EXPOSURE HIERARCHY TABLE

Perception	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not noticeable	No Effect	No Observed Effect	No specific measures required
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 Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
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.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. 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.	Significant Observed Adverse Effect	Avoid
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	Unacceptable Adverse Effect	Prevent

APPENDIX B - INSTRUMENTATION

Manufacturer	Type and / or Model	Serial Number	Last Laboratory Calibration	Calibrator Output (dB)	Free Field Correction (dB)	Initial reading (dB)	Final reading (dB)
01dB	Fusion 1 Class 1 Sound Level Meter (SLM11)	15131	April 2023		-0.30	113.66 (evening)	113.64 (evening)
01dB	Fusion MCE3 Microphone	14038	April 2023		-0.30	113.66 (morning)	113.68 (morning)
Norsonic	Nor1251 Calibrator (Cal 4)	33453	March 2024	113.96			

APPENDIX C

Acoustic Terminology

The annoyance produced by noise is dependent upon many complex interrelated factors such as 'loudness', its frequency (or pitch) and any variations in its level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

A-weighting — The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the A-weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average person. It is also possible to calculate the A-weighted noise level by applying certain corrections to an un-weighted spectrum.

When the noise being measured has variable amplitude, such as traffic noise, it is necessary to qualify the basic dB unit. This may be done using a statistical index L_n dB, where n is any value between 0 and 100, and is the percentage of the sample time for which the stated level is exceeded. In defining the use of the index, both the value of n and the length of the sample period must be stated.

L_{10} — L_{10}, being the level exceeded for 10% of the time, has been shown to be a good indicator for traffic noise intrusion, and is used in assessing the effect of traffic noise on residential or commercial premises.

L_{90} — L_{90} is the level exceeded for 90% of the time, and is used as a measure of background noise level, as it excludes the effects of occasional transient levels, such as individual passing cars or aircraft.

In addition to the statistical noise indices defined above, the following noise units are also used to define variable amplitude noise sources:

$L_{eq,T}$ — $L_{eq,T}$ is defined as the notional steady sound pressure level which, over a stated period of time, would contain the same amount of acoustical energy as the actual fluctuating sound measured over the same period. In other words, it is a measure of the "average" noise level

L_{max} — L_{max} is the maximum time-weighted sound pressure level recorded over the stated time period

APPENDIX D

Definitions from BS 4142 : 2014

reference time interval, T_r

specified interval over which the specific sound level is determined (1 h during the day, and 15 min during the night)

specific sound level, $L_{Aeq,Tr}$

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

rating level, $L_{At,Tr}$

specific sound level plus any adjustment for the characteristic features of the sound

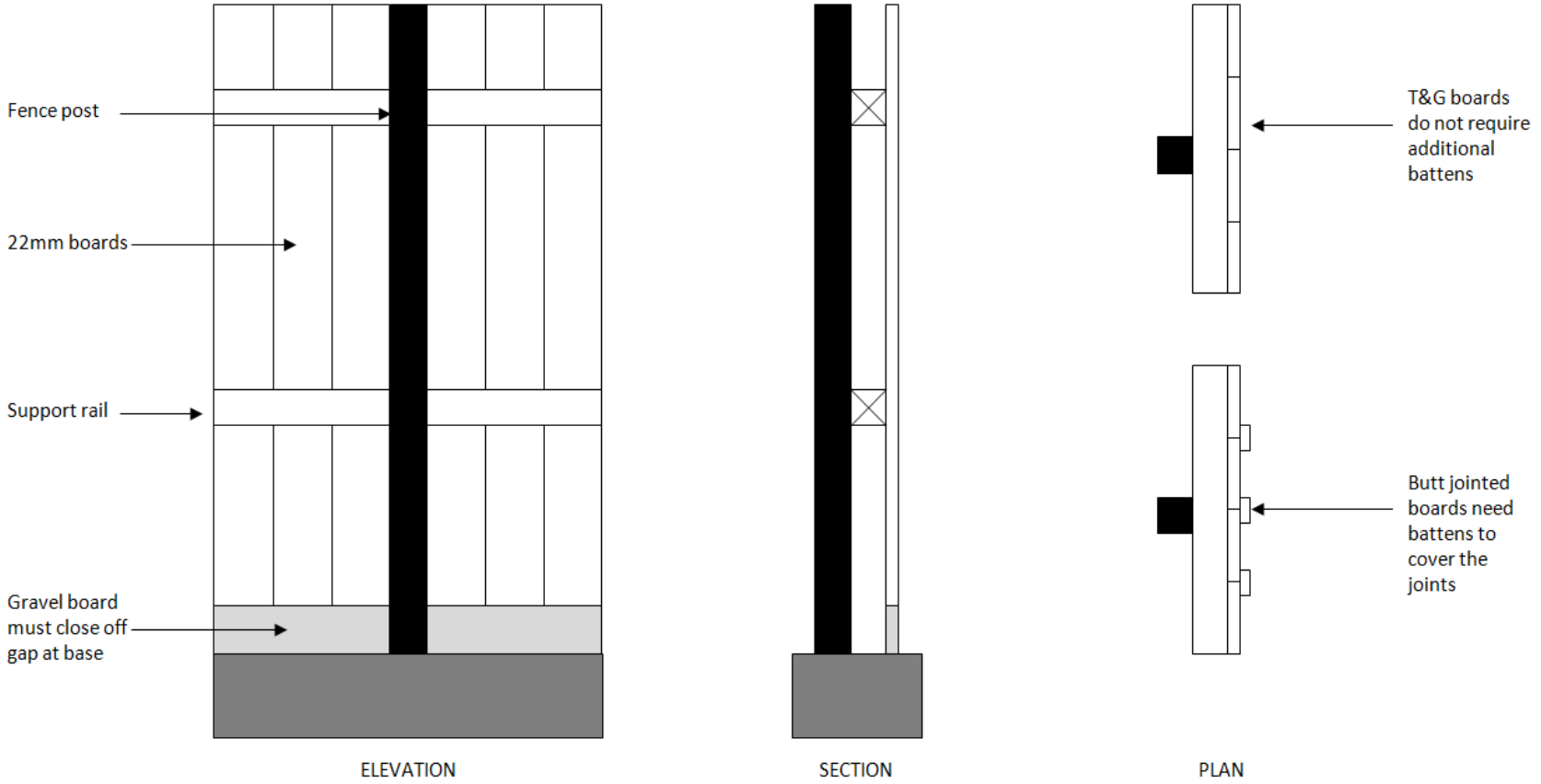
background noise level, $L_{A90,T}$

see Appendix A

APPENDIX E

Service Yard Noise Data

	Noise data: $L_{eq,T}$ at 5m								
	63	125	250	500	1k	2k	4k	8k	A-wt
	$L_{eq,T}$ at 5m								
Unloading using lightweight trolleys	62	58	55	54	55	53	52	46	
HGV manoeuvring (source at 1.25m height)	80	71	66	69	70	69	62	53	74
HGV start and idle (source at 1.25m height)	82	72	69	69	69	70	66	64	75
	L_{max} at 5m								
Unloading	74	67	69	69	71	72	68	62	77
HGV manoeuvring	87	79	80	78	77	78	72	64	83
Engine idling	79	72	67	68	67	64	60	56	71



Notes:-

Nominal sound insulation of fence is R_w 25

Timber acoustic barrier

Appendix F

Acoustic Design Technology
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