SHARPS REDMORE

ACOUSTIC CONSULTANTS ▪ Established 1990

Report

Aldi Store, Harefield Road, Uxbridge

Noise assessment of a proposal to extend permitted trading hours

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Date 26th February 2025

Project No 2422544

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1.0 Introduction

1.1 Sharps Redmore (SR) has been instructed to undertake a noise assessment of a proposal to seek to extend the permitted trading hours at the approved Aldi Store at Harefield Road, Uxbridge.

1.2 The site is located in the administrative area of London Borough of Hillingdon (LBH) and is currently used as a car park. This site has extant planning consent[1] for retail use and consists of two units which are both currently vacant. The units were previously occupied by Wickes Builders Merchants and Halfords. Trading hours were restricted in line with condition 16 of the extant planning consent as follows:

"The premises shall not be used except between 0800 hours and 2000 hours Mondays to Saturdays. On Sundays the larger unit shall not be used except between 1000 hours and 1600 hours and the smaller unit shall not be used except between 0900 hours and 1700 hours.

REASON To protect the residential amenity of the occupiers of adjoining and nearby properties in accordance with Policies D3, SD7, D13, and D14 of The London Plan (2021) and Policy DMHB 11 of Hillingdon Council's Local Plan Part 2 (2020)"

1.3 Planning permission was granted by LBH[2] in December 2023 to enable the site to be used as a supermarket (Aldi).

1.4 To facilitate the use of the site by Aldi, planning permission is being sought to vary condition 16 to enable the store to trade for an additional two hours in the evening period, i.e between 0800-2200 hours (Monday to Saturday). No changes to Sunday trading hours are proposed.

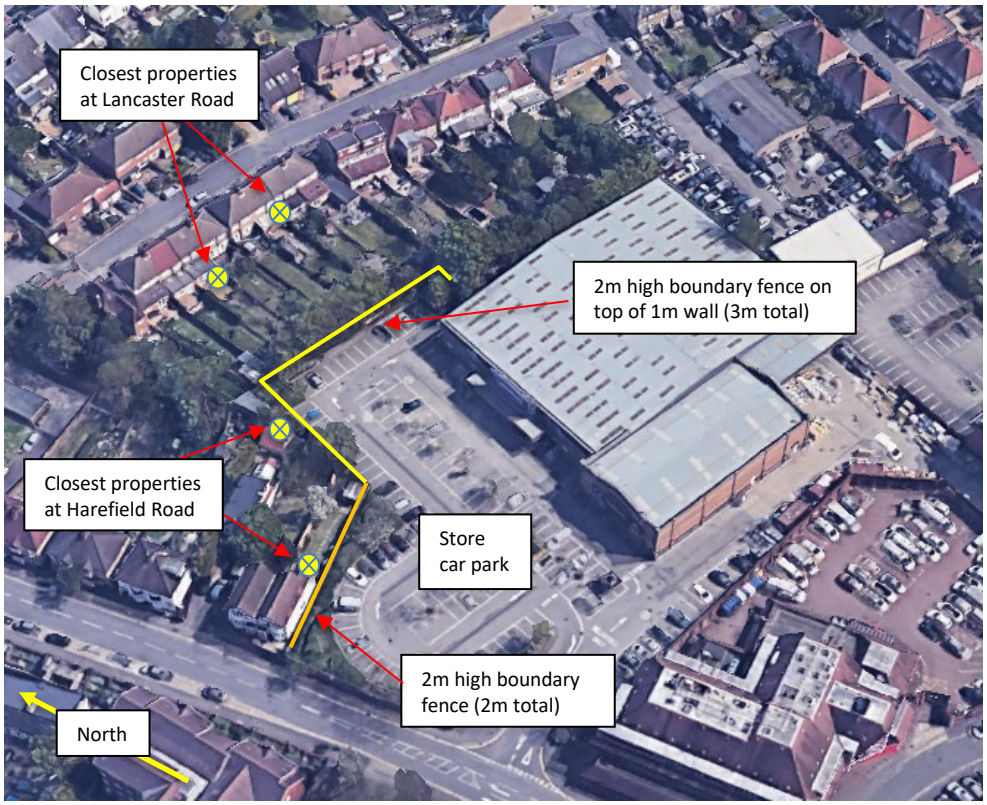
1.5 The objective of the assessment is to determine whether these trading hours could be extended without the associated increase in customer car parking activity noise giving rise to significant adverse impact to the nearest residents.

[1] London Borough of Hillingdon Planning reference 16299/P/2023/3691-Redevelopment of site with two units for non-food retail purposes including service access and access from Warwick Road and public access via Harefield Road.

[2] London Borough of Hillingdon Planning reference 16299/APP/2023/3691

1.6 The site layout is indicated at Figure 1; The closest residential properties to the car parking spaces for the units are primarily the rear facades and gardens of Harefield Road to the north-west and Lancaster Road to the north.

FIGURE 1: Approved Aldi Store, Harefield Road, Uxbridge site layout



1.7 When surveying the site, the carpark is already operating as a 24-hour car park with no time restrictions. It is understood that use of the site as a car park was intended for temporary use 'for a period of 2 years' under the (withdrawn) planning application 16299/APP/2023/2531.

1.8 The objective of the assessment is to determine whether these trading hours could be extended without associated increase in customer car parking activity noise giving rise to significant adverse impact to the nearest residents.

1.9 Section 2 presents details of an environmental noise survey undertaken at the store, with appropriate methods of assessment and criteria discussed in Section 3.

1.10 Noise associated with customer car parking activity is considered in section 4; and concluded in section 5.

1.11 A guide to the acoustic terminology used in this report is given in Appendix C.

2.0 Noise Survey

2.1 Sharps Redmore have undertaken an attended noise survey at two noise monitoring locations, indicated in Figure 2, to determine the existing noise climate at the times that extended trading hours are being sought. This survey was undertaken on Thursday 13th February 2025.

FIGURE 2: Noise monitoring location

2.2 Measurements were undertaken using two Norsonic 140 sound level meters over 5-minute sample periods to provide enhanced resolution for analysis. The equipment was calibrated before and after the survey with no variation in calibration level measured.

2.3 The sound level meter at measurement location A was positioned approximately 2.5 metres above the local ground level, on a tripod at the northern boundary of the car park adjacent to the residential properties on Lancaster Road. The sound level meter at measurement location B was positioned approximately 2m above the local ground level, on a tripod at the north-western boundary of the car park adjacent to the residential properties on Harefield Road. Although both meters were in the vicinity of the fences identified at Figure 1, these were considered to be in free field conditions at the microphone.

2.4 Weather conditions during the noise survey were dry and overcast, with temperatures of 3-5°C; winds were light (<5m/s) and predominantly from the east. Weather conditions are not considered to have affected the noise measurements.

2.5 The underlying noise climate at both locations was dominated by local road traffic noise sources on Harefield Road, with occasional intermittent contributions from car parking activity.

2.6 The full noise survey details are shown at Appendix A, with hourly period noise levels summarised in Table 1.

TABLE 1: Summary of hourly noise levels

Date	Time	Noise level dB Location A		Noise level dB Location B	
		$L_{A90\ 1\ hour}$	$L_{Aeq\ 1\ hour}$	$L_{A90\ 1\ hour}$	$L_{Aeq\ 1\ hour}$
13.02.25	18:00	44.8	48.1	48.2	52.8
	19:00	44.5	46.2	47.9	50.6
	20:00	43.8	45.9	47.3	50.5
	21:00	42.8	56.7	46.2	49.8
	22:00*	42.8	45.2	45.8	48.7

*measurements from 22:00 hours are from 22:00 to 22:20 (4 samples)

2.7 The periods during which extended hours trading are considered are highlighted in yellow in Table 1 (the hours all fall within the period that the planning system considers to be daytime; i.e. 0700 to 2300 hours).

3.0 Methodology and Guidance Criteria

3.1 The National Planning Policy Framework (NPPF), December 2024, sets out the Government's planning policies for England and "these policies articulate the Government's vision of sustainable development." In respect of noise, Paragraph 198 of the NPPF states the following:

"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; and

c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation".

3.2 Guidance on the interpretation of the policy aims contained within the NPPF is contained within National Planning Policy Guidance (NPPG). The NPPG introduces the concept of a noise exposure hierarchy based on likely average response. The guidance contained in the NPPG (NPPG paragraph 005) is summarised in Table 2.

TABLE 2: Noise Exposure Hierarchy

Response	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, 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 small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, 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
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

3.3 The NPPF and NPPG reinforces the March 2010 DEFRA publication, "Noise Policy Statement for England" (NPSE), which states three policy aims, as follows:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life."*

3.4 Together, the first two aims require that no significant adverse impact should occur and that, where a noise level which falls between a level which represents the lowest observable adverse effect and a level which represents a significant observed adverse effect, then according to the explanatory notes in the statement:

"… all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur."

3.5 Taking an overview of national policy aims and guidance it is clear that when considering the impact of noise, the fact noise can be heard and causes impact, is not a reason to refuse an application as consideration should also be given to the significance of the impact and the mitigation measures available.

3.6 It is standard and good practice to apply objective standards to the assessment of noise and the effect produced by the introduction of a certain noise source may be determined by several methods, as follows:

i) The effect may be determined by reference to guideline noise values, such as those contained in the World Health Organisation (WHO) "*Guidelines for Community Noise"*.

ii) Alternatively, the impact may be determined by considering the change in noise level that would result from the proposal, in an appropriate noise index for the characteristic of the noise in question. There are various criteria linking change in noise level to effect. This is the method that is suited to, for example, the assessment of noise from road traffic because it is capable of displaying impact to all properties adjacent to a road link irrespective of their distance from the road.

iii) Another method is described within BS 4142:2014+A1:2019 which focuses on determining the significance of sound impact from sources of industrial and/or commercial nature. The sources that the newly revised standard is intended to assess are sound from industrial and manufacturing processes, sound from fixed plant installations, sound from loading and unloading of goods at industrial and/or commercial premises and the sound from mobile

plant and vehicles, such as forklift, train or ship movements. The use of BS 4142 is not considered applicable in this case.

Guideline noise values

3.7 The WHO "Community Noise Guidelines" (CNG) values are appropriate to what are termed "critical health effects". This means that the limits are at the lowest noise level that would result in any psychological or physiological effect. They are, as defined by NPSE, set at the Lowest Observed Adverse Effect Level (LOAEL), but do not define the level above which effects are significant (the SOAEL). Compliance with the LOAEL should, therefore, be seen as a robust aim.

3.8 In 2018 the WHO published the "Environmental Noise Guidelines for the European Region" (ENGER). The new WHO Environmental Noise Guidelines (page 28) explain that *"The current environmental noise guidelines for the European Region supersede the CNG from 1999. Nevertheless, the GDG* (Guideline Development Group) *recommends that all CNG indoor guideline values and any values not covered by the current guidelines (such as industrial noise and shopping areas) should remain valid"*. Hence the CNG remain relevant to this assessment.

3.9 The WHO ENGER brings together the latest research on the effects of specific types of noise on health in relation to transportation noise sources (road, rail and aircraft noise exposure), wind turbines and leisure noise. Hence in direct relation to the specific proposal that this noise assessment considers, the new WHO ENGER are not of material consideration.

3.10 The World Health Organisation 1999 guideline noise values are summarised in Table 3.

TABLE 3: WHO guideline noise values

Document	Level	Guidance
World Health Organisation "Community Noise 2000"	L_{AeqT} = 55 dB	Serious annoyance, daytime and evening. (Continuous noise, outdoor living areas)
	L_{AeqT} = 50 dB	Moderate annoyance, daytime and evening. (Continuous noise, outdoor living areas).
	L_{AeqT} = 35 dB	Moderate annoyance, daytime and evening. (Continuous noise, dwellings, indoors)
	L_{AeqT} = 30 dB	Sleep disturbance, night-time (indoors)
	L_{Amax} = 60 dB	Sleep disturbance, windows open at night. (Noise peaks outside bedrooms, external level).
	L_{Amax} = 45 dB	Sleep disturbance at night (Noise peaks inside bedrooms, internal level)

Changes in noise level

3.11 Changes in noise levels of less than 3 dBA are not perceptible under normal conditions and changes of 10 dBA are equivalent to a doubling of loudness. This guidance has been accepted by inspectors, at inquiry, to encompass changes in noise levels in the index L_{AeqT}.

3.12 Table 4 below shows the response to changes in noise (known as a semantic scale); this table has been developed from general consensus opinion of acousticians.

TABLE 4: Change in noise level

Change in noise level L_{AeqT} dB	Response	Impact
<3	Imperceptible	None
3 – 5	Perceptible	Slight/moderate
6 – 10	Up to a doubling	Moderate/significant
11 – 15	More than a doubling	Substantial
>15	-	Severe

4.0 Assessment

4.1 The principle noise source associated with retail store trading is from customer car parking activity.

4.2 The proposed trading hours extension represents a two-hour extension in the evening (Monday to Saturday) up to 2200 hrs. No changes to Sunday trading hours are proposed.

4.3 The existing, and proposed, trading hours, above, all fall within the daytime period.

4.4 SR has undertaken extensive noise monitoring of retail store car parks; at 10 metres from the boundary of a busy car park measured noise levels are 48 dB $L_{Aeq,1hr}$ (free field). Typical noise sources include door slams, car radios, car alarms, customer voices and trolley movements.

4.5 The nearest residential property at 14 Harefield Road is approximately 5 metres from the closest parking space. The property at 18 Harefield Road is approximately 7m from the closest car parking space. On Lancaster Road, the nearest residential properties (49 to 35) are approximately 31 metres from the closest parking spaces.

4.6 Predicted car parking activity noise levels at 14 Harefield Road would be 42 dB $L_{Aeq,1hour}$ (48 dB plus 6 dB distance correction, minus 12 dB screening attenuation). The predicted car parking activity noise levels at 18 Harefield Road would be 36 dB $L_{Aeq,1hour}$ (48 dB plus 3 dB distance correction, minus 15 dB screening attenuation). The closest properties (49 to 35) on Lancaster Road, are approximately 31 metres from the closest spaces. At this distance car parking activity noise levels would be 22 dB $L_{Aeq\ 1\ hour}$ (48 dB minus 10 dB distance attenuation, minus 16 dB screening attenuation).

4.7 The predicted Aldi customer car parking activity noise levels would be well below the WHO daytime guideline noise value (50-55 dB $L_{Aeq\ 16\ hours}$) and hence would be indicative of low impact.

4.8 Predicted car park activity noise levels would also be well below the existing ambient ($L_{Aeq\ T}$) noise climate.

4.9 The above assessment is based on noise levels measured during peak trading activity and therefore can be considered robust. It is important to note that the proposed additional trading hours would be considered off peak trading hours. During off peak trading hours, noise associated with customer car parking activity is typically 5 dB quieter than during peak hours. Furthermore, during off peak trading conditions, when the availability of parking spaces is greatest, there is a strong tendency for customers to seek to park as close to the store entrance as possible. This has the effect of maximising distance between residential properties around the site and area of car parking activity.

4.10 Predicted noise associated with Aldi customer car parking activity in the proposed additional trading hours would comply with the requirements of the NPPF (to avoid significant adverse impact).

5.0 Conclusions

5.1 Aldi are seeking to extend the permitted weekday (Monday to Saturday) trading hours of the approved store at Harefield Road, Uxbridge. Aldi is seeking planning permission to allow the store to extend permitted trading hours to 2200 hours Monday to Saturday (with no change to the current Sunday or bank holiday hours).

5.2 This report provides an objective assessment of noise associated with customer car parking activity which concludes that the proposed weekday trading hours would not give rise to significant adverse impact, which is the test under paragraph 198 of the NPPF.

APPENDIX A

NOISE SURVEY RESULTS

Appendix A1	Title: Noise survey results

Measured noise levels at measurement location A, Harefield Road, Uxbridge

Date	Sample start time	Noise Parameter - dB				
		L_{A10}	L_{A90}	L_{Aeq}	L_{AFmax}	L_{AFmin}
13.02.25	18:00:00	47.6	44.3	46.1	61.1	43.1
	18:05:00	49.4	44.5	47.5	61.4	43.2
	18:10:00	49.5	44.6	47.8	61.3	43.2
	18:15:00	48.6	46.1	47.5	55.9	44.7
	18:20:00	48.6	45.2	47.2	56.3	43.6
	18:25:00	49.7	45.5	47.7	58.6	43.9
	18:30:00	48.7	45.5	47.2	55.5	43.7
	18:35:00	48.2	43.7	47.4	66.0	42.3
	18:40:00	48.8	44.8	47.0	55.1	43.4
	18:45:00	56.2	44.5	53.1	69.1	43.4
	18:50:00	47.5	44.3	46.0	52.0	43.0
	18:55:00	48.8	44.5	46.8	53.9	42.6
	19:00:00	47.5	44.2	46.0	52.9	43.0
	19:05:00	48.1	44.6	46.4	52.0	43.6
	19:10:00	47.5	45.0	46.3	50.6	43.3
	19:15:00	47.7	44.5	46.2	52.5	42.6
	19:20:00	49.0	45.0	47.0	54.3	43.7
	19:25:00	48.6	44.4	46.7	55.2	42.9
	19:30:00	47.6	44.8	46.3	50.6	43.6
	19:35:00	47.4	44.5	46.0	55.7	43.3
	19:40:00	47.7	44.5	46.1	51.2	43.0
	19:45:00	46.7	44.0	45.4	50.2	42.2
	19:50:00	48.2	44.4	46.2	51.0	42.9
	19:55:00	47.2	44.5	45.9	50.5	42.8
	20:00:00	47.5	44.2	45.9	52.8	42.7
	20:05:00	46.7	44.0	45.8	58.4	42.2
	20:10:00	46.8	43.9	45.4	53.8	42.1
	20:15:00	47.7	44.6	46.3	52.5	43.6
	20:20:00	47.9	43.8	45.9	55.1	42.5
	20:25:00	47.0	43.5	45.2	50.5	42.3
	20:30:00	51.0	44.3	48.2	61.2	42.7
	20:35:00	46.9	43.8	45.3	51.5	42.4
	20:40:00	47.8	43.5	46.4	56.8	41.8
	20:45:00	47.6	42.7	45.3	54.7	41.1
	20:50:00	46.6	43.5	45.1	52.1	42.4
	20:55:00	47.0	43.4	45.3	52.5	41.7
	21:00:00	47.7	43.1	46.8	64.0	41.4
	21:05:00	45.5	43.0	44.3	52.1	41.5
	21:10:00	46.6	43.0	44.8	52.2	40.9
	21:15:00	46.3	43.2	44.7	51.6	42.2
	21:20:00	45.4	42.5	44.2	52.2	40.5
	21:25:00	47.0	42.9	44.9	51.9	41.1
	21:30:00	47.2	42.9	45.2	53.1	41.2
	21:35:00	49.3	42.4	50.1	73.5	40.1
	21:40:00	68.6	42.9	67.1	87.7	40.1
	21:45:00	51.4	43.1	45.4	53.2	40.0
	21:50:00	49.1	41.9	44.8	54.3	40.5
	21:55:00	48.8	42.3	45.1	51.5	40.4
	22:00:00	47.7	43.8	46.0	53.0	41.7
	22:05:00	45.4	42.7	44.9	53.1	40.3
	22:10:00	46.5	43.3	45.4	50.1	39.9
	22:15:00	44.9	41.2	44.4	49.9	40.1

Appendix A2	Title: Noise survey results

Measured noise levels at measurement location B, Harefield Road, Uxbridge

Date	Sample start time	Noise Parameter - dB				
		L_{A10}	L_{A90}	L_{Aeq}	L_{AFmax}	L_{AFmin}
13.02.25	18:00:00	53.1	47.8	50.6	57.4	46.2
	18:05:00	53.6	48.2	51.3	60.5	46.4
	18:10:00	55.1	48.3	53.0	69.3	46.8
	18:15:00	53.7	49.0	51.6	56.8	47.8
	18:20:00	53.7	48.2	51.2	56.1	46.8
	18:25:00	53.3	48.7	51.2	58.2	47.7
	18:30:00	54.0	48.7	51.7	60.1	47.0
	18:35:00	53.2	47.3	53.3	76.5	46.0
	18:40:00	55.2	48.3	53.1	70.8	46.4
	18:45:00	58.9	47.8	57.9	80.0	46.2
	18:50:00	52.5	47.7	50.2	57.1	46.5
	18:55:00	53.8	47.9	51.2	61.2	46.1
	19:00:00	53.0	47.5	50.6	60.2	46.1
	19:05:00	53.8	48.2	51.0	59.1	46.9
	19:10:00	52.5	47.9	50.4	56.4	46.9
	19:15:00	53.0	47.8	50.7	60.4	46.7
	19:20:00	54.0	48.2	51.2	59.8	46.8
	19:25:00	52.8	48.0	50.7	57.8	46.3
	19:30:00	53.0	48.3	50.7	56.9	46.7
	19:35:00	52.7	47.9	50.6	61.6	46.6
	19:40:00	53.3	48.0	50.7	56.3	46.6
	19:45:00	51.8	47.6	49.8	56.9	46.1
	19:50:00	53.2	47.9	50.4	57.6	46.7
	19:55:00	52.3	48.0	50.3	58.0	46.7
	20:00:00	52.9	47.5	50.4	60.0	46.1
	20:05:00	51.7	47.4	50.3	67.5	46.0
	20:10:00	51.5	47.6	49.6	57.6	46.2
	20:15:00	52.5	48.1	50.5	58.4	46.5
	20:20:00	52.7	47.4	50.4	60.2	46.3
	20:25:00	52.3	47.0	49.5	55.7	45.9
	20:30:00	58.5	47.5	54.1	67.7	46.3
	20:35:00	51.7	47.3	49.6	56.7	45.9
	20:40:00	52.0	47.2	49.4	57.2	45.3
	20:45:00	52.0	46.3	49.3	57.4	45.0
	20:50:00	52.1	47.0	49.6	58.1	46.0
	20:55:00	52.1	46.9	50.5	73.2	45.4
	21:00:00	51.4	46.4	51.1	69.5	44.8
	21:05:00	50.8	46.3	48.2	57.1	45.1
	21:10:00	52.0	46.4	49.0	60.3	44.7
	21:15:00	51.2	46.3	48.7	55.5	45.1
	21:20:00	50.1	46.2	48.4	58.1	44.8
	21:25:00	52.3	46.2	49.4	59.6	44.6
	21:30:00	54.4	46.5	53.4	77.8	45.0
	21:35:00	51.0	46.1	48.2	57.0	45.6
	21:40:00	51.8	46.9	49.2	56.3	45.0
	21:45:00	53.1	46.2	49.1	56.4	44.7
	21:50:00	51.1	45.3	49.4	58.4	43.9
	21:55:00	52.4	45.7	50.3	64.3	45.1
	22:00:00	51.9	45.2	49.3	69.8	44.5
	22:05:00	51.2	45.1	48.0	57.4	44.8
	22:10:00	50.4	46.4	48.8	60.6	44.4
	22:15:00	52.4	46.5	48.5	55.8	43.1

APPENDIX B

SCREENING CALCULATION

Appendix B1

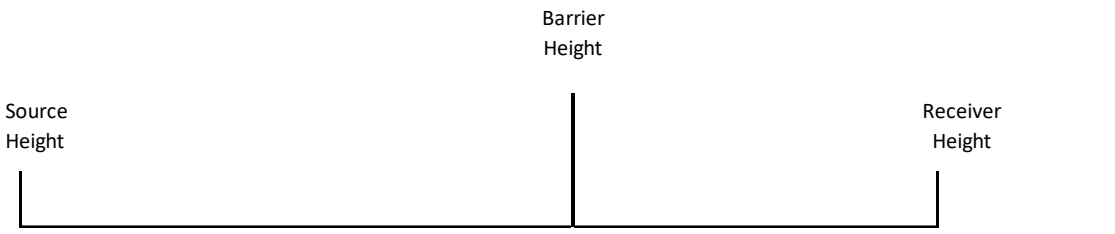
BASIC BARRIER ATTENUATION

(based on Maekawa or CRTN)

Receptor: **14 Harefield Road**

Project: **Aldi Harefield Road, Uxbridge**

Source: **Car parking activity** **Receiver:** **14 Harefield Road**



Source-to-Barrier Distance	4.0 m
Receiver-to-Barrier Distance	1.0 m

Source Height	0.5 m
Receiver Height	1.5 m
Barrier Height	2.0 m

Boundary Fence

Path difference = 0.291 m

Frequency - Hz	63	125	250	500	1K	2K	4K	8K	CRTN
Attenuation - dB	**7.1**	**8.6**	**10.6**	**13.0**	**15.7**	**18.5**	**21.4**	**24.4**	**11.7 dBA**

Appendix B2

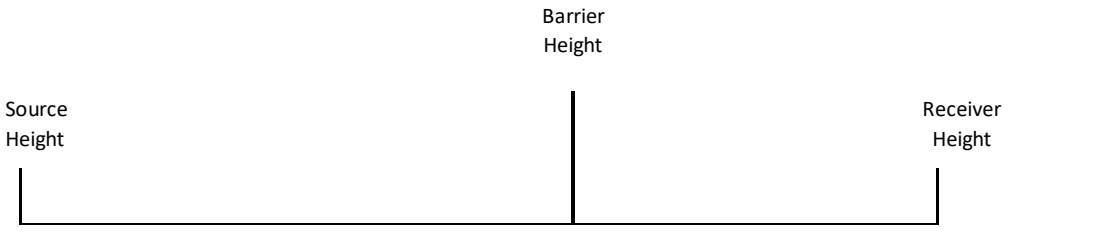
BASIC BARRIER ATTENUATION

(based on Maekawa or CRTN)

Receptor: **18 Harefield Road**

Project: **Aldi Harefield Road, Uxbridge**

Source: **Car parking activity** **Receiver:** **18 Harefield Road**



Source-to-Barrier Distance	4.0 m
Receiver-to-Barrier Distance	3.0 m

Source Height	0.5 m
Receiver Height	1.5 m
Barrier Height	3.0 m

Boundary Fence

Path difference = 1.000 m

Frequency - Hz	63	125	250	500	1K	2K	4K	8K	CRTN
Attenuation - dB	**10.1**	**12.4**	**15.1**	**17.9**	**20.8**	**23.7**	**26.7**	**29.7**	**15.4 dBA**

Appendix B3

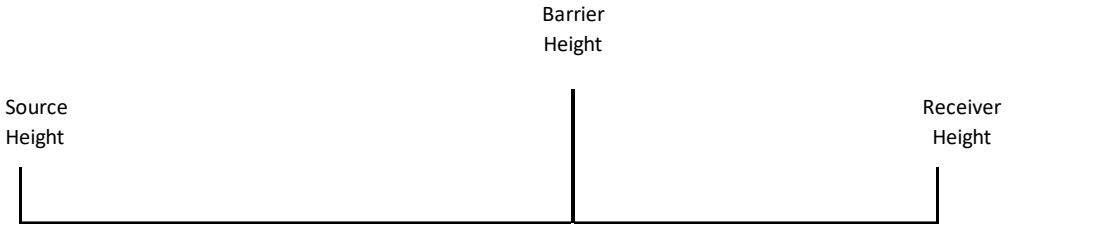
BASIC BARRIER ATTENUATION

(based on Maekawa or CRTN)

Receptor: **Properties on Lancaster Road**

Project: **Aldi Harefield Road, Uxbridge**

Source: **Car parking activity** **Receiver:** **Properties on Lancaster Road**



Source-to-Barrier Distance	2.0 m
Receiver-to-Barrier Distance	29.0 m

Source Height	0.5 m
Receiver Height	2.0 m
Barrier Height	3.0 m

Boundary Fence

Path difference = 1.183 m

Frequency - Hz	63	125	250	500	1K	2K	4K	8K	CRTN
Attenuation - dB	**10.7**	**13.1**	**15.7**	**18.6**	**21.5**	**24.5**	**27.4**	**30.4**	**16.0 dBA**

APPENDIX C

ACOUSTIC TERMINOLOGY

Acoustic Terminology

C1 Noise, defined as unwanted sound, is measured in units of decibels, dB. The range of audible sounds is from 0 dB to 140 dB. Two equal sources of sound, if added together will result in an increase in level of 3 dB, i.e. 50 dB + 50 dB = 53 dB. Increases in continuous sound are perceived in the following manner:

1 dB increase - barely perceptible.

3 dB increase - just noticeable.

10 dB increase - perceived as twice as loud.

C2 Frequency (or pitch) of sound is measured in units of Hertz. 1 Hertz (Hz) = 1 cycle/second. The range of frequencies audible to the human ear is around 20Hz to 18000Hz (or 18kHz). The capability of a person to hear higher frequencies will reduce with age. The ear is more sensitive to medium frequency than high or low frequencies.

C3 To take account of the varying sensitivity of people to different frequencies a weighting scale has been universally adopted called "A-weighting". The measuring equipment has the ability automatically to weight (or filter) a sound to this A scale so that the sound level it measures best correlates to the subjective response of a person. The unit of measurement thus becomes dBA (decibel, A-weighted).

C4 The second important characteristic of sound is amplitude or level. Two units are used to express level, a) sound power level - L_w and b) sound pressure level - L_p. Sound power level is an inherent property of a source whilst sound pressure level is dependent on surroundings/distance/directivity, etc. The sound level that is measured on a meter is the sound pressure level, L_p.

C5 External sound levels are rarely steady but rise or fall in response to the activity in the area - cars, voices, planes, birdsong, etc. A person's subjective response to different noises has been found to vary dependent on the type and temporal distribution of a particular type of noise. A set of statistical indices have been developed for the subjective response to these different noise sources.

C6 The main noise indices in use in the UK are:

L_{A90}: The sound level (in dBA) exceeded for 90% of the time. This level gives an indication of the sound level during the quieter periods of time in any given sample. It is used to describe the "background sound level" of an area.

L_{Aeq}: The equivalent continuous sound level in dBA. This unit may be described as "the notional steady noise level that would provide, over a period, the same energy as the intermittent noise". In other words, the energy average level. This unit is now used to measure a wide variety of different types of noise of an industrial or commercial nature, as well as aircraft and trains.

L_{A10}: The sound level (in dBA) exceeded for 10% of the time. This level gives an indication of the sound level during the noisier periods of time in any given sample. It has been used over many years to measure and assess road traffic noise.

L_{AMAX}: The maximum level of sound measured in any given period. This unit is used to measure and assess transient noises, i.e. gun shots, individual vehicles, etc.

C7 The sound energy of a transient event may be described by a term SEL - Sound Exposure Level. This is the L_{Aeq} level normalised to one second. That is the constant level in dBA which lasting for one second has the same amount of acoustic energy as a given A weighted noise event lasting for a period of time. The use of this unit allows the prediction of the L_{Aeq} level over any period and for any number of events using the equation;

$$L_{AeqT} = SEL + 10 \log n - 10 \log T \text{ dB}.$$

Where

n = Number of events in time period T.

T = Total sample period in seconds.

C8 In the open, known as free field, sound attenuates at a rate of 6 dB per each doubling of distance. This is known as geometric spreading or sometimes referred to as the Inverse Square Law. As noise is measured on a Logarithmic scale, this attenuation in distance = 20 Log (ratio of distances), e.g. for a noise level of 60 dB at ten metres, the corresponding level at 160 metres is:

$$60 - 20 \text{ Log } {}^{160}/_{10} = 60 - 24 = 36 \text{ dB}.$$