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Project:
Lidl Crieff Road, Perth

Title:
Noise Impact Assessment

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CONTENTS:

1	INTRODUCTION	1
2	SITE	2
3	GUIDANCE	3
4	MEASUREMENTS	5
5	EQUIPMENT	5
6	RESULTS	6
7	DELIVERY NOISE ASSESSMENT	7
8	PLANT NOISE ASSESSMENT	11
9	CAR PARK NOISE ASSESSMENT	14
10	SUMMARY & CONCLUSIONS	15

APPENDIX A:	Glossary of Technical Terms
APPENDIX B:	Proposed Site Plan
APPENDIX C:	Planning Policy & Guidance
APPENDIX D:	Survey Results (Tabular)
APPENDIX E:	Survey Results (Graphical)



1 INTRODUCTION

- 1.01 Environmental Equipment Corporation Limited has been commissioned by Lidl GB Ltd to undertake a noise impact assessment of a proposed new Lidl supermarket store development in Perth.
- 1.02 This noise assessment has been conducted in accordance with the policies and requirements of Perth & Kinross Council and is based on a noise survey carried out at the site over a weekend period.
- 1.03 This assessment includes the prediction of noise impacts at the worst affected noise sensitive receptors based on the proposed items of plant and their location as well as store operations associated with the customer activity and deliveries/servicing.
- 1.04 This report is prepared solely for Lidl GB Ltd. Environmental Equipment Corporation Limited accepts no responsibility for its use by any third party.
- 1.05 Whilst every effort has been made to ensure that this report is easy to understand, it is necessarily technical in nature. To assist the reader, an explanation of the terminology used in this report is contained in Appendix A.

2 SITE

2.01 The proposed development site is set amongst greenfield and brownfield land. There were previously what appeared to be both residential and commercial units on the land but all have been demolished. The surrounding area includes a mixture of commercial industrial style units and dwellings. The aerial photograph presented below shows the existing local area, the proposed Lidl site boundary and notes on the nearest noise sensitive dwellings, described as follows:

- Two storey semi-detached style dwellings of separate flats, 192-206 Crieff Road, to the southeast of the proposed development site.
- Four storeys of flats due south of the proposed site
- Detached dwellings to the east of the site.



Figure 1: Existing local area, site boundary and dwellings

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2.02 Figure 2 below presents an overlay of the proposed new development in the context of an aerial view of the local area. The plant compound is to be located at the rear of the store in the north west corner of the Lidl site. The delivery bay will be located in the south west corner of the store.



Figure 2: Proposed new development site in context. Aerial view Google Maps

3 GUIDANCE

3.01 PAN1/2011 (Scottish Government, 2011), sets out a series of noise issues for planning authorities to consider when making decisions on planning applications. A Technical Advice Note (TAN) on Assessment of Noise (Scottish Government, 2011) had been published to accompany PAN1/2011. In Appendix 1 of the TAN are codes of practice for the assessment of various sources of noise. BS4142 is identified as appropriate guidance for the evaluation of industrial noise commercial noise sources. A summary of the guidance provided within BS 4142 is presented in Appendix C of this document.

3.02 An assessment of noise from deliveries and plant in line with BS 4142 has been presented within this report.

3.03 Also in relation to plant noise the following standard condition is typically applied by the Local Authority:

‘Any plant or equipment associated with the completed development should be sited and operated in such a manner as to prevent any noise nuisance occurring at nearby dwellings. Noise associated with the completed development shall not give rise to a noise level, assessed with the windows open, within any dwelling or noise sensitive

buildings in excess of the equivalent to Noise Rating Curve (N.R.C.) 35 between 07.00 hours and 22.00 hours and N.R.C. 25 at all other times.’

- 3.04 The World Health Organisation’s ‘Night Noise Guidelines for Europe – 2009’ includes guidance on the effects of external night time noise on the population’s health. Table 5.4 of that document outlines the health effects associated with different external average, yearly night time (2300 – 0700hrs) noise levels based on levels outside of bedroom windows ($L_{\text{night, outside}}$). For external noise levels up to 30dBA, although individual sensitivities and circumstances may differ, no substantial biological effects are observed. Thus 30 dB(A) is equivalent to the NOEL for night noise. Furthermore, there is no sufficient evidence that the biological effects observed at the level below 40 dB $L_{\text{night, outside}}$ are harmful to health. However, adverse health effects are observed at the level above 40 dB $L_{\text{night, outside}}$ and is thus equivalent to the LOAEL.
- 3.05 To assess the noise impact from the absolute noise levels further guidance can be taken from BS8233:2014, ‘Guidance on sound insulation and noise reduction for buildings’, section 7 gives guidance on acoustic criteria and noise levels appropriate for various internal spaces that have different functions. Section 7.7 relates specifically to buildings having a residential purpose and offers guidance on appropriate internal ambient noise levels for dwellings (when unoccupied) with specific consideration:
- i. for bedrooms, the acoustic effect on sleep; and
 - ii. for other rooms, the acoustic effect on resting, listening and communicating.
- 3.06 The guidance applies to external noise as it affects the internal acoustic environment from sources without a specific character.
- 3.07 Table 4 of section 7.7.2 recommends the following internal noise limits based on the presence of steady, external noise sources:

Table 4 Indoor ambient noise levels for dwellings

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

- 3.08 The guidance criteria are based upon research and existing guidelines provided by the World Health Organisation.
- 3.09 It is generally considered that the sound insulation provided by a partially open window will be 10-15dB, dependent on window type, extent of opening and source frequency content. Adopting a minimum reduction of 10dB in this context will ensure that most assessments are as robust as possible.
- 3.10 It can be seen that in the worst case, with a partially open window reduction of 10dB, indoor ambient noise targets for bedrooms will be met where the external ambient noise level is below 40dB(A). This is based upon steady noise of an anonymous nature and is consistent with the World Health Organisations LOAEL.

4 MEASUREMENTS

4.01 Environmental noise measurements were carried out over a weekend period, between 1630hrs hours on Friday 14th January, 2022 and concluded 0700 hours Monday 17th January, 2022, to establish the existing noise levels at the site. The survey methodology and results are set out below.

4.02 Noise measurements have been carried out at the following position, as shown in Figure 1 and described as:

- Position 1: located at a height of approximately 1.5 metres above ground level on the proposed development site. The measurement was not located within 3.5 metres of any reflecting surfaces, other than the mounting surface.

4.03 This position is considered to be representative of the nearest residential windows to the proposed store based on the measurement location and nearest dwelling being equidistant from the controlling ambient noise source, Crieff Road.

5 EQUIPMENT

5.01 The equipment used for the survey was as follows:-

- 01dB Metravib Black Solo Integrating Sound Level Meter conforming to Class 1 BS EN 61672, Type 1 BS EN 60804 & BS EN 60651: 1994;
- 01dB Metravib MCE 212 Condenser Microphone, PRE 21 S Pre-amp and Connecting Leads;
- 01dB Outdoor Microphone Kit and a
- Tripod.

5.02 The equipment holds current UKAS or equivalent accreditation and serial numbers as follows:

Sound Level Meter 01dB Black Solo	Serial No.	61719
	Calibration Date	30 th July 2020
	Cal Certificate No.	U35361
½" MCE 212 Condenser Mic.	Serial No.	166397
	Calibration Date	30 th July 2020
	Cal Certificate No.	35360/U35361
Calibrator CAL 21	Serial No.	34634297
	Calibration Date	21 st October, 2021
	Cal. Certificate No.	U37247

N.B. Copies of calibration certificates are available upon request.

5.03 The equipment was calibrated both before and after the survey with no difference noted in the levels.

6 RESULTS

- 6.01 The weather during the survey was suitable for noise measurement, it being dry with little wind for the duration of the survey.
- 6.02 Noise sources at the site were predominantly controlled by local and distant road traffic. There were no other obvious significant sources of noise during the survey.
- 6.03 A list of the levels measured is included in Appendix D and represented graphically in Appendix E.
- 6.04 A summary of the time averaged ambient levels and lowest measured background levels over the measurement periods are shown in Table 6.1. The minimum L_{A90} is the lowest fifteen minute measurement in the specified period.

Period	Average $L_{Aeq,T}$ – dB	Minimum $L_{A90,15min}$ – dB	Modal $L_{A90,15min}$ – dB	Range $L_{A90,15min}$ – dB
Day time (0700-1900 hrs)	55.5	43	52	43-56
Evening (1900-2300 hrs)	52.7	41	49	41-51
Night-time (2300-0700 hrs)	47.9	33	38	33-52

Table 6.1: Free-Field Measured Ambient and Background Noise Levels

- 6.05 BS4142:2014 states that ‘in using the background sound level...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.’. The proposed typical background noise levels that are to be used are presented in Table 6.2 below. The chosen values consider the occasional background minima and the modal range for each period, whereby the most representative and typical values are taken to be at the lower extent of the majority modal distribution rather than the actual minimum measured value of each period:

Period	Typical L_{A90} – dB
Day time (0700-1900 hrs)	49 dB $L_{A90,1hour}$
Evening (1900-2300 hrs)	45 dB $L_{A90,1hour}$
Night-time (2300-0700 hrs)	35 dB $L_{A90,15 min}$

Table 6.2: Typical Background Noise Levels

7 DELIVERY NOISE ASSESSMENT

- 7.01 As shown in Figure 2 the proposed delivery bay is located on the southern elevation of the store with HGV access gained via the main car park entrance. The opening in the store delivery dock will be sealed around the rear of the delivery vehicle with a heavy duty rubber curtain to contain noise breakout. The lorries are expected to travel at no more than 10kph across the car park and will utilise reversing alarms when manoeuvring into position. The engine will be turned off for the duration of the unloading process. There is a refrigeration unit that keeps the trailer cool and, whilst typically it will be off for the duration of the unloading, it could turn on occasionally to maintain food-safe temperatures within the trailer. The majority of the stock will be on pallets and unloaded using an electric pallet truck. All goods are unloaded off the truck and directly into the store. The whole operation is expected to take one hour.
- 7.02 Based on library data for typical deliveries to Lidl stores the following source noise levels have been used in our assessment:
- Lorry manoeuvring including reversing alarm - 89dB(A) Sound power level L_{eq} for three minutes
 - Unloading operation – 80 dB(A) Sound power level L_{eq} for fifty five minutes
 - Refrigeration compressor – 85 dB(A) Sound power level L_{eq} for two minutes
 - Lorry Unloading - 58 dB(A) at 5m L_{max} (pallets within trailer)
 - Lorry door – 75dB(A) at 3m L_{max} (Door slam)
- 7.03 The delivery operation has been modelled in the noise modelling software CadnaA by Datakustik. Calculations are undertaken using the General Method of Calculation from ISO9613-2:1996. Within the noise model, buildings and the immediate local topography have been accounted for. A ground absorption of no more than 0.2 has been allowed for due to the mixture of hard and soft ground and based around an air temperature of 10°C and 70% humidity
- 7.04 Figures 3 & 4 present the results of the calculation carried out with CadnaA for the unloading operation of the lorry including for the operation of the refrigeration unit for 10 minutes during the 1 hour unloading process.



Figure 3: Specific Noise Level for the unloading operation – $L_{Aeq,1 \text{ hour}}$

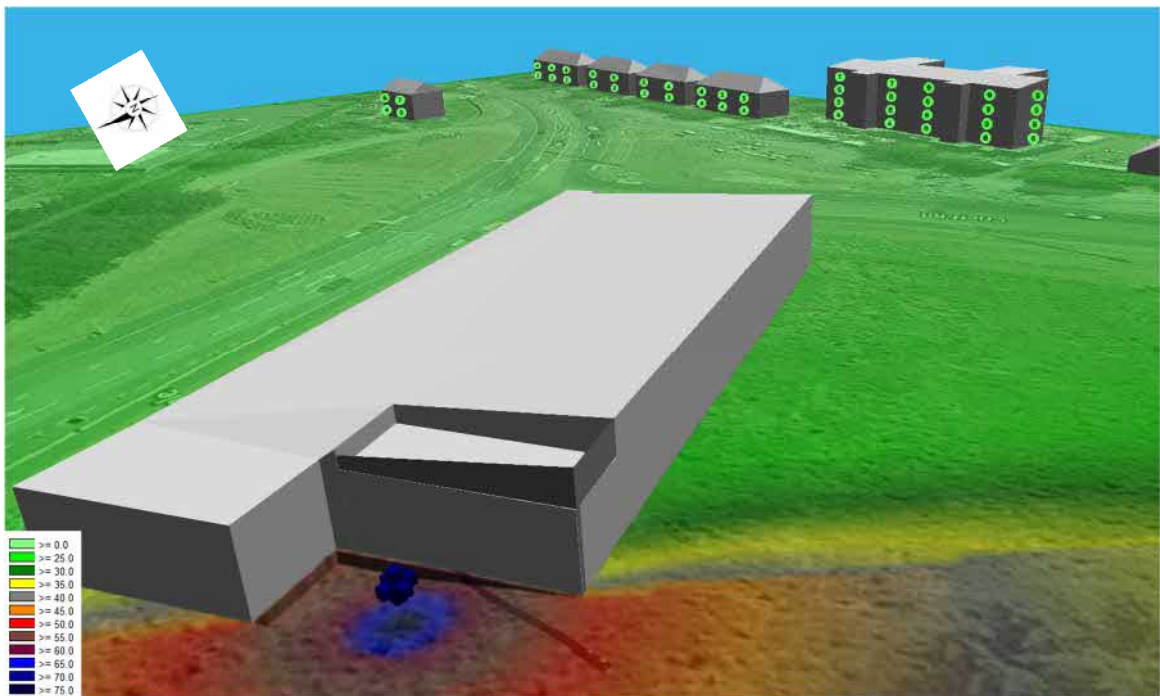


Figure 4: Isometric view of unloading noise propagation

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- 7.05 In line with the requirements of the Local Authority, an assessment in accordance with BS 4142:2014 has been carried out to gauge the potential noise impact from the delivery operation.
- 7.06 The results of the model indicate the property most affected by noise from the delivery operation would be along Crieff Road to the South of the delivery bay. The specific noise level including the arrival, unloading and departure of the lorry will be 9 dB $L_{Aeq,1hour}$.
- 7.07 Table 7.1 shows the potential noise impact associated with deliveries occurring between 0700-2300hrs (i.e. for day and evening times). Table 7.2 present the assessments for a single delivery occurring during the night time – due to the night time assessment being carried over 15 minute periods the worst case noise levels for the delivery operation is 2 dB higher than for the full 1 hour operation. Both BS4142 assessments include a 3dB character correction for the noise being ‘readily distinctive’ for items such as the compressor and reversing alarm based on guidance contained within BS4142.

Results		Relevant Clause	Commentary
Assessment made during the daytime, so reference time interval is 1 hour		7.2	
Calculated Specific Noise	9 dB $L_{Aeq,1 hour}$	7.3.4 7.3.5	1 hour delivery operation
Acoustic Character Correction	+ 3 dB	9.2	Distinctive
Rating Sound Level	(9+3)dB=12 dB $L_{Aeq,1 hour}$	9.2	Overall 1 hour level
Background Noise Level	45 dB $L_{A90,1 hour}$	8	Representative Daytime Background 0700-2300hrs
Difference	(12-45)dB= -33 dB	11	
Assessment indicates no observed impact from the proposed activity		11	
Uncertainty of assessment	Not Significant	10	Test data has been used and background noise levels during the survey period were consistent

Table 7.1: BS4142 Assessment for deliveries between 0700-2300hrs

Results		Relevant Clause	Commentary
Assessment made during the night time, so reference time interval is 15 minutes		7.2	
Calculated Specific Noise	11 dB $L_{Aeq,15min}$	7.3.4 7.3.5	15 minute assessment based on 1 hour delivery operation+2dB
Acoustic Character Correction	+ 3 dB	9.2	Distinctive
Rating Sound Level	(11+3)dB= 14dB $L_{Aeq,1 hour}$	9.2	Overall 15 minute level
Background Noise Level	35 dB $L_{A90,15 min}$	8	Representative Night time Background 2300-0700hrs
Difference	(14-35) dB= -21 dB	11	
Assessment indicates no observed impact from the proposed activity		11	
Uncertainty of assessment	Not Significant	10	Based on difference between background noise level and rating level

Table 7.3: BS4142 Assessment for deliveries between 2300-0700 hrs

- 7.08 Based on the outcome of the BS4142 assessment no adverse impact is expected from delivery activity within the service yard of the store during any period.
- 7.09 We have also considered the relative magnitude of the noise in the context of absolute guideline noise limits for noise in dwellings as described in BS8233:2014, 'Guidance on sound insulation and noise reduction for buildings'.
- 7.10 The delivery process noise reaching the windows of the newly developed properties along Crieff Road has been calculated to be no more than 9 dB(A) for the 1 hour operation; the noisiest events being the arrival and departure of the lorry. The unloading operation contributes relatively little to this overall level. Allowing for a minimal loss of 10dB for noise passing through a partially open window the noise level within the most affected dwelling would negligible. This will obviously satisfy the guideline values set within BS8233 for noise levels within bedrooms of 30 dB $L_{Aeq,8hour}$. It is also noted with BS 8233 that regular individual noise events that could cause sleep disturbance and require assessment against separate values. Based on guidance within World Health Guidelines regular events of 45 dB(A) L_{max} within bedrooms are said to lead to sleep disturbance. Based on the library data the noisiest events associated within the delivery operation is the slam of the door to the driver's cab, 75 dB(A) at 3m. Extrapolating this noise level to the closest noise sensitive properties along Crieff Road yields a resultant sound pressure level of 37dB(A) outside the bedroom windows. Assuming a worst case of only a 10dB reduction for noise passing through a partially open window the noise levels within the bedrooms would be no more than 27dB(A) which is significantly below a level expected to cause sleep disturbance. In addition, the cab door slam is infrequent and so does not present a 'regular'

noise event as described in the WHO guidance. A review of the survey data showed that in any fifteen minute night time period the existing L_{Amax} noise levels at these dwellings was consistently above 55dB.

- 7.11 An assessment of noise from the delivery operation has indicated that deliveries to the store will have no adverse impact.
- 7.12 Based on the assessed values it should be permissible for unrestricted deliveries to occur at the store.

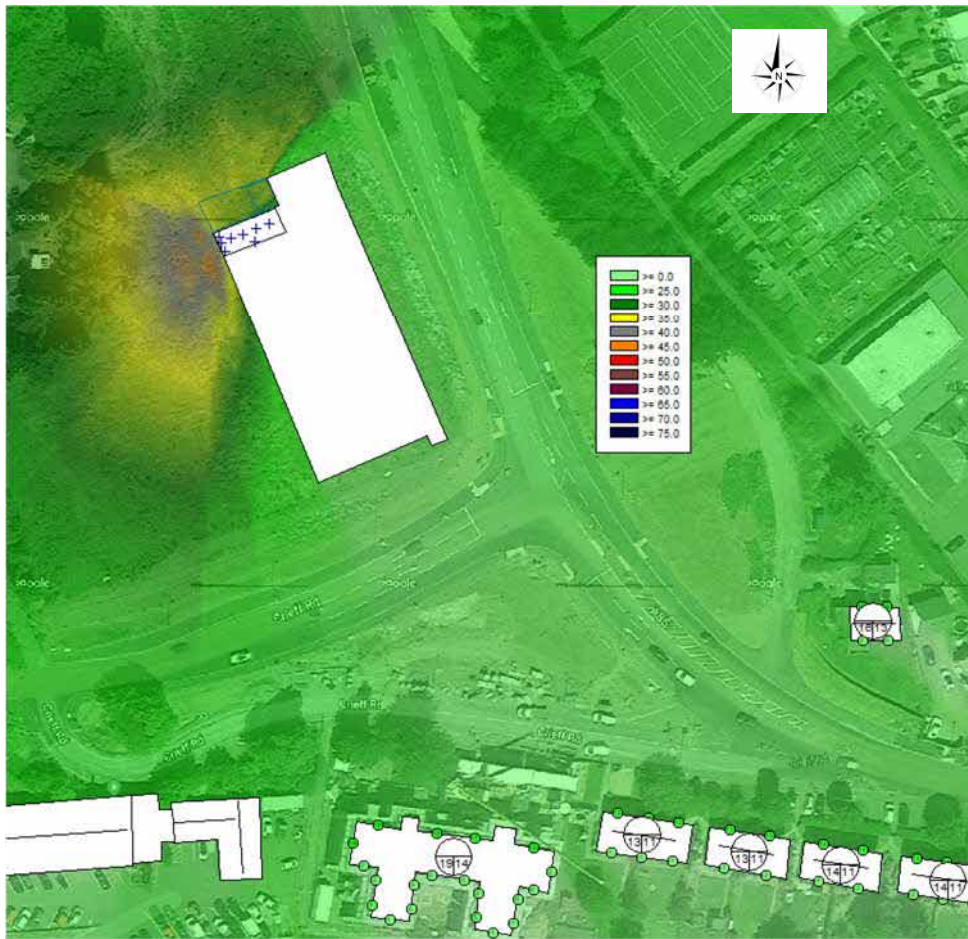
8 PLANT NOISE ASSESSMENT

- 8.01 The store design includes a screened plant compound sited on the roof of the store adjacent to the service yard. The screen will incorporate weather louvres that do not offer an significant acoustic performance.
- 8.02 The external plant will consist of dry air coolers (DACs) and associated pump stations that will serve the fridges within the store and a small air conditioning (AC) unit serving the Comms room will run 24 hours a day. There will also be 2 No. heat pumps that will serve air handling units (AHUs) that will run during the store trading hours and also a smaller heat pump to serve the welfare area that will also only run during the store trading hours. The AHUs will be sited within the curtilage of the store and will have suitable duct mounted attenuators installed to ensure their noise emissions do not exceed the required noise criteria.
- 8.03 Table 8.1 below presents the manufacturer’s published noise data for the proposed plant items.

Plant Item	Quantity	Sound Pressure Level dB re 2×10^{-5} Pa
DAC Plant	2	42dB(A) at 5m each
DAC Pump Station	2	43dB(A) at 1m each
Comms Room AC Unit	1	56dB(A) at 1m
AHU heat Pump	2	57dB(A) at 1m each
Welfare Heat Pump	1	56dB(A) at 1m

Table 8.1: Manufacturer’s Published Sound Pressure Levels

- 8.04 The data presented in Table 8.1 has been used within a CadnaA model with all calculations carried out in accordance with BS 9613-2. Figure 5 & 6 presented below show the results of the calculations.



Figures 5: Plant Noise to surroundings
(Daytime noise level/Night time noise level)

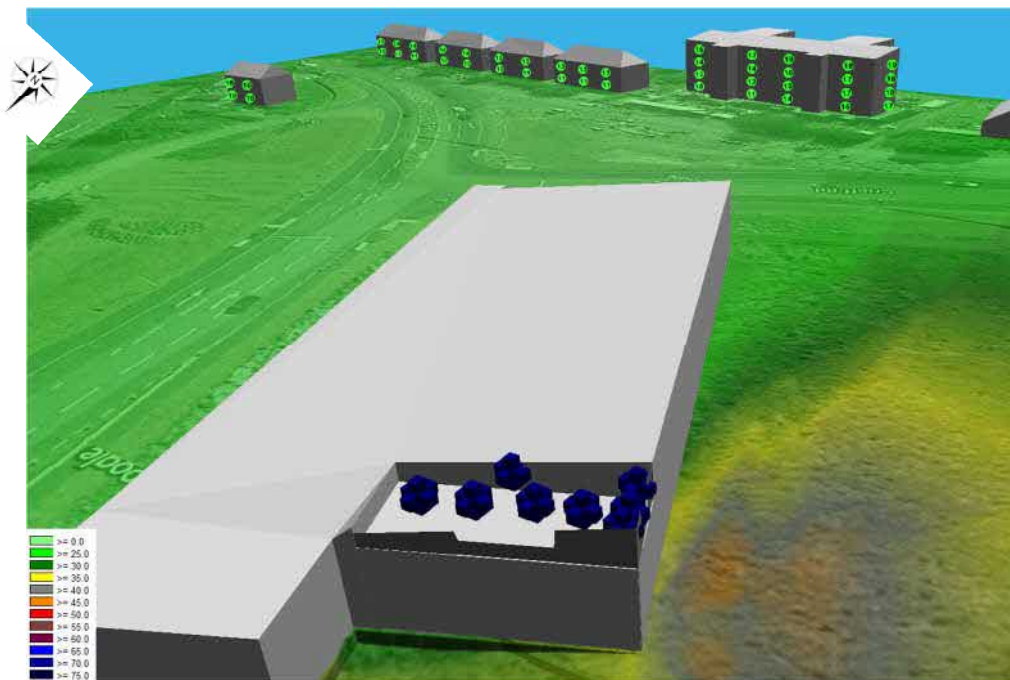


Figure 6: Plant noise propagation to the surroundings - Daytime

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8.05 Table 8.2 presents a summary of a BS4142:2014 assessment of the calculated plant noise levels against the typical daytime and night time background noise levels. Based on the octave band noise data the plant is not considered to be distinctly tonal and will not operate intermittently enough to attract attention therefore the calculated specific noise level is considered to be equivalent to the rating level.

Assessment Location	Assessment Period	Typical Background Sound Level, L_{A90}	Rating Level, L_{Aeq}	Difference
Crieff Road Flats	Daytime	45 dB	14 dB	- 31 dB
	Night-time	35 dB	11 dB	- 24 dB

Table 8.2: BS4142:2014 Fixed Plant Assessment

8.06 As presented in Table 8.2 both the daytime and night time noise emissions are significantly below the typical background noise levels. In the context of BS 4142 this would be described as being of negligible impact. The plant noise assessment has been based on all plant operating at its maximum noise level which is expected to occur only during busy trading times on the warmest days, with the plant operating at lower duties during quieter times and periods of cooler ambient air temperature.

8.07 The guidance from Scottish Local Authorities also stipulates that noise from the plant should not exceed NR 35 within the nearest residential receiver dwellings during the day time and NR 25 during the night time. Table 8.3 presents a comparison of the equivalent calculated NR levels using the data presented in Table 8.2, adopting a -6dB correction for dB(A) to NR as advised in BS8233, and corrected for a reduction of 10 dB for noise passing through a partially open window.

Period	Proposed Noise Limit, NR	Predicted NR (inside dwelling)	Exceedance of noise limit
Daytime	35	0	-35
Night-time	25	0	-25

Table 8.3: Plant Noise Rating level – limiting and predicted values within dwelling

8.08 It can be seen from the Table 8.3 that the noise limits are readily met during all periods of the proposed plant operation.

9 CAR PARK NOISE ASSESSMENT

9.01 It is expected that the proposed car park hours will be restricted to 0700-2300 hours which would be one hour either side of the typical longest store trading hours of 0800-2200hrs. Based on similar stores it is expected around 110 car movements in an hour would represent peak activity and noise generation.

9.02 Based on CadnaA library data for typical car park noise generation based on car parking for up to 107 cars the following peak noise level has been calculated. The CadnaA model presented in Figure 7 below represents the noise levels generated by customer vehicle activity and movements within the car park. The noise levels outside the most affected dwellings at Crieff Road will be no more than 42dB $L_{Aeq, 1hour}$. This noise level is at least 2dB below the lowest daytime background noise level that was recorded on site during the daytime period and therefore not expected to have any significant adverse impact based on the existing noise climate. The existing noise climate is controlled by traffic flow along the main roads that are at a significantly higher noise level than the activity noise level within the car park along with being closer to the existing dwellings. This is therefore expected effectively mask any activity noise within the store car park.

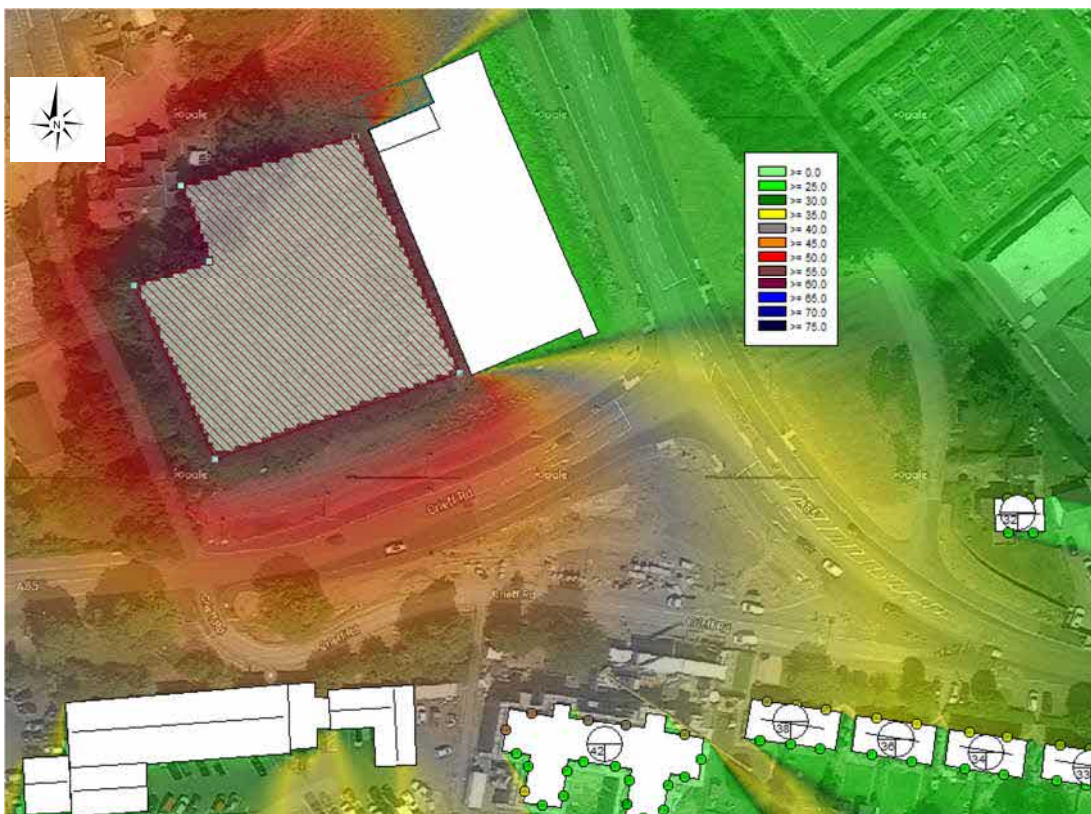


Figure 7: Customer car park activity noise model

10 SUMMARY & CONCLUSIONS

10.01 Lidl GB Ltd has appointed Environmental Equipment Corporation Limited to undertake a noise impact assessment for the development of a new Lidl store.

10.02 The noise impact assessment has been undertaken with reference to BS 4142:2014 and general planning guidance from Perth and Kinross City Council.

10.03 The assessment has been carried out in three parts:

- noise associated with the delivery operation;
- noise associated with the worst case operation of the plant, sited external to the store; and,
- noise due to customer vehicular movement within the car park.

10.04 Calculations have been carried out using CadnaA, a proprietary acoustic modelling software package, and using plant manufacturers published/library data for typical delivery operations to supermarkets. The delivery process was assessed for a single delivery occurring in any one hour period.

10.05 The BS4142 delivery noise assessment indicates no adverse impact. Further reference of the calculated delivery noise levels to both World Health Organisation Guidance and BS 8233 also indicates noise emissions of this type and magnitude will easily satisfy relevant guidance values, even with windows partially open. It would be reasonable to conclude therefore that deliveries at any time of the day or night will not lead to any adverse impacts and could be permitted.

10.06 The BS4142 assessment for the plant noise demonstrates that plant noise would of negligible impact at all times of the day and night. Assessing the plant against the typical planning requirement of the Local Authority showed that the resultant noise within the properties will readily satisfy the standard condition by at least 31 dB.

10.07 On the basis of this plant noise assessment it is considered that noise does not pose a material constraint to the operation of the external plant items.

10.08 Noise from the movement of cars within the customer car park during a peak hour has also been assessed. The resultant noise levels will be below the lowest typical evening background noise level and therefore can be considered of low impact. Furthermore, character of car park activity noise is familiar and in keeping with the existing ambient noise climate, controlled by traffic flow along Crieff Road.

APPENDIX A
GLOSSARY OF TECHNICAL TERMS

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ACOUSTIC TERMINOLOGY

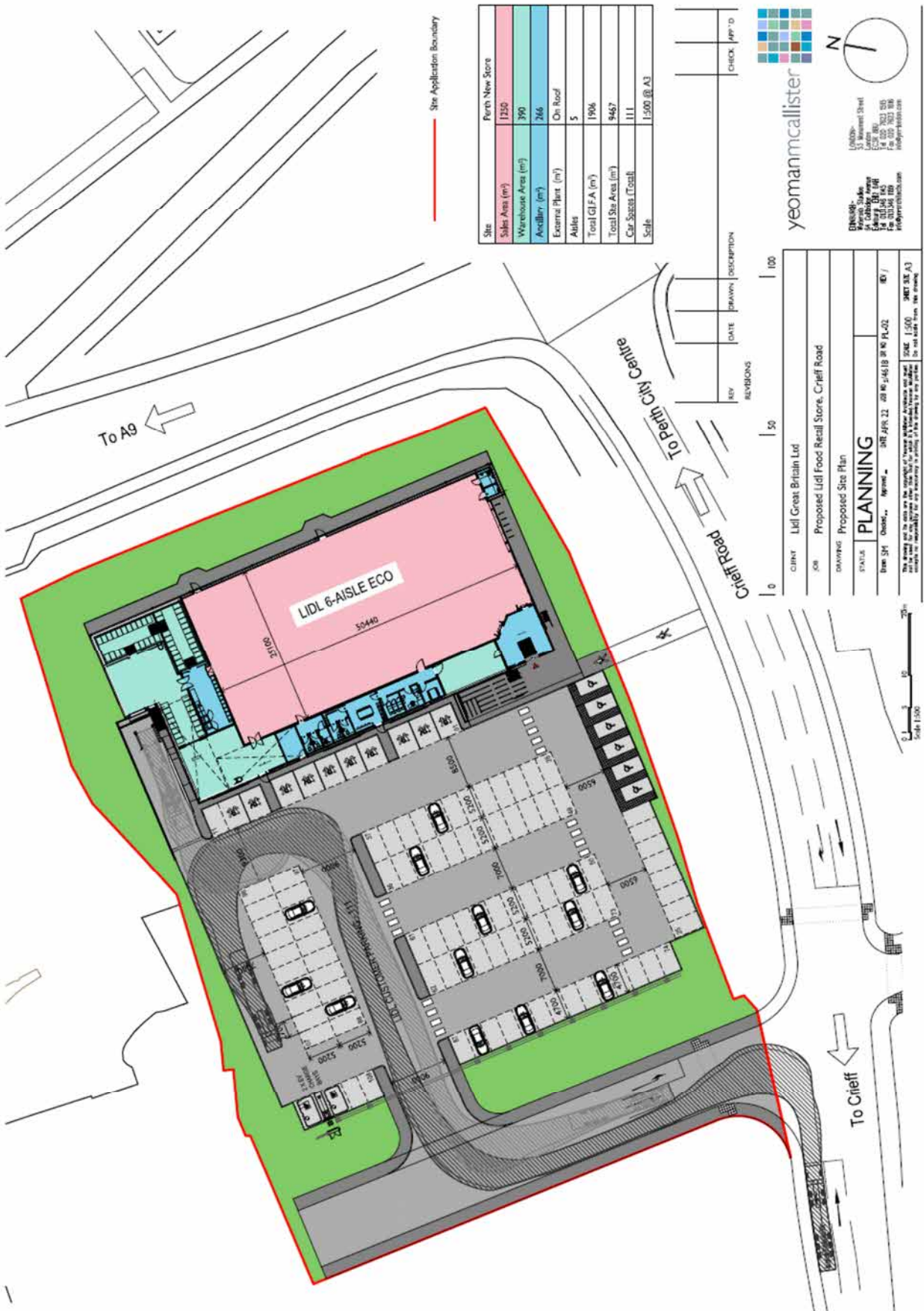
Absorption Classes	The sound absorption of a material is rated from Class A to Class E, where Class A materials provide the highest level of sound absorption.
Ambient Noise Levels	Noise levels measured in the absence of noise requiring control, frequently measured to determine the situation prior to the additional of a new noise source.
dB	Decibel. The logarithmic unit of sound level.
dBA	A-weighted decibel. The A-weighting approximates the response of the human ear.
$D_{nT,w}$	Weighted standardized level difference. A single number quantity of the sound level difference between two rooms. $D_{nT,w}$ is typically used to measure the on-site sound insulation performance of a building element such as a wall, floor or ceiling. Measured in accordance with BS EN ISO 16283-1 and weighted in accordance with BS EN ISO 717-1.
$D_{n,e,w}$	The weighted element-normalized level difference. A single number rating of the sound reduction provided by a sound passing through an individual element. $D_{n,e,w}$ is typically used to define the sound insulation provided by ventilators. Measured in accordance with BS EN ISO 10140-2:2010 and rated in accordance with BS EN ISO 717-1.
Flanking	Transmission of sound energy through paths adjacent to the building element being considered. For example, sound may be transmitted around a wall by travelling up into the ceiling space and then down into the adjacent room.
Frequency	Sound can occur over a range of frequencies extending from the very low, such as the rumble of thunder, up to the very high such as the crash of cymbals. Sound is generally described over the frequency range from 63Hz to 4kHz, roughly equal to the range of frequencies on a piano.
Impact Sound	Sound produced by an object impacting directly on a building structure, such as footfall noise or chairs scrapping on a floor.
$L_{Aeq,t}$	The equivalent continuous sound level measured in dBA. This is commonly referred to as the average noise level. 't' is the interval time for the measurement. Typically 't' of 16hrs and 8hrs is used for day and night time ambient noise respectively or 't' is defined by the period of interest in BS4142 assessments.
$L_{A90,t}$	The noise level exceeded for 90% of the measurement period, measured in dBA. This is commonly referred to as the background noise level.
$L'_{nT,w}$	Weighted, standardized impact sound pressure level. A single number rating of the impact sound insulation of a floor/ceiling when impacted on by a standard "tapper" machine. The lower the $L'_{nT,w}$, the better the acoustic performance. Measured in accordance with BBS EN ISO 140-7 and rated in accordance with BS EN ISO 717-2.
NR	Noise Rating. A single number rating which is based on the sound level in the octave bands 31.5Hz – 8kHz inclusive, generally used to assess noise from mechanical services in buildings.
Octave Band	Frequencies are often grouped together into octaves for analysis. Octave bands are labelled by their centre frequency which are: 63Hz, 125Hz, 250Hz, 500Hz, 1kHz, 2kHz and 4kHz.
Reverberation Time (T_{mf})	Reverberation time is used for assessing the acoustic qualities of a space. It is defined as the time it takes for an impulse to decay by 60dB. T_{mf} is the arithmetic average of the reverberation time in the mid frequency bands (500Hz, 1kHz and 2kHz).
R_w	Weighted sound reduction index. A single number rating of the sound insulation performance of a specific building element. R_w is measured in a laboratory. R_w is commonly used by manufacturers to describe the sound insulation performance of building elements such as plasterboard and concrete. Measured in accordance with BS EN ISO 10140-2:2010 and rated in accordance with BS EN ISO 717-1.
Sound Absorption	When sound hits a surface, some of the sound energy is absorbed by the surface material. Sound absorption refers to the ability of a material to absorb sound, rated from 0, complete reflection, to 1, complete absorption.
Sound Insulation	When sound hits a surface, some of the sound energy travels through the material. 'Sound insulation' refers to the ability of a material to prevent the travel of sound.
Structure-borne transmission	Transmission of sound energy as vibrations via the structure of a building.

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APPENDIX B

PROPOSED
SITE PLAN

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APPENDIX C
PLANNING POLICY
AND GUIDANCE

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PLANNING POLICY AND GUIDANCE

British Standard 4142

To assess the acceptability of the resultant noise levels we have consulted the relevant standards. BS 4142:2014 'Methods for rating and assessing industrial and commercial sound' has been used to assess the likelihood any adverse impacts based on the resultant noise level from the new plant item, including any corrections for the character of the noise against the existing background noise level.

BS4142 gives guidance on assessing the likelihood of adverse impacts by calculating a 'rating level' of the new noise source and comparing its magnitude at noise sensitive locations to the existing or underlying background noise level. The background noise level is subtracted from the 'rating level' to assess the likelihood of complaints:

- The greater the difference the greater the likelihood of complaints.
- A difference of around +10dB or more is an indication of a significant adverse impact, depending on the context.
- A difference of +5dB 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 noise level, the less likely it is that the specific sound source will have an adverse impact or 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 sound impact, depending on the context.

This assessment is carried out over a one hour period for the daytime and a fifteen minute period for the night-time. For the purposes of the standard it states that daytime and night-time are typically 07:00 to 23:00 hours and 23:00 to 07:00 hours respectively.

The 'rating level' of the noise source is obtained taking the following factors into consideration:

- The new plant noise (the specific noise) is measured or predicted in terms of L_{Aeq} .
- An additional correction shall be included if the noise contains a distinguishable, discrete continuous note, if the noise contains distinct impulses or if the noise is irregular enough to attract attention. The value for any tonal noise can be an addition of up to 6dB and for impulsive noise of up to 9dB.

BS 4142 goes onto state that:

‘The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context.’

BS4142 has been referenced in setting noise limits for any fixed plant proposed as part of the proposed development.

British Standard 8233

BS8233:2014, ‘Guidance on sound insulation and noise reduction for buildings’, section 7 gives guidance on acoustic criteria and noise levels appropriate for various internal spaces that have different functions. Section 7.7 relates specifically to buildings having a residential purpose and offers guidance on appropriate internal ambient noise levels for dwellings (when unoccupied) with specific consideration:

- i. for bedrooms, the acoustic effect on sleep; and
- ii. for other rooms, the acoustic effect on resting, listening and communicating.

The guidance applies to external noise as it affects the internal acoustic environment from sources without a specific character.

Table 4 of section 7.7.2 recommends the following internal noise limits based on the presence of steady, external noise sources:

Table 4 Indoor ambient noise levels for dwellings

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

WHO Night Noise Guidelines for Europe

The World Health Organisation’s ‘Night Noise Guidelines for Europe – 2009’ includes guidance on the effects of external night time noise on the population’s health. Table 5.4 of that document outlines the health effects associated with different external average, yearly night time (2300 – 0700hrs) noise levels based on levels outside of bedroom windows ($L_{night, outside}$). For external noise levels up to 30dBA, although individual sensitivities and circumstances may differ, no substantial biological effects are observed. Thus 30 dBA is equivalent to the NOEL for night noise. Furthermore, there is no sufficient evidence that the biological effects observed at the level below 40 dB $L_{night, outside}$ are harmful to health. However, adverse health effects are observed at the level above 40 dB $L_{night, outside}$ and is thus equivalent to the LOAEL.

Average night noise level over a year $L_{\text{night, outside}}$	Health effects observed in the population
Up to 30 dB	Although individual sensitivities and circumstances may differ, it appears that up to this level no substantial biological effects are observed. $L_{\text{night, outside}}$ of 30 dB is equivalent to the no observed effect level (NOEL) for night noise.
30 to 40 dB	A number of effects on sleep are observed from this range: body movements, awakening, self-reported sleep disturbance, arousals. The intensity of the effect depends on the nature of the source and the number of events. Vulnerable groups (for example children, the chronically ill and the elderly) are more susceptible. However, even in the worst cases the effects seem modest. $L_{\text{night, outside}}$ of 40 dB is equivalent to the lowest observed adverse effect level (LOAEL) for night noise.
40 to 55 dB	Adverse health effects are observed among the exposed population. Many people have to adapt their lives to cope with the noise at night. Vulnerable groups are more severely affected.
Above 55 dB	The situation is considered increasingly dangerous for public health. Adverse health effects occur frequently, a sizeable proportion of the population is highly annoyed and sleep-disturbed. There is evidence that the risk of cardiovascular disease increases.

Table 3
Effects of different levels of night noise on the population's health

APPENDIX D
SURVEY RESULTS
(TABULAR)

quietly moving forward

EC 18943 - Lidl Crieff Road, Perth

Lidl GB Ltd

Tabulated Noise data

Sheet 1 of 3

Time	L _{Aeq}	L _{AMax}	L _{A90}
16:30	57.4	78.4	52.3
16:45	55.9	60.4	52.5
17:00	56.2	60.6	53.6
17:15	55.5	61.0	53.0
17:30	55.5	60.7	52.8
17:45	55.3	64.8	52.0
18:00	55.3	68.9	51.1
18:15	54.2	61.8	49.7
18:30	54.7	63.3	50.3
18:45	55.6	73.0	50.1
19:00	53.9	59.8	49.0
19:15	53.4	58.8	48.1
19:30	54.3	65.6	49.5
19:45	53.3	62.5	48.4
20:00	54.6	61.7	49.4
20:15	54.2	60.6	47.4
20:30	53.7	62.9	48.1
20:45	53.9	64.1	49.1
21:00	53.5	60.8	48.5
21:15	53.5	63.6	47.3
21:30	52.8	62.8	46.9
21:45	52.6	62.2	46.4
22:00	52.0	65.5	45.5
22:15	50.2	57.8	43.8
22:30	49.1	60.3	40.7
22:45	50.4	68.2	42.5
23:00	49.2	59.7	40.9
23:15	48.9	63.1	40.9
23:30	48.5	65.5	41.5
23:45	48.0	60.6	39.5
00:00	46.1	57.5	38.5
00:15	47.2	59.6	38.8
00:30	46.2	63.5	36.9
00:45	44.1	56.6	38.4
01:00	45.5	58.0	37.1
01:15	47.1	60.2	38.5
01:30	43.8	59.4	35.5
01:45	42.2	56.6	35.4
02:00	43.2	58.1	33.9
02:15	42.4	55.6	34.6
02:30	41.4	54.6	34.6
02:45	45.3	65.5	34.4
03:00	44.5	58.5	36.0
03:15	40.5	55.4	33.0
03:30	42.2	56.0	32.8
03:45	40.5	54.9	33.6
04:00	41.0	55.4	33.9
04:15	45.9	60.8	34.9

Time	L _{Aeq}	L _{AMax}	L _{A90}
04:30	44.2	55.2	35.2
04:45	44.3	55.1	36.0
05:00	45.7	55.6	38.0
05:15	46.5	61.6	37.9
05:30	46.2	56.7	38.8
05:45	47.8	56.3	39.5
06:00	47.8	58.5	40.2
06:15	48.3	57.2	39.2
06:30	49.8	60.1	41.2
06:45	49.1	57.6	40.9
07:00	49.8	57.9	42.6
07:15	51.5	60.2	45.4
07:30	52.7	60.1	48.5
07:45	53.6	70.5	47.8
08:00	53.1	61.0	47.9
08:15	53.4	60.2	49.1
08:30	53.9	63.4	49.4
08:45	54.8	63.7	50.5
09:00	54.2	61.8	50.1
09:15	54.0	59.3	50.2
09:30	54.3	58.9	50.8
09:45	53.4	59.3	49.2
10:00	54.2	60.7	49.9
10:15	54.4	59.8	50.7
10:30	54.1	58.9	50.2
10:45	54.7	60.4	50.9
11:00	55.1	61.4	52.0
11:15	55.1	63.8	51.8
11:30	54.9	60.3	51.4
11:45	54.7	60.2	50.6
12:00	55.1	59.3	51.7
12:15	55.7	63.3	52.6
12:30	55.3	61.9	52.0
12:45	55.3	62.3	52.5
13:00	54.9	61.9	50.3
13:15	55.2	66.2	51.8
13:30	54.9	64.5	50.9
13:45	55.4	63.6	52.2
14:00	55.2	62.7	51.9
14:15	55.9	68.7	51.9
14:30	54.6	64.2	50.4
14:45	54.2	62.1	49.8
15:00	54.6	63.3	51.3
15:15	56.1	71.8	51.8
15:30	56.2	67.0	52.7
15:45	55.4	63.6	52.4
16:00	56.0	61.4	53.0
16:15	55.7	65.3	52.9

EC 18943 - Lidl Crieff Road, Perth

Lidl GB Ltd

Tabulated Noise data

Sheet 2 of 3

Time	L _{Aeq}	L _{AMax}	L _{A90}
16:30	56.1	75.5	52.1
16:45	55.1	63.1	50.7
17:00	54.8	68.1	51.2
17:15	54.5	59.9	50.3
17:30	54.3	63.6	49.6
17:45	53.7	61.9	48.6
18:00	53.4	59.1	47.1
18:15	52.4	59.5	46.7
18:30	52.6	61.0	47.4
18:45	53.1	63.5	45.6
19:00	52.8	68.1	46.1
19:15	51.6	63.5	44.0
19:30	50.8	58.4	41.4
19:45	51.3	59.7	45.1
20:00	50.8	58.0	42.3
20:15	51.2	60.7	42.7
20:30	51.8	59.8	44.8
20:45	51.7	61.3	44.1
21:00	50.8	58.4	45.4
21:15	51.6	61.2	45.4
21:30	53.3	73.6	44.4
21:45	51.3	59.1	45.6
22:00	51.5	59.9	45.1
22:15	51.6	61.4	42.9
22:30	50.2	57.4	44.2
22:45	50.5	64.9	41.9
23:00	49.2	62.1	41.3
23:15	50.0	65.6	41.9
23:30	50.6	59.8	42.8
23:45	49.4	64.2	40.1
00:00	49.6	63.6	40.8
00:15	48.3	60.7	37.9
00:30	49.2	61.8	41.5
00:45	50.1	63.3	43.0
01:00	49.9	70.2	41.3
01:15	46.6	60.9	39.5
01:30	47.9	63.0	39.6
01:45	48.2	60.6	39.7
02:00	47.4	59.0	37.6
02:15	46.9	58.4	39.0
02:30	45.4	58.5	38.4
02:45	45.3	59.3	37.1
03:00	46.7	65.8	38.2
03:15	45.2	61.6	37.7
03:30	44.9	58.3	37.3
03:45	44.4	61.4	37.7
04:00	44.3	61.7	36.2
04:15	42.6	55.4	36.5

Time	L _{Aeq}	L _{AMax}	L _{A90}
04:30	43.3	56.0	38.3
04:45	44.3	56.8	37.7
05:00	43.6	57.1	37.2
05:15	46.1	64.4	38.6
05:30	47.7	58.1	40.6
05:45	48.1	63.1	39.1
06:00	47.1	58.2	39.1
06:15	44.7	55.8	38.3
06:30	47.5	58.7	38.3
06:45	48.6	57.5	39.4
07:00	50.5	59.5	42.7
07:15	50.8	60.7	44.6
07:30	54.8	63.4	49.0
07:45	57.9	80.3	47.5
08:00	52.1	60.6	45.8
08:15	52.6	61.5	47.1
08:30	53.4	69.8	48.5
08:45	53.7	61.0	48.2
09:00	54.4	68.9	48.5
09:15	55.3	69.4	51.0
09:30	55.7	62.0	52.2
09:45	56.3	70.0	52.3
10:00	56.0	61.7	52.4
10:15	55.9	61.6	51.3
10:30	55.5	63.2	51.9
10:45	56.1	67.1	52.6
11:00	56.4	67.0	53.0
11:15	56.0	61.6	52.6
11:30	56.4	64.1	53.3
11:45	56.5	65.1	53.5
12:00	56.7	69.5	52.9
12:15	55.6	64.4	52.2
12:30	56.5	62.1	53.4
12:45	56.7	63.4	53.2
13:00	56.1	62.3	53.1
13:15	57.1	68.8	54.4
13:30	57.2	62.5	54.5
13:45	57.2	70.9	54.8
14:00	56.9	61.7	54.3
14:15	56.4	62.6	53.4
14:30	57.2	64.8	54.7
14:45	57.9	63.4	55.5
15:00	57.5	63.9	55.0
15:15	57.2	63.1	54.7
15:30	57.4	65.7	54.7
15:45	57.4	62.8	54.9
16:00	57.7	64.2	55.3
16:15	57.8	63.4	54.9

EC 18943 - Lidl Crieff Road, Perth

Lidl GB Ltd

Tabulated Noise data

Sheet 3 of 3

Time	L _{Aeq}	L _{AMax}	L _{A90}
16:30	57.4	71.3	54.5
16:45	57.1	65.3	54.4
17:00	56.7	62.5	53.7
17:15	56.5	62.8	53.4
17:30	55.3	60.7	52.2
17:45	55.8	61.6	52.9
18:00	55.5	63.4	51.9
18:15	55.1	61.7	51.6
18:30	54.7	62.2	50.4
18:45	55.5	66.5	51.6
19:00	54.6	66.9	49.8
19:15	54.0	69.1	48.6
19:30	54.8	61.6	50.5
19:45	54.6	68.0	49.3
20:00	54.7	64.5	49.6
20:15	53.5	60.5	48.8
20:30	52.5	59.4	47.4
20:45	52.8	60.6	47.5
21:00	52.4	60.2	46.8
21:15	53.0	64.7	48.0
21:30	52.3	64.4	45.7
21:45	52.6	62.0	46.3
22:00	53.7	62.6	48.6
22:15	53.9	69.4	47.1
22:30	50.4	60.3	43.5
22:45	49.7	62.7	41.9
23:00	49.4	61.0	42.2
23:15	48.7	59.7	41.9
23:30	48.8	65.1	40.3
23:45	48.2	62.0	41.0
00:00	46.2	60.1	39.7
00:15	46.2	60.0	39.0
00:30	45.6	57.8	37.7
00:45	45.4	59.5	38.3
01:00	45.9	66.5	38.8
01:15	47.7	67.4	40.2
01:30	44.0	55.7	37.4
01:45	43.9	61.5	37.0
02:00	45.0	65.2	39.2
02:15	44.8	56.8	39.9
02:30	44.8	61.5	39.7
02:45	45.3	57.6	38.6
03:00	44.3	58.5	37.9
03:15	45.4	60.9	36.6
03:30	46.1	66.8	37.5
03:45	45.3	61.5	35.8
04:00	46.3	60.6	38.1
04:15	46.6	59.7	41.2

Time	L _{Aeq}	L _{AMax}	L _{A90}
04:30	48.2	60.2	41.7
04:45	48.0	58.2	41.9
05:00	48.6	61.2	42.2
05:15	49.9	60.6	44.8
05:30	52.7	61.1	48.1
05:45	53.4	61.5	49.0
06:00	53.3	61.1	49.5
06:15	54.2	61.6	50.6
06:30	55.2	62.6	52.1
06:45	55.3	63.7	52.1

APPENDIX E
SURVEY RESULTS
(GRAPHICAL)

Noise Level Time History at Lidl Crieff Road, Perth



— LAeq — LAFmax — LAF90

