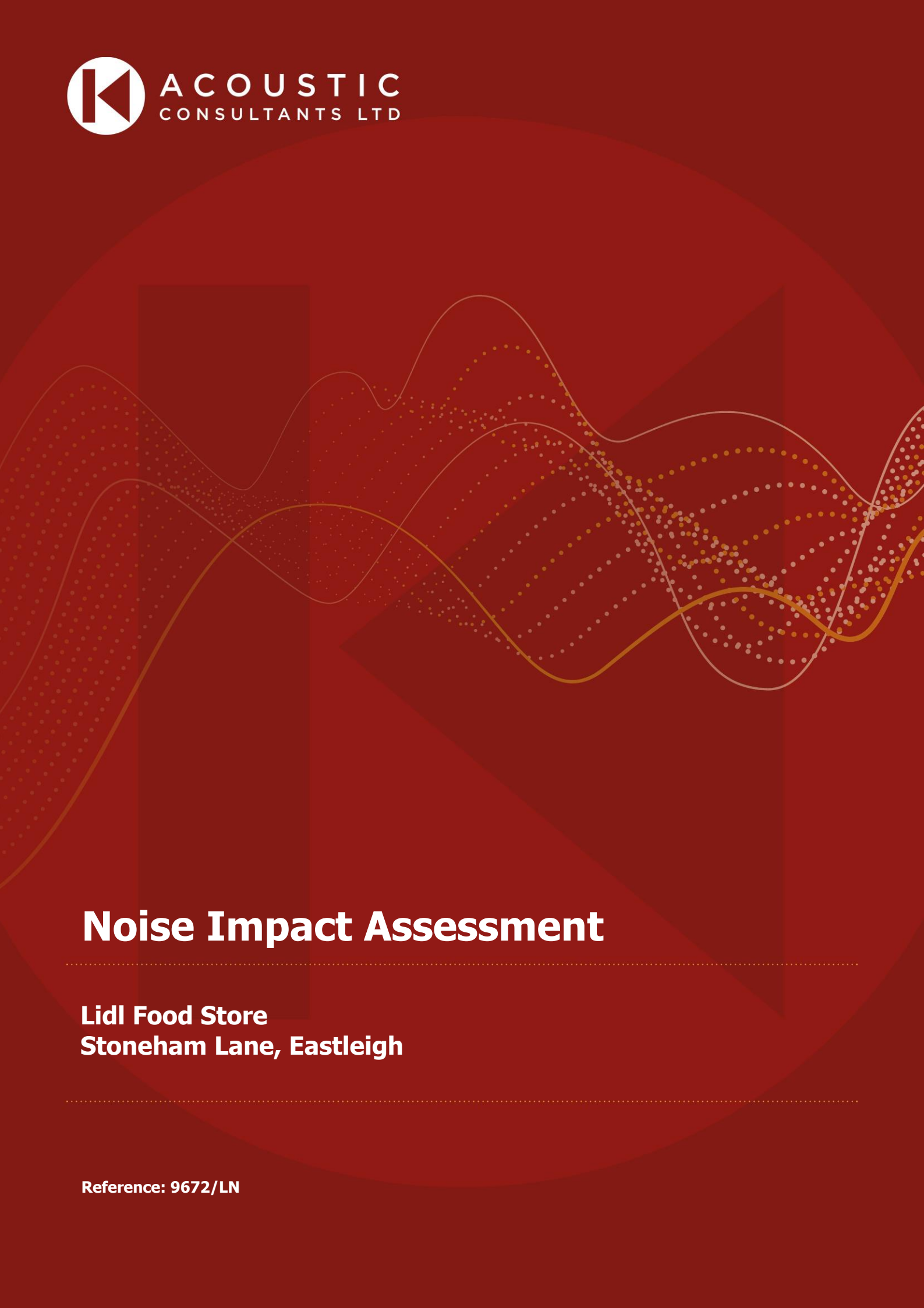




Noise Impact Assessment

**Lidl Food Store
Stoneham Lane, Eastleigh**

Reference: 9672/LN

Client:



Document Control

Version	Revision Description	Date	Author:	Reviewed by:
1.0	--	20/05/22	Laurence Nickolls	Daniel Oldaker
2.0	Addressed Client Comments	27/06/22	Fergal Denman	Blake Lucas
3.0	Updated Site Plan	25/07/22	Laurence Nickolls	Blake Lucas

The report has been prepared in good faith, with all reasonable skill and care, based on information provided or available at the time of its preparation and within the scope of work agreement with the Client. We disclaim any responsibility to the Client and others in respect of any matters outside the scope of the above. The report is provided for the sole use of the named Client and is confidential to them and their professional advisors. No responsibility is accepted to other parties.

The report limits itself to addressing solely on the noise aspects as included in this report. We provide advice only in relation to noise and acoustics. It is recommended that appropriate expert advice is sought on all the ramifications (e.g. CDM, structural, condensation, fire, legal, etc.) associated with any proposals in this report or as advised and concerning the appointment. It should be noted that noise predictions are based on the current information as we understand it and on the performances noted in this report. Any modification to these parameters can alter the predicted level. All predictions are in any event subject to a degree of tolerance of normally plus or minus three decibels. If this tolerance is not acceptable, then it would be necessary to consider further measures.

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1. Introduction

Lidl Great Britain Ltd appointed Acoustic Consultants Ltd to undertake a noise impact assessment in relation to the proposed food store at Stoneham Lane, Eastleigh.

This report predicts the noise impact from the plant and delivery operations associated with the new store on the residential properties in the area.

The noise impact assessment has been undertaken in accordance with the guidance in the National Planning Policy Framework (NPPF), Noise Policy Statement for England (NPSE), National Planning Practice Guidance (NPPG) and British Standard 4142:2014+A1:2019 (BS4142).

The author of this report is an Associate Member of the Institute of Acoustics (AMIOA) with an acoustics qualification and the report is checked by a Member of the Institute of Acoustics (MIOA) with over 13 years' experience.

2. The Site

The site comprises partially developed land in Eastleigh, the development currently contains a primary school, nursery, community centre and retirement apartments. The apartments will form the nearest noise sensitive receptors and are approximately 30m to the west. The residential properties in the vicinity of the site as well as the retirement apartments have the potential to be affected by plant and delivery noise associated with the Lidl food store.

A google image of the existing site and area is provided below

Figure 1: Existing Google Image



The proposed site plan is provided below:

Figure 2: Proposed site plan



3. Planning & Noise

3.1. National Planning Policy Framework

The National Planning Policy Framework (NPPF) was published in March 2012 and revised in July 2021. Section 15 entitled 'Conserving and enhancing the natural environment' addresses noise as a requirement of planning. Paragraph 174 states:

"174. 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;

Paragraph 185 states:

"185. 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 life¹*
- 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. "*

The document does not prescribe any assessment methodology or criteria to assess the adverse effect of noise.

¹ See Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010)

3.2. Noise Policy Statement for England

The NPPF refers to the Noise Policy Statement for England (NPSE). This was published in March 2010 and aims to provide clarity regarding current policies and practices to enable noise management decisions to be made within the wider context, at the most appropriate level, in a cost-effective manner and in a timely fashion and applies to all forms of noise including environmental noise, neighbour noise and neighbourhood noise.

The NPSE sets out the long-term vision of Government noise policy. This long-term vision is supported by three noise 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."*

The NPSE introduces the concept of "Significant adverse" and "Adverse" impacts of noise which relate to the noise policy aims. These are applied as follows:

NOEL – No Observed Effect Level - This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level - This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level - This is the level above which significant adverse effects on health and quality of life occur.

The Noise Policy Statement for England (NPSE) states that noise levels above the Lowest Observed Adverse Effect Level are acceptable in planning where reduced to a minimum.

With regard to where there is potential for noise impact it states the following in relation to the second noise policy aim:

"The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur."

The NPSE does not provide any assessment criteria for the noted effect levels and each case must be considered on its merits. The NPSE does, however, emphasise that in dealing with noise Local Planning Authorities are required to take a balanced approach in considering the benefits of development as against any adverse effects which arise. Paragraph 2.18 of the NPSE is particularly relevant in this respect and states:

"There is a need to integrate consideration of the economic and social benefits of the activity or policy under examination with proper consideration of the adverse environmental effects, including the impact of noise on health and quality of life. This should avoid noise being treated in isolation in any particular situation, i.e. not focusing solely on the noise impact without taking into account other related factors."

The planning need is outside the scope of noise and acoustics and will need to be addressed by others.

3.3. National Planning Practice Guidance, Noise

The National Planning Practice Guidance (NPPG) on noise referred to here is based on the current version (January 2015) as provided on the Planning Guidance Website. It states that *"Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment."*

It provides generic guidance on how to determine the noise impact and what factors could be a concern. It includes the option types to mitigate any adverse effects of noise stating that there are four broad types of mitigation. These are engineering, layout, using planning conditions or obligations and noise insulation.

Paragraph 5 of the NPPG provides a table identifying the effect level and examples of effect relating to the impact effect levels provided in the NPSE. The table is duplicated below:

Table 1: NPPG Noise - Perception of effect levels

Perception	Examples of Outcomes	Increasing Effect Level	Action
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	

Perception	Examples of Outcomes	Increasing Effect Level	Action
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

The table does not provide any objective assessment which equates to the noted effect levels however the NPPG identifies that where noise is audible it is not necessarily intrusive. The effect and impact on people is based primarily on the level of noise.

4. Assessment Methodology

The following section identifies guidance which is considered to provide noise criteria equivalent to or below the LOAEL described in NPPG and NPSE, i.e. *"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."*

For industrial and commercial noise, the most relevant guidance is provided within BS 4142:2014+A1:2019. The methods described in the British Standard use outdoor sound levels to assess the likely effects of sound upon people who might be inside or outside a dwelling or other premises used for residential purposes.

The principle is that of establishing the 'difference' between the 'rating level' and the 'background sound level'. The 'rating level' is the 'specific sound level' of the source over a period of one hour during the day (07:00 to 23:00 hours) and over a period of 15 minutes during the night (23:00 to 07:00 hours). Clause 9 entitled 'Rating Level' states:

"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level."

An acoustic character correction should be added to the 'specific sound level' if it exhibits any tonality, impulsivity, other specific characteristics and/or intermittency at the assessment location. The value of the character correction varies, dependent on the prominence of the character of the sound source at the assessment location.

In Clause 11 of the Standard, entitled 'Assessment of the Impacts', it states:

"Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level (see Clause 8) from the rating level (see Clause 9), and consider the following."

- *Typically, the greater this difference, the greater the magnitude of the impact.*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- *A difference of around +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 sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."*

Based on the initial assessment outcomes of British Standard 4142, and depending on context, it is our opinion that the NOEL, LOAEL and SOAEL levels stated in the Noise Policy Statement for England would generally fall within the following categories when considered in conjunction with the effect levels of the NPPG Noise.

Table 2: BS4142 difference in relation to effect levels

BS4142 Assessment Difference	Corresponding Effect level*	Action*
≤-10 dB	No Observed Effect	No specific measures required
-9.9 dB to 0 dB	No Observed Adverse Effect	No specific measures required
	Lowest Observed Adverse Effect Level	
0.1 dB to 5 dB	Observed Adverse Effect	Mitigate and reduce to a minimum
	Significant Observed Adverse Effect Level	
5.1 dB to 10 dB	Significant Observed Adverse Effect	Avoid
≥10.1 dB	Unacceptable Adverse Effect	Prevent

*BS4142 states that “where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration”. Therefore, the assessment levels and effect levels above are not definitive and maybe modified in some instances due to context.

It should be noted that the numerical outcome only represents the initial estimate of impact, as stated in the first paragraph of Clause 11, and that contextual matters should be considered before determining what the potential impact is. This paragraph states:

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.

Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level (see Clause [8](#)) from the rating level (see Clause [9](#)).

NOTE 1 More than one assessment might be appropriate.

The second part of Clause 11 sets out three contextual matters that should be taken into account once the initial numerical estimate has been determined. It is important to note that the three listed is not exhaustive and all pertinent factors should be considered.

5. Baseline Noise Monitoring

A noise monitoring exercise was undertaken between the 13th and 16th of May 2022 to determine the baseline noise climate at a location representative of the noise sensitive dwellings.

5.1. Monitoring Equipment

Sound Pressure Levels were measured using an NTI XL2 Class 1 sound level analyser with half-inch condenser microphone, using the 'fast' setting.

The equipment is checked regularly using a Quality System meeting the requirements of British Standard EN ISO/IEC 17025:2017 entitled "General requirements for the competence of testing and calibration laboratories"; in accordance with British Standard EN 10012:2003 "Measurement management systems. Requirements for measurement processes and measuring equipment"; and traceable to the National Standards. This equipment was checked and calibrated as noted below.

Table 3: Monitoring equipment

Equipment Description / Manufacturer / Type	Serial number	Date of calibration	Calibration Certification Number
SLM, NTI, XL2	A2A-20250-E0	22/03/2022	34610
Pre-Amp, NTI, MA220	10592	22/03/2022	34610
Microphone, NTI, MC230A	A225696	22/03/2022	34609
Calibrator, Larson Davis, CAL200	19741	22/03/2022	44642

The measuring system was checked for calibration before and after the tests. No drift exceeding 0.2 dB was detected, which has no effect on the measured data.

5.2. Weather Conditions

The weather conditions are provided below during the survey:

Table 4: Weather conditions during daytime survey

Wind Speed (m/s)	Average Air Temperature (°C)	Precipitation (time/hrs)	Cloud Cover (%)
< 3	~ 15 to 18	0	~70 to 100

5.3. Monitoring Procedure

The meter was set to record 15-minute periods with a 1-second log. The monitoring location was located to the west opposite the dwellings to the west. The microphone was at an approximate height of 2.5 metres from the ground in a free-field position.

The baseline noise levels affecting the noise sensitive receivers in the area were determined primarily by road traffic along the surrounding highways and noise from the primary school to the north. The monitoring location is displayed in the figure below.

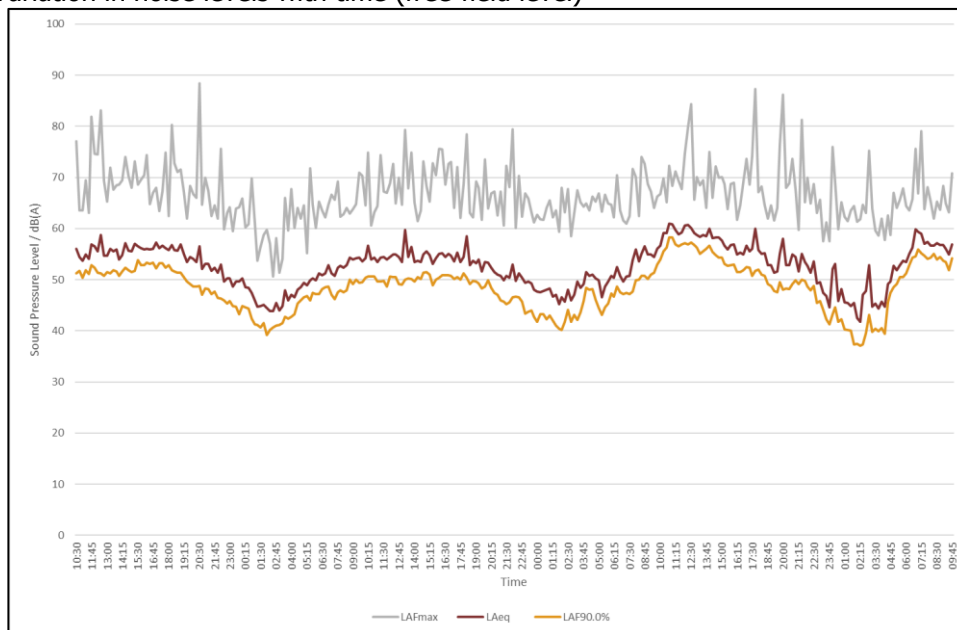
Figure 3: Monitoring Location



5.4. Measured Baseline Noise Levels

The full 15-minute A-weighted baseline background sound levels and equivalent noise levels are provided in Chart 1 below. The full tabular data is available upon request.

Chart 1: Variation in noise levels with time (free-field level)



From the measured data we have summarised and determined the design background sound levels and equivalent noise levels from the monitoring period.

Table 5: Summary of measured level (façade level)

Period	L _{A90,15min}		L _{Aeq,15min}	
	Range	Mode	Range	Mode
Day (07:00 - 23:00)	45-58	51	49-61	54
Night (23:00 - 07:00)	37-55	42	42-60	50

6. Plant Assessment

6.1. Proposed Plant

The proposed plant for the food store will be at roof level above the warehouse/delivery area.

We have been advised that the proposed plant is as follows. It should be noted that any changes to the following schedule, or changes to the location or layout of the plant units will affect the predicted levels at the receiver points around the site and, as such, would need reassessing.

Table 6: Plant Noise Data (serving store)

Plant type	No.	Sound Pressure Level (dBA)
Drycooler	2	42 @ 5m
VRF	3	62 @ 1m

For the detailed plant layout please see Appendix B.

6.2. Predicted Specific Sound Level

The plant noise emission has been modelled in the noise modelling software Cadna:A by DataKustik. Calculations are undertaken using the General Method of Calculation from ISO 9613. The parameters within the Cadna:A model are as follows and are considered reasonable assumptions:

- The store height is based on our experience of typical Lidl stores, the existing buildings in the surrounding area have been assumed to be 6 metres tall.
- The order of reflections is 3, and all buildings are reflective.
- The ground across the site and surrounding area is considered hard and reflective.
- The topography of the site is considered flat.
- The predictions are based on the supplied plant noise levels.
- The predictions are based on all plant operating continuously.
- The predicted noise map level is at a height of 4.5 metres.
- Noise mitigation is as per above.

A noise map of the predicted specific sound level of plant is provided below.

Figure 4: Predicted Plant Specific Sound Level, dB $L_{Aeq}(T)$



6.3. Estimate of Impact

In accordance with British Standard 4142:2014, a noise impact assessment has been undertaken.

6.3.1. Background Sound Level

We have determined a background sound level to be 42 dB $L_{A90,15min}$ during night-time hours, and 51 dB $L_{Aeq,1hour}$ during the day.

6.3.2. Specific Sound Level

The predicted specific sound level of plant is 39 dB $L_{Aeq,T}$ at the worst-case dwellings. This is the level with no character corrections applied.

6.3.3. Character Corrections

Character corrections should be added to the "specific sound level" if the "specific sound level" exhibits any *tonality*, *impulsivity*, *other specific characteristics* and/or *intermittency* at the assessment location. Based on our site visit the character corrections to be applied are as follows:

- *Tonality* – From our experience of other Lidl sites their new plant is not tonal however the supplier and installer should ensure any tonality is not distinguishable at the noise-sensitive receivers in the area.
- *Impulsivity* – Plant noise is not normally impulsive.
- *Intermittency* – We have assumed all plant is running continuously within our noise model. There is also existing plant affecting these dwellings, therefore any intermittency is likely to be of a similar character and a correction is not applicable.
- *Other Sound Characteristics* – We do not believe a character correction is necessary for other sound characteristics as the noise climate is currently determined by plant noise.

6.3.4. Estimate of Impact

Therefore, the British Standard 4142:2014 initial estimate at the most sensitive location is as follows:

Table 7: BS 4142:2014 initial estimate of impact

Parameter	Dwellings to the West	
	Day	Night
Background Level, $L_{A90,T}$	51 dB	42 dB
Specific Sound Level, $L_{Aeq,T}$	39 dB	
Acoustic Character Correction	+0 dB	
Rating Level, L_{Ar}	39 dB	
Excess of rating over background level	-12 dB	-3 dB

As such, the predicted level is an indication plant noise will have a low impact on the noise-sensitive receivers in the area.

6.4. Context

It should be noted that in all instances the context needs to be considered when determining the overall impact. British Standard 4142:2014 states:

"Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following.

6.4.1. Absolute Levels

- 1) *Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night. Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.*

With regard to 'absolute levels', the most relevant guidance is British Standard 8233:2014. Section 7.7.2 Table 4 of the British Standard provides internal ambient noise levels for dwellings. The guideline states that internal noise levels should not exceed 30 dB L_{Aeq} (8 hr) at night and 35 dB L_{Aeq} (16 hr) during the day.

The internal level is approximately 15 dB quieter than the external free-field level (as stated by the WHO) allowing for the attenuation of a partially open window. Therefore, based on the predicted rating levels noted above, the internal absolute levels are as follows.

Table 8: Comparison with British Standard 8233:2014 at Worst Case Receiver

Time	Predicted External Level dB(A)	Open Window Correction dB(A)	Predicted Internal Level dB(A)	Within Criteria
Daytime	39	-15	24	YES
Night-time		-15		YES

As can be seen from the table above, the plant rating sound level is at least 21 dB lower than the British Standard 8233:2014 criteria for night-time rooms and 26 dB lower than the criteria for daytime rooms. Therefore, we would consider plant noise to be suitably controlled to the dwellings in the vicinity when absolute levels are considered.

6.4.2. Residual Noise Levels

We should also consider the residual noise climate. British Standard 4142:2014 also states:

"2.) The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound, to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it."

We have compared the residual noise climate to the specific sound level. This is summarised below:

Table 9: Comparison with Residual Noise Climate

Parameter	Daytime dB	Night-time dB
Residual Sound Level $L_{Aeq,15min}$	54	50
Specific Sound Level $L_{Ar,15min}$	39	29
Difference	-15	-11

As can be seen, the plant specific sound level is considerably lower than the residual sound. We would consider the noise source will not result in an incongruous sound by comparison to the baseline residual climate.

6.5. Summary of British Standard 4142:2014 Assessment

As can be seen above, once context is considered and the noise impact of the plant is compared to the existing noise climate and internal noise levels compared to the relevant adopted guidance, then it is clear that plant noise will be acceptable when assessed to British Standard 4142:2014+A1:2019.

We would consider the noise impact of the proposed plant to fall below the Lowest Observed Adverse Effect Level (LOAEL) of the NPSE and NPPG during the daytime and, as such, achieves the aims of National Planning Policy Framework (NPPF).

7. Delivery Noise Assessment

7.1. Summary of Delivery Operation

The unloading, arrival and departure of the delivery vehicle has the potential to affect the receivers around the site.

We understand that the deliveries are contained to an articulated vehicle which includes a refrigerated section with condensing unit. The vehicle arrives on site and reverses up to the loading bay dock. The goods are moved internally from the trailer into the store. The goods are mostly on pallets and an electric pallet truck is used. The operation takes place internally and the vehicle departs after about one hour.

7.2. Delivery Noise Monitoring

Acoustic Consultants Limited have measured the delivery operation from Lidl food stores over a number of years, at a number of different sites. We have found that the noise level of a delivery operation does not vary significantly from site to site as the operation and site conditions are always the same. The measured noise levels of a typical Lidl delivery operation are as follows; these are free-field levels at a distance of 10 metres.

Table 10: Typical Delivery Operation Noise Emission

Duration, T (min)	$L_{Aeq,T}$ (dB)	Activity at 10m
5	61	HGV Arrive
60	57	HGV unloading
2	63	HGV Depart

7.3. Noise Control Measures

To control noise from the deliveries at the nearest NSR, it is required to limit deliveries to daytime only (07:00-23:00).

7.4. Delivery Operation Noise Predictions

Noise emission prediction calculations have been carried out for the potentially most sensitive locations to delivery noise (as stated above). The delivery operation has been modelled in the noise modelling software Cadna:A by DataKustik. The parameters within the Cadna:A model are as noted in Section 6.2 with the following amends.

- The predictions are based on the measured delivery noise emission levels noted above and the delivery times as detailed above.
- The assessment considers the worst-case 60 minute period during the day (as required for a BS4142:2014 assessment), this essentially comprises of the arrival, departure and unloading process in any hour.

- The delivery vehicle path has been based on reasonable assumptions and the vehicle speed is 15 mph.

A noise map of the delivery noise is provided in the figures below:

Figure 5: Arrival Delivery Noise Map (Day) dB $L_{Aeq}(1hr)$

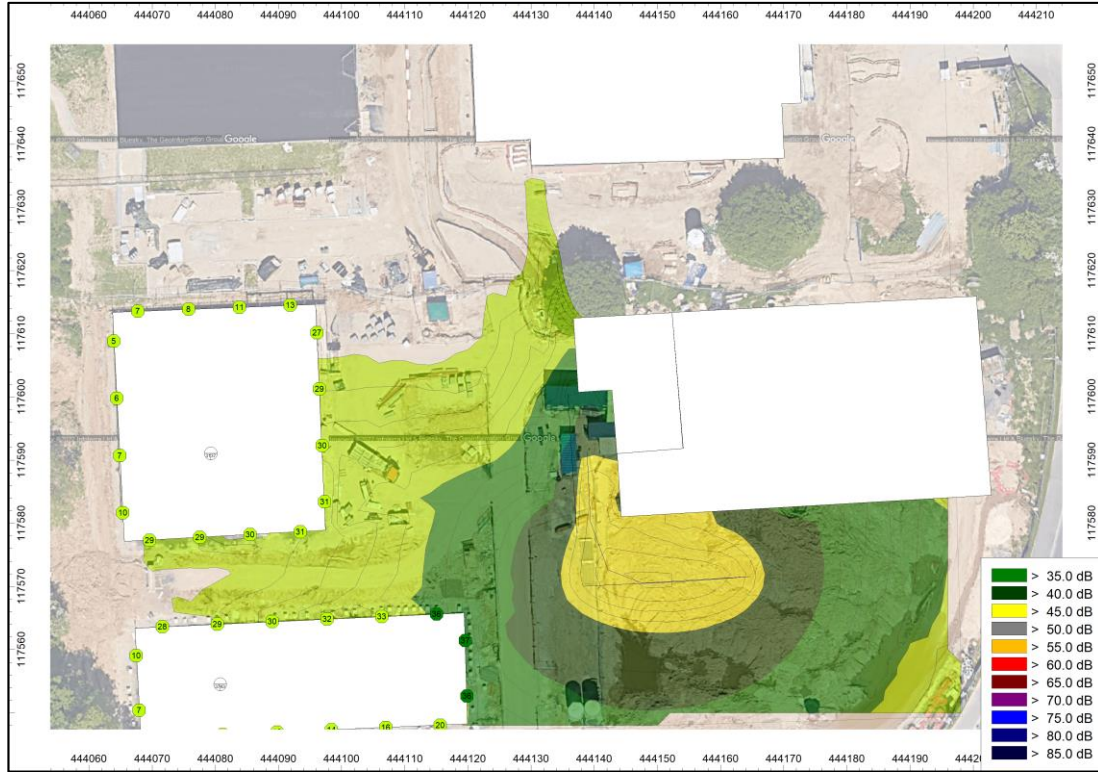


Figure 6: Arrival Delivery Noise Map dB (Night) $L_{Aeq}(15mins)$

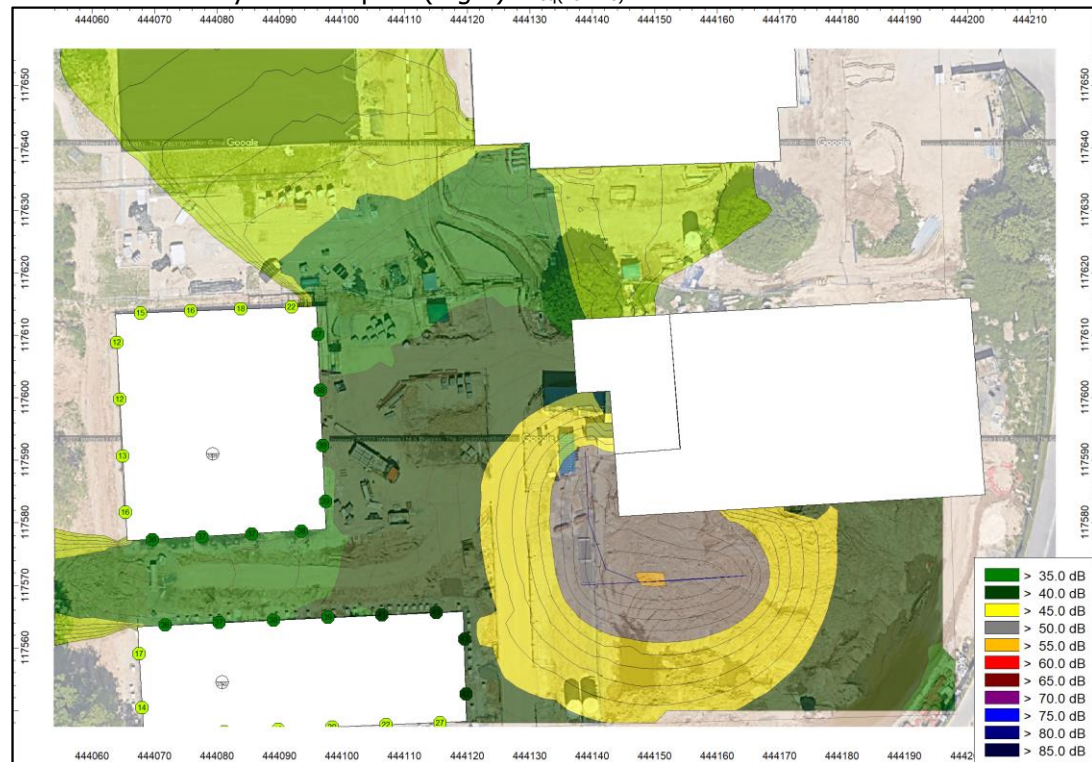


Figure 7: Unloading Delivery Noise Map dB $L_{Aeq}(1hr)$

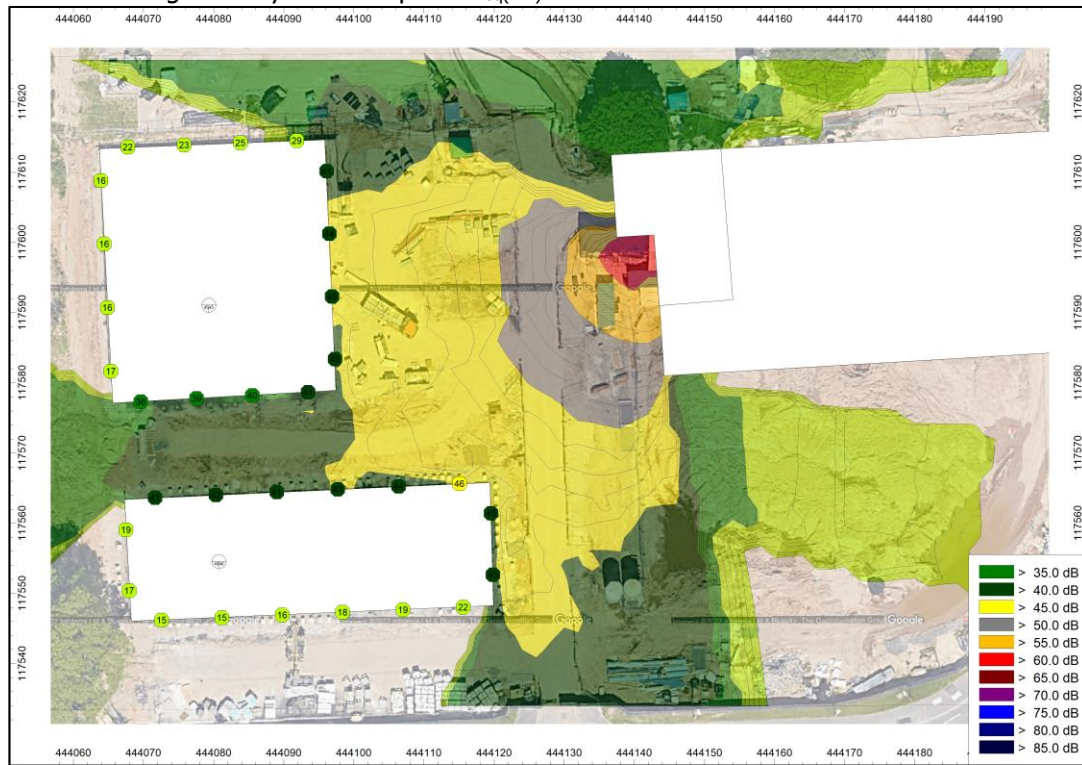


Figure 8: Departure Delivery Noise Map dB (Day) $L_{Aeq}(1hr)$

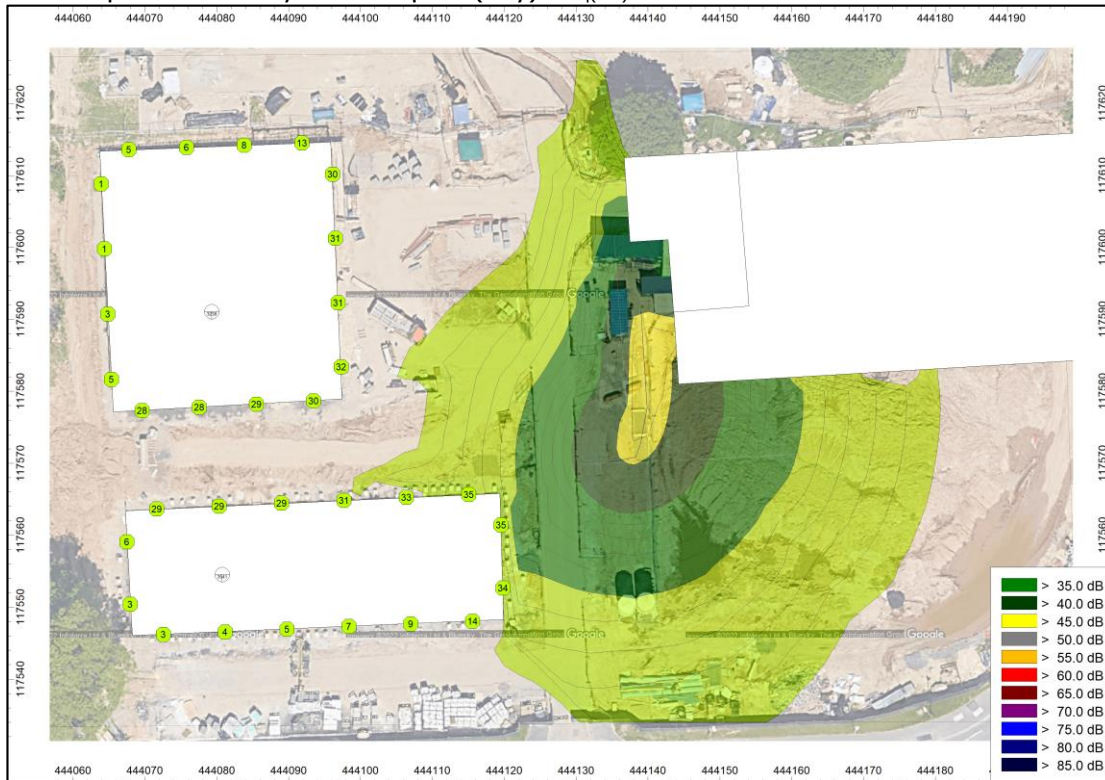
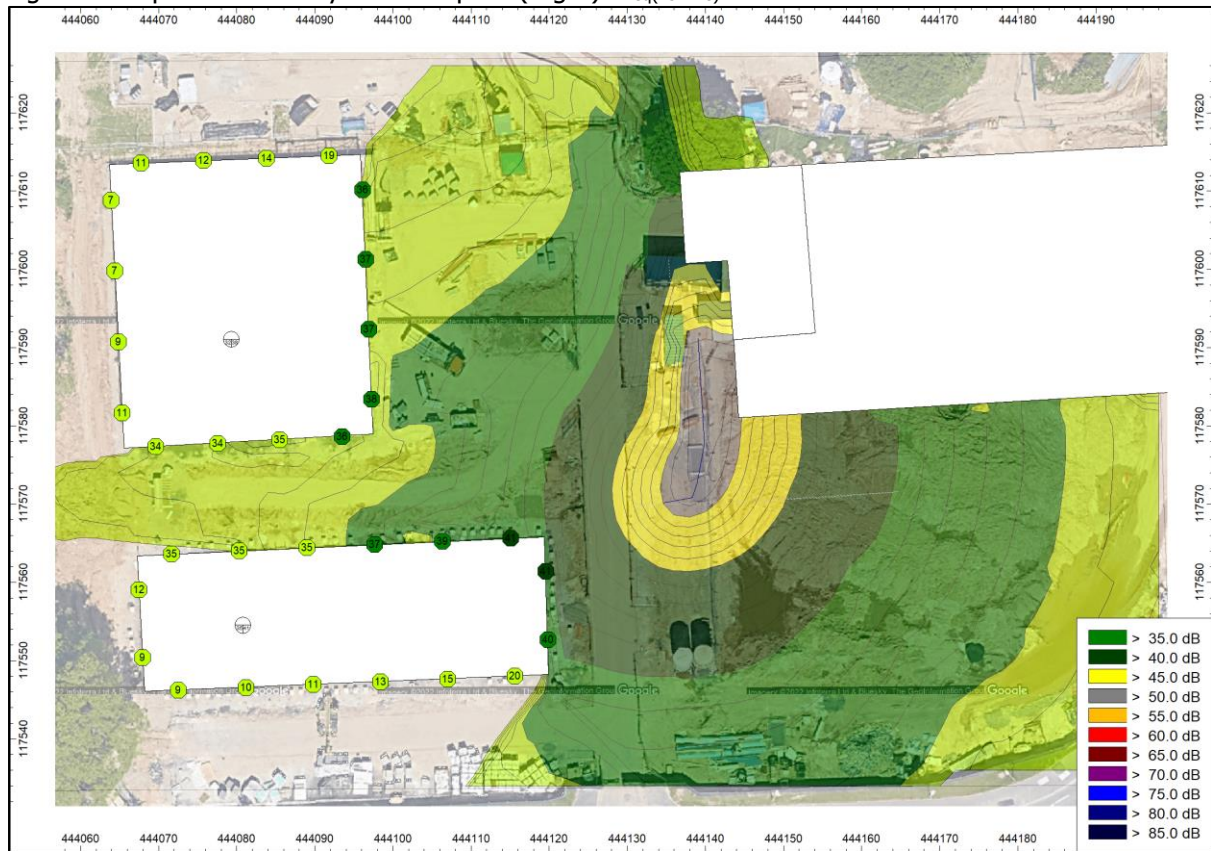


Figure 9: Departure Delivery Noise Map dB (Night) $L_{Aeq}(15mins)$



7.5. Estimate of Impact

It is considered appropriate to assess the impact of deliveries in accordance with the methodology of British Standard 4142:2014.

7.5.1. Background Sound Level

We have determined a background sound level to be 51 dB $L_{Aeq,1hour}$ during the day.

7.5.2. Specific Sound Level

The predicted specific sound level at the worst-case dwellings is as follows:

Table 11: Predicted Specific Sound Level, $L_{Aeq}(1hr)$

Parameter	Daytime Noise Level at Dwelling dBA	Night Time Noise Level at Dwelling dBA
Arrival	37	43
Departure	35	41
Unloading	46	46

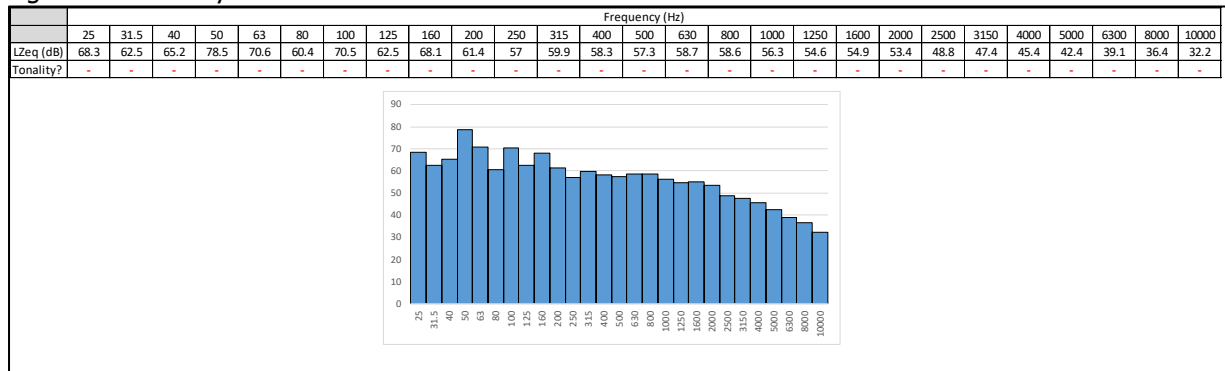
This is the level without character corrections applied.

7.5.3. Character Corrections

Character corrections should be added to the 'specific sound level' if it exhibits any *tonality, impulsivity, other specific characteristics and/or intermittency* at the assessment location. Based on our site visit and knowledge of such heating units, corrections to be applied are as follows:

Tonality – Lidl Delivery noise is not considered tonal in nature. The BS4142 tonality calculation is below for the Diesel Fridge 10m at a Lidl RDC. The fridges would be the source of any significant tone from a refrigerated HGV. As can be seen, there is no tonality present and a character correction is not required. It should be noted on most Lidl deliveries the Diesel fridges do not normally operate when a HGV arrives at a store as the ambient temperature of the trailer is sufficiently cooled at the RDC and on transport.

Figure 10: Tonality Calculation



Impulsivity – The unloading operation is normally impulsive. The BS4142 impulsivity assessment is as follows based on our delivery data at other Lidl sites and residual level at this site:

Figure 11: Impulsivity Calculation

	Daytime	Night-time
Predicted LAFmax at NSR	64	64
Residual at NSR	56	50
Predicted Prominence $P = 3\text{Log}(\text{onset rate}) + 2\text{Log}(\text{level change})$		
Onset Rate at NSR = (LAFmax - Residual)/Onset time	27	47
Level Change at NSR = LAFmax - Residual	8	14
Prominence	6	7
BS4142:2014+A1:2019 Impulsivity correction	2	4

Intermittency – The delivery operation is expected to last for the full duration with no on/off periods. As such no intermittency correction has been considered.

Other Sound - We also do not consider a character correction is necessary for intermittency or other sound characteristics.

7.5.4. Estimate of Impact

Therefore, the British Standard 4142:2014 initial estimate of the noise impact at the most sensitive locations is as follows:

Table 12: British Standard 4142:2014 Initial Estimate

Parameter	Noise Source	Day Noise Level dBA	Night Noise Level dBA
Background Sound Level, $L_{A90,T}$ dB	--	51	42
Specific Sound Level, $L_{Aeq,T}$ dB	Arrival	37	43
	Unloading	46	46
	Departure	35	-
Character correction, dB	Arrival	0	0
	Unloading	2	4
	Departure	0	0
Rating Sound Level $L_{Ar,T}$ dB	Cumulative	48	51
Difference between rating & background level, dB	--	-3	9

As such it is estimated that delivery noise during the daytime hours would be of a low impact, while over the night hours the impact would have an observed adverse effect. However, the context of the site and the receivers needs to be considered.

7.6. Context of Site

It should be noted that in all instances the context needs to be considered when determining the overall impact. British Standard 4142:2014 states:

"Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following.

7.6.1. Absolute Levels

- 1) Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night. Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.*

With regard to 'absolute levels', the most relevant guidance is British Standard 8233:2014. Section 7.7.2 Table 4 of the British Standard provides internal ambient noise levels for dwellings. The guidance states that internal noise levels should not exceed 35 dB L_{Aeq} (16 hr) during the day.

The internal level is approximately 15 dB quieter than the external free-field level (as stated by the WHO) allowing for the attenuation of a partially open window.

Therefore, based on the predicted rating levels noted above, the internal absolute levels are as follows.

Table 13: Comparison with British Standard 8233:2014 at Worst Case Receiver

Time	Predicted External Level dB(A)	Open Window Correction dB(A)	Predicted Internal Level dB(A)	Within Criteria
Daytime	48	-15	33	YES
Night Time	51	-15	36	NO

As can be seen from the table above, the delivery rating sound level is 11 dB lower than the British Standard 8233:2014 criteria for daytime rooms but exceeds the night time criteria by 6 dB. Therefore, we would consider delivery noise to be suitably controlled to the dwellings in the vicinity during day time hours only and when the absolute levels are considered.

7.6.2. Residual Noise Levels

We should also consider the residual noise climate. British Standard 4142:2014 also states:

"2.) The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound, to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it."

We have compared the residual noise climate, i.e. the ambient sound at the assessment location when the specific sound source (deliveries) is suppressed to such a degree that it does not contribute to the ambient sound, to the specific sound level (deliveries) and rating level (delivery noise level with character correction applied). This is summarised below:

Table 14: Comparison with Residual Noise Climate

Parameter	Daytime dB	Night time dB
Residual Sound Level $L_{Aeq,15min}$	56	50
Rating Sound Level $L_{Ar,15min}$	48	51
Difference	-3	+1

As can be seen, the delivery rating sound level (with character) is lower than the residual sound during the day. We would consider the noise source will not result in an incongruous sound by comparison to the baseline residual climate during the day period only.

7.7. Summary of British Standard 4142:2014 Assessment

As can be seen above, once context is considered and the noise impact of the deliveries is compared to the existing noise climate and internal noise levels compared to the relevant adopted guidance, then it is clear that delivery noise will be acceptable over the day period only (07:00-23:00) when assessed to British Standard 4142:2014+A1:2019.

We would consider the noise impact of the proposed daytime deliveries to fall below the Lowest Observed Adverse Effect Level (LOAEL) of the NPSE and NPPG during the daytime and, as such, achieves the aims of National Planning Policy Framework (NPPF).

8. Summary & Conclusions

Lidl appointed Acoustic Consultants Ltd to undertake a noise impact assessment in relation to the proposed food store at Stoneham Lane, Eastleigh.

This report predicts the noise impact from the plant and delivery operations associated with the new store on the residential properties in the area.

The noise impact assessment has been undertaken in accordance with the guidance in the National Planning Policy Framework (NPPF), Noise Policy Statement for England (NPSE), National Planning Practice Guidance (NPPG) and British Standard 4142:2014+A1:2019 (BS4142).

Based on the survey and modelling results, the noise assessment clearly indicates that the impact of plant would be low at the sensitive receivers in the area, and therefore acceptable.

The noise assessment indicates deliveries need to be limited to daytime hours only, with daytime deliveries, delivery noise is acceptable.

We would consider the noise impact of the proposed Lidl development to fall below the Lowest Observed Adverse Effect Level (LOAEL) of the NPSE and NPPG and, as such, achieves the aims of National Planning Policy Framework (NPPF).

9. Appendix A – Glossary of Acoustic Terminology

A-weighted sound pressure p_A – value of overall sound pressure, measured in pascals (Pa), after the electrical signal derived from a microphone has been passed through an A-weighting network

A-weighted sound pressure level, L_{pA} – quantity of A-weighted sound pressure given by the following formula in decibels (dBA)

$$L_{pA} = 10 \log_{10} (p_A/p_0)^2$$

where:

p_A is the A-weighted sound pressure in pascals (Pa);
 p_0 is the reference sound pressure (20 μ Pa)

Background sound level, $L_{A90,T}$ – A-weighted sound pressure level that is exceeded by the residual sound assessment location for 90% of a given time interval, T, measured using weighting F and quoted to the nearest whole number of decibels

Break-in - noise transmission into a structure from outside.

Decibel (dB) – The decibel is the unit used to quantify sound pressure levels. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro-Pascals to 100 Pascals). Therefore, a logarithmic scale is used to describe sound pressure levels and also sound intensity and power levels. The logarithms are taken to base 10. Hence an increase of 10 dB in sound pressure level is equivalent to an increase by a factor of 10 in the sound pressure level (measured in Pascals). Subjectively, this increase would correspond to a doubling of the perceived loudness of sound.

Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$ – value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, $T = t_2 - t_1$, has the same mean-squared sound pressure as a sound that varies with time, and is given by the following equation:

$$L_{Aeq,T} = 10 \log_{10} \left\{ (1/T) \int_{t_1}^{t_2} [p_A(t)^2/p_0^2] dt \right\} \quad (1)$$

where:

p_0 is the reference sound pressure (20 μ Pa); and
 $p_A(t)$ is the instantaneous A-weighted sound pressure (Pa) at time t

NOTE The equivalent continuous A-weighted sound pressure level is quoted to the nearest whole number of decibels.

Facade level – sound pressure level 1 m in front of the façade. Facade level measurements of L_{pA} are typically 1 dB to 3 dB higher than corresponding free-field measurements because of the reflection from the facade.

Free-field level – sound pressure level away from reflecting surfaces. Measurements made 1.2 m to 1.5 m above the ground and at least 3.5 m away from other reflecting surfaces are usually regarded as free-field. To minimize the effect of reflections the measuring position has to be at least 3.5 m to the side of the reflecting surface (i.e. not 3.5 m from the reflecting surface in the direction of the source).

Octave and Third Octave Bands – The human ear is sensitive to sound over a range of frequencies between approximately 20 Hz to 20 kHz and is generally more sensitive to medium and high frequencies than to low frequencies within the range. There are many methods of describing the frequency content of a noise. The most common methods split the frequency range into defined bands, in which the mid-frequency is used as the band descriptor and in the case of octave bands is double that of the band lower. For example, two adjacent octave bands are 250 Hz and 500 Hz. Third octave bands provide a fine resolution by dividing each octave band into three bands. For example third octave bands would be 160 Hz, 250 Hz, 315 Hz for the same 250 Hz octave band.

Sound pressure level – Sound pressure level is stated on many of the charts. It is the amplitude of the acoustic pressure fluctuations in a sound wave, fundamentally measured in Pascals (Pa), typically from 20 micro-Pascals to 100 Pascals, but commonly simplified onto the decibel scale.

Sound reduction index, R – laboratory measure of the sound insulating properties of a material or building element in a stated frequency band.

Specific sound level, $L_s = L_{Aeq,T_r}$ – equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r .

Structure-borne noise – audible noise caused by the vibration of elements of a structure, the source of which is within a building or structure with common elements

Rating level, L_{A_r,T_r} – Specific sound level plus any adjustment for the characteristic features of the sound.

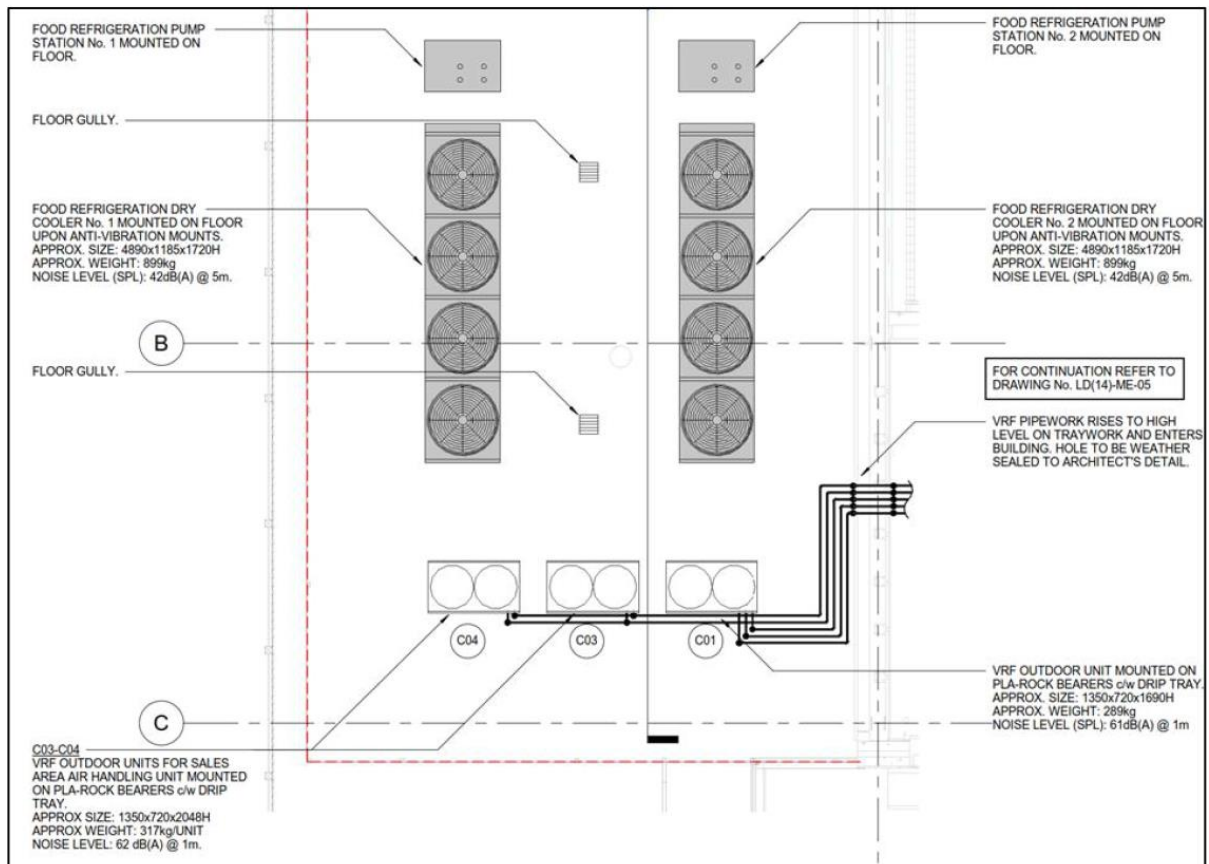
Reverberation Time, T – The reverberation time is defined as the time taken for a noise level in an enclosed space to decay by 60 dB from a steady level, once the noise source has stopped. It is measured in seconds. Often a 60 dB decay cannot be measured so the reverberation time is measured over a lesser range and corrected back to the time for a 60 dB drop assuming a constant decay rate. Common parameters are T20 (time taken for a 20 dB decay multiplied by three) and T30 (time taken for a 30 dB decay multiplied by two).

Vibration Dose Value, VDV – measure of the total vibration experienced over a specified period of time.

Estimated Vibration Dose Value, $eVDV$ – estimation of the total vibration experienced over a specified period of time. This is usually based on the number of events and shortened measurement data.

Weighted sound reduction index, R_w – Single-number quantity which characterizes the airborne sound insulating properties of a material or building element over a range of frequencies. The weighted sound reduction index is used to characterize the insulation of a material or product that has been measured in a laboratory (see BS EN ISO 717-1).

10. Appendix B – Plant Layout





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