ACOUSTIC CONSULTANTS LTD

Noise Impact Assessment

Lidl, Ickenham Road
Ruislip

Reference: 10890/BL

Client:


Document Control

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1.0	First Issue	23/05/2024	Blake Lucas	Daniel Oldaker	Blake Lucas
RevA	BBS Plant included	29/05/2024	Blake Lucas	Daniel Oldaker	Blake Lucas
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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, acoustic, and vibration aspects as included in this report. We provide advice only in relation to noise, vibration 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 appointed Acoustic Consultants Limited to undertake a noise impact assessment for the proposed Lidl store at Ickenham Road, Ruislip.

This report provides a noise assessment of both plant and delivery operations on the nearby sensitive receivers around the site.

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), Planning Practice Guidance (PPG) and British Standard 4142:2014+A1:2019 (BS4142).

The author of this report is a Full Member of the Institute of Acoustics (MIOA) with over 17 years of experience within the field of noise and acoustics.

2. The Site

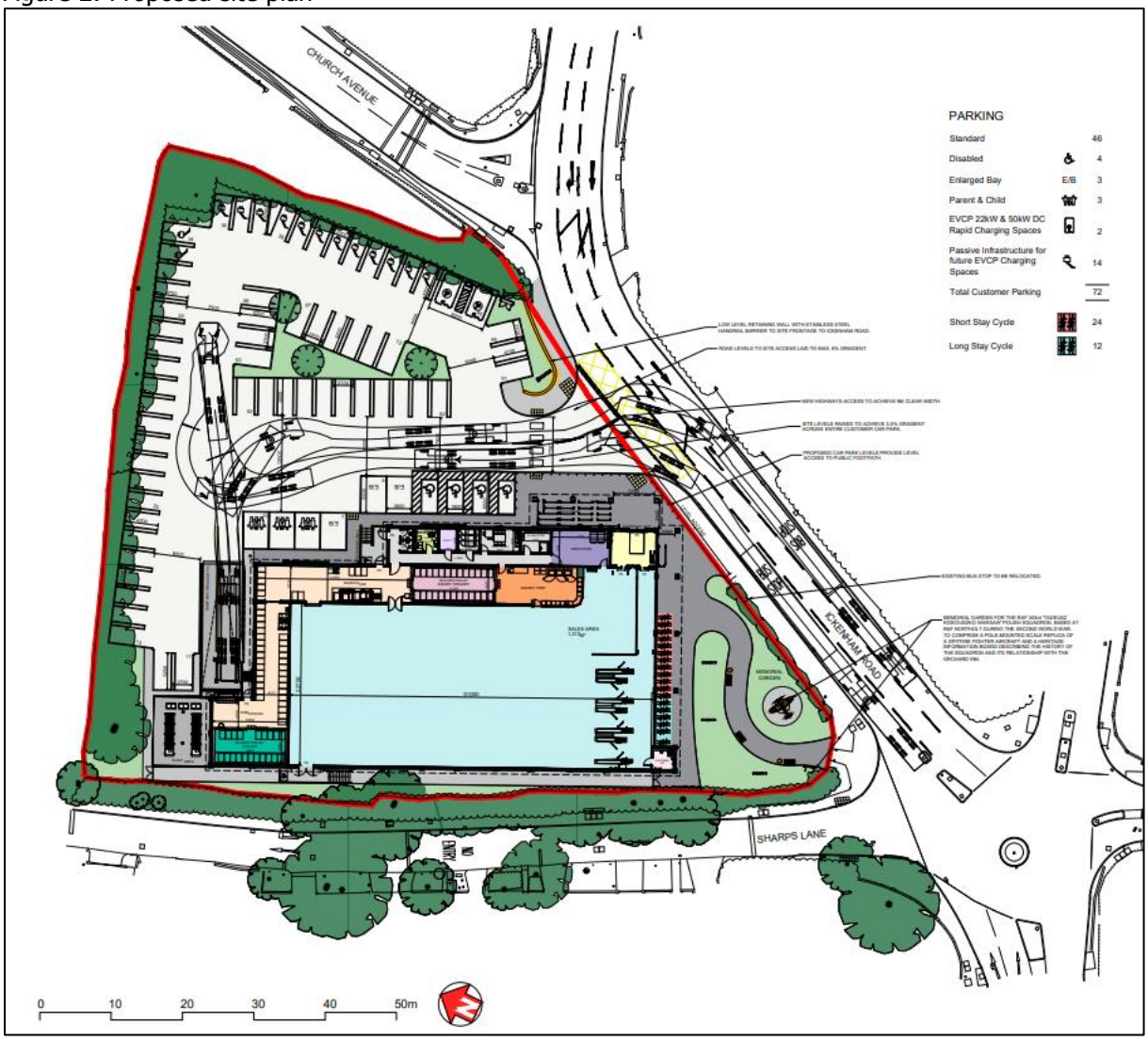
The proposed site is located in Ickenham Road, Ruislip, near the roundabout between Ickenham Road and Sharps Lane.

The site is located within a residential area and surrounded by residential dwellings to all sides. The most sensitive receivers to noise from the site are those to the north adjacent to the plant and delivery area.

The existing noise climate in the area consists mainly of road traffic noise. The proposed site location and the proposed site plan are provided below:

Figure 1: Proposed site location (red area)

Figure 2: Proposed site plan



3. Planning and Noise

3.1. National Planning Policy Framework

The National Planning Policy Framework (NPPF) was published in March 2012 and revised in December 2024. Section 15 entitled 'Conserving and enhancing the natural environment' addresses noise as a requirement of planning. Paragraph 187 states:

"187. 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; and."

Paragraph 198 states:

"198. 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. "

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

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. Planning Practice Guidance, Noise

The Planning Practice Guidance (PPG) on noise referred to here is based on the current version (January 2019) 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 PPG 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: PPG Noise – Perception of Effect Levels

Perception	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

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

4. Assessment Criteria

4.1. **BS4142:2014+A1:2019**

The following section identifies guidance which is considered to provide noise criteria equivalent to or below the LOAEL described in the PPG 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 British Standard 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 initial estimate 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 BS4142, 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 PPG 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 can be modified 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. BS 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.

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.*

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.*

   NOTE 3 Consideration ought to be given to evidence on human response to sound and, in particular, industrial and/or commercial sound where it is available. A number of studies are listed in the "Effects on humans of industrial and commercial sound" portion of the "Further reading" list in the Bibliography.

4.2. London Borough of Hillingdon

The Supplementary Planning Document (SPD) Development Control for Noise Generating and Noise Sensitive Development provides the following noise criteria relating to the rating level of proposed Industrial, commercial premises or plant:

Figure 3: Noise criteria from the London Borough of Hillingdon SPD

Noise Impact From Relevant Proposed Industrial Or Commercial Premises Or Plant	Development Outcome
Rating Level (LAr,Tr) is at least 5 dB(A) below the Background Level LA90	Normally acceptable
Rating level (LAr,Tr) is no more than 5 dB(A) above the Background Level LA90	Acceptable only if there are overriding economic or social reasons for development to proceed
Rating level (LAr,Tr) is more than 5 dB(A) above the Background Level LA90	Normally unacceptable

Note: All terms as defined in BS4142

5. Baseline Noise Monitoring

A baseline noise survey was undertaken to determine the background sound levels at the nearest dwellings to the proposed development.

5.1. Monitoring Equipment

Sound Pressure Levels were measured using a Class 1 sound level meter with a 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 "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 and the certificates are available for inspection.

Table 3: Monitoring equipment

Equipment Description	Serial Number	Date of Calibration	Calibration Certification Number
SLM, NTI, XL2	A2A-19376-E0	23/06/2023	UK-23-070
Pre-Amp, NTI, MA220	8322	23/06/2023	UK-23-070
Microphone, NTI, MC230A	A20671	23/06/2023	UK-23-070
Larson Davies, CAL 200	18914	23/06/2023	45100

The measuring systems were checked for calibration before and after the tests and no drift exceeding 0.1 dB was detected.

5.2. Weather Conditions

The weather conditions were as follows and are not considered to havre adversely affected the survey data:

Table 4: Noise Survey Weather Conditions

Date	Temperature (°C)	Precipitation (mm)	Average Wind Speed (m/s)	Wind Speed Range (m/s)	Wind Direction
May 9, 2024	High: 18°C, Low: 10°C	0 mm	3.3 m/s	2.5 - 4.2 m/s	West
May 10, 2024	High: 18°C, Low: 7°C	0 mm	3.9 m/s	2.8 - 5.0 m/s	West
May 11, 2024	High: 17°C, Low: 9°C	1 mm	4.2 m/s	3.1 - 5.3 m/s	Southwest
May 12, 2024	High: 19°C, Low: 12°C	2 mm	4.4 m/s	3.3 - 5.6 m/s	Southwest
May 13, 2024	High: 19°C, Low: 12°C	3 mm	5.0 m/s	3.9 - 6.1 m/s	Southwest

5.3. Monitoring Procedure

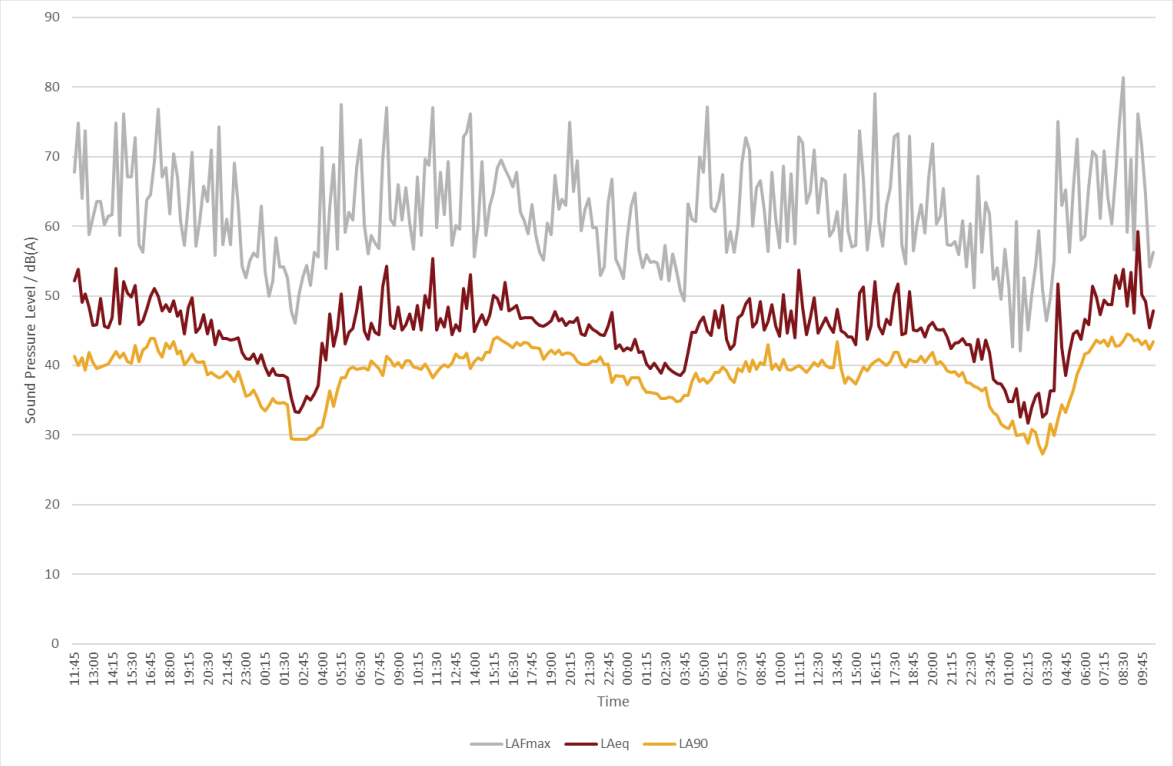
A long-term noise survey was undertaken between the 9th to 13th May 2024. The microphone was located on a tripod approximately 1.5m above ground, in a free-field position. The noise climate at this location is considered representative of the dwellings in the area. The monitoring location can be seen on the figure below:

Figure 4: Monitoring location

5.4. Measured Noise Levels

The chart below details the measured equivalent, background, and maximum noise levels over the duration survey period.

Chart 1: Measured equivalent, background, and maximum noise levels over time



The following range and modal background sound levels are provided in the table below along with the equivalent noise level (residual sound level):

Table 5: Summary of Measured Levels

Period	$L_{A90,15min}$		$L_{Aeq,15min}$	
	Range	Mode	Range	Typical
Day (07:00 - 23:00)	37 - 45	40	41 - 59	46
Night (23:00 - 07:00)	27 - 44	38	32 - 52	42

From the measured data we have determined the representative background sound levels during the day (07:00 to 23:00 hours) and night (23:00 to 07:00 hours) to be 40 dB $L_{A90,1hr}$ and 38 dB $L_{A90,15min}$ respectively.

6. Plant Assessment

6.1. Proposed Plant

The proposed plant for the food store will be on an outdoor plant area to the west of the warehouse 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. The installed plant should not exceed the below sound power levels. If it does, then a further assessment will be necessary. It is the responsibility of the client to ensure this information is correct.

Table 6: Plant Noise Data

Plant type	No.	Sound Power Level (dBA)
Dry cooler	2	69
CU- 1 Warehouse	1	76
CU- 2 Back of House	1	68
CU- 4 AHU DX Coil Circuit 1-2	1	81
CU- 5 AHU DX Coil Circuit 3-4	1	81

6.2. Noise Control Measures

The proposed plant will require an acoustic enclosure covering the walls and top of the units. The enclosure should achieve the following sound reduction per unit type:

Table 7: Plant Noise Control Measures

Plant type	No.	Maximum Sound Power Level per unit (dBA)[1]	Attenuation required per unit (dBA) [2]
Dry cooler	2	59	10
CU- 1 Warehouse	1	56	20
CU- 2 Back of House	1	53	15
CU- 4 AHU DX Coil Circuit 1-2	1	56	25
CU- 5 AHU DX Coil Circuit 3-4	1	56	25

[1] The supplier of the enclosure should ensure the maximum sound power level above is met when the plant is housed within the acoustic enclosure.

[2] We have not been issued octave band sound power level data for the plant. The supplier of the enclosure should ensure the attenuation is met based on the octave band sound power level of the plant.

6.3. **Noise Modelling**

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 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.
- Building evaluations indicate the maximum noise level at each façade.
- Plant noise is mitigated and designed to do not exceed the maximum sound power levels as noted in Table 7 above.

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

Figure 5: Predicted Plant Specific Sound Level, dB $L_{Aeq(1hour)}$

6.4. Estimate of Impact

A noise impact assessment in accordance with British Standard 4142:2014+A:2019 has been undertaken.

6.4.1. Background Sound Level

From the measured data we have determined the representative background sound levels during the day (07:00 to 23:00 hours) and night (23:00 to 07:00 hours) to be 40 dB $L_{A90,1hr}$ and 38 dB $L_{A90,15min}$ respectively.

6.4.2. Specific Sound Level

The predicted specific sound level of plant is 33 dB $L_{Aeq,T}$ at the most noise-sensitive dwellings. This is the level with no character corrections applied.

6.4.3. 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.
- *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.

6.4.4. Estimate of Impact

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

Table 8: BS 4142:2014 initial estimate of impact

Parameter	Dwellings to the North	
	Day	Night
Background Level, $L_{A90,T}$	40 dB	38 dB
Specific Sound Level, $L_{Aeq,T}$	33 dB	
Acoustic Character Correction	+0 dB	
Rating Level, L_{Ar}	33 dB	
Excess of rating over background level	-7 dB	-5 dB

Predicted rating levels at the nearby noise-sensitive receivers result in a difference of -7 dB during the day, and -5 dB during the night. This indicates that the cumulative plant noise level will have low impact when assessed to BS4142:2014+A1:2019 during the daytime and night-time and is also within the councils criteria.

However, context also needs to be considered.

6.5. 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.

6.5.1. 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 9: 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	33	-15	18	YES
Night-time		-15		YES

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

6.5.2. 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 typical residual noise climate to the specific sound level. This is summarised below:

Table 10: Comparison with Residual Noise Climate

Parameter	Daytime dB	Night-time dB
Residual Sound Level $L_{Aeq,15min}$	46	42
Specific Sound Level $L_{Aeq,15min}$	33	33
Difference	-13	-11

As can be seen, the plant rating 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.

6.6. Summary of British Standard 4142:2014 Assessment

As can be seen above, once mitigation is installed 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 PPG and, as such, achieves the aims of National Planning Policy Framework (NPPF).

This cumulative plant noise level will also be within the councils criteria.

7. Delivery Noise Assessment

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

7.1. Summary of Delivery Operations

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.

At this site, the vehicle will access and exit the parking area via Lady Ln to the east of the site. The unloading, arrival and departure of the delivery vehicle has the potential to affect the residential receivers around the site.

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 process and site conditions are consistent.

The measured noise levels of a typical Lidl delivery operation are as follows; these are free-field levels at a distance of 10 metres. The measured levels include reflections off the store building.

Table 11: 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

The proposed deliveries will need to be controlled to ensure the dwellings are not adversely affected. It is advised:

- Deliveries are restricted to daytime hours only (7am-11pm)
- A 3m high barrier is installed along the edge of the delivery bay as shown in blue in the noise model below.

7.4. **Noise Modelling**

Noise emission predictions have been carried out for delivery noise. The delivery operation has been modelled in the noise modelling software Cadna:A by DataKustik. All modelling parameters are as Section 6.2, except for the following:

- The predictions are based on the measured delivery noise emission levels noted above.
- The assessment considers the worst-case 1 hour period (as required for a daytime BS4142:2014 assessment).
- The delivery vehicle path has been based on reasonable assumptions and the vehicle speed is 10 mph.

The following noise maps display the predictions of noise propagation across the site due to the different delivery operations.

Figure 6: Day-time noise map of delivery vehicle arrival ($L_{Aeq,1hour}$, 4.5 metre height)

Figure 7: Noise map of unloading activity ($L_{Aeq,T}$, 4.5 metre height)

Figure 8: Day-time noise map of delivery vehicle departure ($L_{Aeq,1}$ hour, 4.5 metre height)

7.5. Estimate of Impact

A noise impact assessment in accordance with British Standard 4142:2014+A:2019 has been undertaken.

7.5.1. Background Sound Level

From the measured data we have determined the representative background sound levels during the day (07:00 to 23:00 hours) to be 40 dB $L_{A90,1hr}$.

7.6. Specific Sound Level

The predicted specific sound level of the delivery operation (including vehicle movements and unloading) is as follows:

Table 12: Predicted Specific Sound Level, $L_{Aeq,T}$

Parameter	Specific Sound Levels at the nearest NSRs
Arrival	40
Unloading	41
Departure	40
Cumulative	45

The cumulative level (arrival, unloading and departure over the fullone-hour assessment period during the day) will be considered in this assessment.

7.7. Character Corrections

Character corrections should be applied to the specific sound level if the noise source is expected to exhibit tonality, intermittency, impulsivity or any other sound characteristic at the noise-sensitive receiver. The character corrections are as follows.

7.7.1. Impulsivity

Impulsivity has been calculated based on our measurements of unloading noise on Lidl sites, the residual level at the noise-sensitive receivers and the methodology of Annex E of British Standard 4142:2014.

Based on the predicted maximum noise level of the unloading operation only (i.e. no vehicle movements, as vehicle movements are not considered impulsive) at the worst-case dwellings and the typical residual noise levels at the site, the following correction applies:

Figure 9: Impulsivity Correction

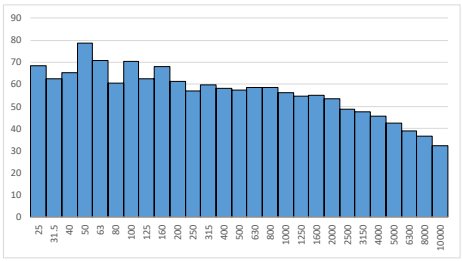
Day Unloading Specific level	40
Daytime	
Predicted LAFmax at NSR	58
Residual at NSR	46
Predicted Prominence P = 3Log(onset rate) + 2Log(level change)	
Onset Rate at NSR = (LAFmax - Residual)/Onset time	40
Level Change at NSR = LAFmax - Residual	12
Prominance	7
BS4142:2014+A1:2019 Impulsivity correction	**4**

7.7.2. Tonality

We do not consider a character correction is necessary for tonality. 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.

Figure 10: Tonality Calculation

	Frequency (Hz)																											
	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
LZeq (dB)	68.3	62.5	65.2	78.5	70.6	60.4	70.5	62.5	68.1	61.4	57	59.9	58.3	57.3	58.7	58.6	56.3	54.6	54.9	53.4	48.8	47.4	45.4	42.4	39.1	36.4	32.2
Tonality?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



It should be noted on most Lidl deliveries the Diesel fridges do not operate when a HGV arrives as the ambient temperature of the trailer is sufficiently cooled on at the RDC and on transport.

7.7.3. Intermittency and Other Sound Characteristics

We do not consider a character correction is necessary for intermittency, tonality or other sound characteristics.

7.7.4. Estimate of Impact

Therefore, the British Standard 4142:2014 initial estimate of impact is as follows:

Table 13: Initial Estimate of Impact

Parameter	Dwellings to the East
Background Level, $L_{A90,T}$	40
Specific Sound Level, $L_{Aeq,T}$	45
Acoustic Character Correction	+4
Rating Level, L_{Ar}	49
Excess of rating over background level	+9

This means that the delivery rating noise level will result in a British Standard 4142:2014+A1:2019 assessment 'difference' of +9 dB during the day.

This demonstrates that the delivery noise maybe of adverse impact. However, context needs to be considered.

7.8. Context of Site

7.8.1. Absolute Levels

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.

> *"1) The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low. Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night. 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 from noise sources 'without a specific character' and are based on existing guidelines issued by the World Health Organisation in 1999. We would advise the rating level is considered to allow for the character of the source.

The guideline states that noise levels should not exceed 35 dB $L_{Aeq(16hr)}$ within living rooms during the daytime and 30 dB $L_{Aeq(8hr)}$ within night-time rooms.

As the delivery has character, the level with a character correction (rating level) should be considered (to the L_{Aeq} only) to allow for the fact it is not anonymous noise. In addition, time correction from a short term L_{Aeq} to long term 16 hr/8hr level is not considered representative of the overall impact and therefore no time correction is applied. This is a worse case impact.

The internal level is approximately 15 dB(A) 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 above, the worst-case absolute level assessment is follows.

Table 14: Absolute level assessment

Time Period	Predicted External Level dB $L_{Ar,1hour}$	Open Window Correction dB(A)	Predicted Internal Level dB $L_{Ar,1hour}$	Within Criteria
Day (07:00 – 23:00)	49	-15	34	YES

As can be seen from the table above, the delivery rating sound level is within the BS8233:2014 criteria during daytime hours. Therefore, we would consider delivery noise to be of a low impact at all noise-sensitive receivers when compared to the absolute level criteria.

7.8.2. Residual Levels

British Standard 4142:2014 also states:

"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 (delivery noise) and rating level (delivery noise level with character correction applied).

This is summarised below:

Table 15: Comparison to Residual Sound Levels

Parameter	Daytime (07:00 – 23:00)
Residual Sound Level dB $L_{Aeq,15min}$	46 dB $L_{Aeq(15\ minutes)}$
Specific Sound Level dB $L_{Aeq,15min}$	45 dB $L_{Aeq(1\ hour)}$

As can be seen, the rating sound level is 1 dB below the typical residual sound level at the nearest noise sensitive receivers during the daytime hours. We would consider the noise source would not be dominant over the residual noise climate.

Therefore, we would consider delivery noise to be of a low impact at all noise-sensitive receivers when compared to the residual noise climate.

7.9. Summary of Assessment

From the assessment it can be concluded that the deliveries would be considered acceptable for the daytime period only (07:00-23:00 hours).

We would consider the noise impact of the proposed unloading and vehicle movements associated with deliveries to the Lidl food store to fall below the Low Observed Adverse Effect Level (LOAEL) of the PPG and NPSE during daytime hours only.

8. Summary and Conclusions

Lidl appointed Acoustic Consultants Limited to undertake a noise impact assessment for the proposed Lidl store at Ickenham Road, Ruislip.

This report provides a noise assessment of both plant and delivery operations on the nearby sensitive receivers around the site.

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), Planning Practice Guidance (PPG) and British Standard 4142:2014+A1:2019 (BS4142).

As can be seen above, comparing the noise impact of the plant with the measured background noise levels at the NNSRs, it is clear that plant noise will have a low impact and will be acceptable when assessed to British Standard 4142:2014+A1:2019. This is subject to mitigation being installed.

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

From the assessment it can be concluded that the deliveries would be considered acceptable for the daytime period only (07:00-23:00 hours).

We would consider the noise impact of the proposed unloading and vehicle movements associated with deliveries to the Lidl food store to fall below the Low Observed Adverse Effect Level (LOAEL) of the PPG and NPSE during daytime hours only.

9. Appendix 1 – Glossary of Acoustic Terminology

A-weighted sound pressure pA – 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 µPa)

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 = t2 – t1, has the same mean-squared sound pressure as a sound that varies with time, and is given by the following equation:

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

where:

p_0 is the reference sound pressure (20 µPa); 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, $L_s = L_{Aeq,Tr}$ – 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, $L_{Ar,Tr}$ – 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).

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