

PROPOSED NEW LIDL STORE, RETAIL UNITS & DRIVE-THRU NOISE IMPACT ASSESSMENT

Brookside Road, Uttoxeter

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1.0 Introduction

Lidl UK GmbH (Lidl) has appointed SLR Consulting Limited (SLR) to undertake a noise impact assessment for a proposed new foodstore, two retail units and a drive-thru restaurant located on Brookside Road in Uttoxeter ('the proposed development').

The assessment for the proposed development has been conducted in accordance with the requirements of East Staffordshire Borough Council (ESBC) and the guidance contained in British Standard 4142:2014 *Methods for rating and assessing industrial and commercial sound*.

Further to this, the assessment also refers to British Standard BS8233:2014, *Guidance on sound insulation and noise reduction for buildings*, with respect to noise levels for indoor living areas during daytime and night-time periods. The stated limits in BS8233:2014 mirror those prescribed in the World Health Organisation (WHO) 1999: *Guidelines for Community Noise*.

The assessment is based on background sound measurements and associated observations at the nearest noise-sensitive locations to the proposed development during representative daytime and night-time periods.

The assessment considers the suitability of the site for its proposed use in terms of the potential impact of noise generated by the proposed new foodstore, two retail units and drive-thru restaurant on the sensitive receptors close to the site.

The predictions in this assessment have been undertaken using a proprietary software-based noise model, CadnaA®, which implements the full range of UK calculation methods.

As this report is technical in nature, SLR has provided a glossary of terms at Appendix 01 to assist the reader when reviewing this report.

2.0 Site Description

2.1 Existing Site Conditions

The existing site is located to the east of Uttoxeter at the approximate National Grid Reference (NGR): X 409565, Y 333345, bordered by Brookside Road to the south and Town Meadows Way to the west as shown in Figure 02-1 in Appendix 02.

The site is bound to the north by Dovefields Retail Park, to the east by light industry uses, to the south by Brookside Road and to the west by the A58.

The site currently comprises a number of buildings which are used for light industrial purposes and sits within ESBC's administrative area.

2.2 Proposed Site Conditions

A hybrid application will be submitted for the proposed development. A full application will seek the development of:

- a Lidl foodstore with a gross internal floor area (GIA) of 2,125 sqm (22,873 sqft);
- two non-food retail units, with a GIA of 700 sqm (7,535 sqft);
- 182 car parking spaces; and
- customer and service vehicle access from Brookside Close.

In addition, an outline planning application will be submitted for the following:

- a drive-thru A3/A5 restaurant with a GIA of 169 sqm.

The proposals include the widening of Brookside Road to six metres in width for the length between the customer and service vehicle access points inclusive, together with a two metre footway along the northern side of Brookside Road for the length of the site frontage.

The proposal also includes the provision of a vehicular and pedestrian link which would connect with the proposed development site with the Dovefields Retail Park to the north.

A previous planning application (Ref. P/2018/00530) for this site includes a residential element to the east of the proposed development. For this current application, there are no site layout plans for any residential development; however, this assessment will consider the impact that the proposed development may have on any residential properties which may be built in the future.

It should be noted that although there is no site layout for the potential residential development to the east of the proposed development, a number of properties have been included for assessment purposes. The nearest residential receptors to the eastern boundary of the site have an assumed position of 15m from the site boundary line. These residential locations are for indicative purposes only, to allow for the determination of a predicted impact on any future residential premises planned for the site and do not represent the location of any planned future developments. The receptors have been placed 15m back from the boundary to allow for potential external amenity areas.

The layout for the proposed development is shown in Figure 02-2 of Appendix 02.

3.0 Scope of Report

3.1 Consultation

SLR has consulted with ESBC to confirm their views and policies on noise related issues with the development proposals.

The Environmental Protection Officer (EPO) at ESBC commented that a previous planning application (Ref. P/2018/00530) had been made for the proposed site, which was to be a mixed-use and residential development. The EPO intimated that since there is already a planning application for residential units for this site, there is a need to ensure that the proposed Lidl store, retail units and drive-thru proposed as part of this application is designed and built in a way that is compatible with the future potential residential end use. The EPO stated that there is a requirement to ensure that plant noise, noise from service yards and noise from late night service (associated with the drive-thru) do not adversely impact on any potential future residential development.

The noise report submitted in support of the previous application was completed by WYG¹ and based on this assessment Environmental Health at ESBC had recommended conditions for the submission and approval of a noise mitigation scheme depending on the final layout of the proposal and for a condition to limit plant noise. These are reproduced below:

- *An adequate scheme of noise attenuation measures shall be drawn up to protect the proposed dwellings from noise. The local Planning Authority prior to construction work commencing must agree the scheme and it should be fully implemented before any occupation of the site. Given the proposed sensitive nature of the premises, the scheme shall meet the requirements for 'internal ambient noise levels for dwellings', including a maximum internal limit of 45dB $L_{Amax,F}$ in accordance with BS8233:2014.*

Once completed, this scheme shall be maintained to ensure that an adequate level of noise attenuation is occurring and there should be no alterations to facades or openings without prior permission of the local Planning Authority.

- *Noise levels from fixed plant and equipment should not exceed more 30 dB LAeq(5 min) at free field locations representing facades of nearby residential dwellings' as measured or calculated based the methodology described in BS4142:2014.*

Informative: The following sound power levels for the fixed plant may be used as a guide for meeting the above Condition, but given the final location of the plant is yet to be agreed, may be conservative as they are based on the fixed plant being located on building roofs and not on non-residential side of buildings.

Sound power levels, as provided by WYG and used for the noise modelling in the supporting Noise Assessment with the planning application.

BSP Location	Noise Emission Limit - Sound Power Level	
	Daytime	Night-time
Roof Plant A	83.1 dB(A)	78.1 dB(A)
Roof Plant B & C	80.1 dB(A)	66.1 dB(A)

¹ WYG Planning & Environment, Proposed Mixed-Use Development, Brookside Road, Utttoxeter, Noise and Vibration Assessment, September 2014

Further to this, the EPO agreed with SLR's proposed scope for the assessment, but intimated that more up to date information may be available on plant (compared to the above that should be used). The EPO noted his concerns about the proximity of the service yard and proposed plant, its size and the need for HGV's to reverse to residential receptors. The plans currently only show a palisade fence between the two land uses and potential for disturbance at first floor level should be considered.

The EPO at ESBC agreed to the use of the previous baseline data captured by WYG¹ in August 2014 for the assessment.

An assessment in accordance with BS4142: 2014 has been undertaken in order to determine the noise impact of the proposed food store, retail units and drive-thru developments. Additionally, an assessment in accordance with BS8233:2014 has been undertaken in order to determine the noise impact with respect to noise levels for indoor living areas during daytime and night-time periods, in conjunction with those prescribed in the WHO Guidelines.

A summary of the guidance mentioned above is given below.

3.2 BS4142:2014

BS4142:2014 is intended to be used to assess the potential adverse impact of sound, of an industrial and/or commercial nature, at nearby sensitive receptor locations within the context of the existing sound environment.

The assessment of impact contained in BS4142:2014 is undertaken by comparing the sound rating level, i.e. the specific level of the source plus any penalties, to the measured representative background sound level outside the sensitive receptor location.

In accordance with BS4142:2014, the significance of an industrial or commercial sound source depends on both the margin by which the rating level exceeds the background sound level and the context in which the sound occurs. It is therefore essential to place the sound in context.

BS4142:2014 (Section 3) provides the following definitions:

- **Ambient Sound:** Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far. NOTE: The ambient sound comprises the residual sound and the specific sound when present.
- **Ambient Sound Level, $L_a = L_{Aeq,T}$:** Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T.
- **Background Sound Level, $L_{A90,T}$:** A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given interval, T, measured using time weighting F and quoted to the nearest whole number of decibels (dB).
- **Rating Level, $L_{Ar,Tr}$:** Specific sound level plus any adjustment for the characteristic features of the sound.
- **Specific Sound Level, $L_s = L_{Aeq,T}$:** Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T.
- **Specific Sound Source:** Sound source being assessed.

BS4142:2014 defines the impact of the specific sound by subtracting the measured background sound level from the rating level. This assessment is detailed in Table 3-2 and is reproduced from Section 11 of BS4142:2014 where it states: "Typically, the greater this difference, the greater the magnitude of impact".

Table 3-1
BS4142:2014 Assessment of Impacts

Rating Level minus Background Sound Level	Assessment of Impacts
Around +10dB or more	A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.
Around +5dB	A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.

In addition, BS4142:2014 states:

“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.”

BS4142:2014 also notes that, *“adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact”*.

To account for the acoustic character of proposed sound sources, BS4142:2014 provides the following with respect to the application of penalties to account for *“the subjective prominence of the character of the specific sound at the noise-sensitive locations and the extent to which such acoustically distinguishing characteristics will attract attention”*.

- **Tonality** – *“For sound ranging from not tonal to predominantly tonal the Joint Nordic Method gives a correction of between 0dB and +6dB for tonality. Subjectively, this can be converted to a penalty of 2dB for a tone which is just perceptible at the noise receptor, 4dB where it is clearly perceptible and 6dB where it is highly perceptible;*
- **Impulsivity** – *A correction of up to +9dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3dB for impulsivity which is just perceptible at the noise receptor, 6dB where it is clearly perceptible, and 9dB where it is highly perceptible;*
- **Intermittency** – *When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied; and*
- **Other Sound Characteristics** – *Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied.”*

Finally, BS4142:2014 outlines guidance for the consideration of the context of the potential impact including consideration of the existing residual sound levels, location and/or absolute sound levels.

3.3 BS8233:2014

BS8233:2014 provides guidance for the control of noise in and around buildings. These guidelines help define what is considered to be acceptable in different environments.

The standard suggests suitable internal noise levels within different types of buildings, including residential dwellings, as shown in Table 3-3.

Table 3-2
Suitable Internal Noise Levels, dB

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

With regards to external noise, Section 7.7.3.2 of BS8233:2014 states that:

“For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited”.

3.3.1 World Health Organisation

The WHO’s *Guidelines for Community Noise* and *Night Noise Guidelines for Europe* recommend guideline noise levels regardless of the current noise environment. The WHO suggests suitable noise levels for both indoor and outdoor living areas during daytime and night-time periods, and these levels are set regardless of the noise type or noise source, i.e. ‘benchmark’ levels. It advises on the minimum levels of noise before critical health effects, including annoyance, occur.

In this regard, the WHO guidelines state:

- *“In dwellings, the critical effects of noise are on sleep, annoyance and speech interference. To avoid sleep disturbance, indoor guideline values for bedrooms are 30dB $L_{Aeq,8h}$ for continuous noise and 45dB L_{Amax} for single sound events;*
- *The probability of being awakened increases with the number of noise events per night. For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dB L_{Amax} more than 10–15 times per night.*
- *To protect the majority of people from being seriously annoyed during the daytime, the sound pressure level on balconies, terraces and outdoor living areas should not exceed 55dB $L_{Aeq,16h}$ for a steady, continuous noise; and*
- *To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound pressure level should not exceed 50dB $L_{Aeq,16h}$.”*

3.4 ISO9613-2:1996

The noise levels generated by the fixed plant and on-site vehicle movements have been predicted in accordance with the noise prediction framework set out in ISO 9613-2:1996 *Acoustics – Attenuation of sound during propagation outdoors – Part 2 General method of calculation*.

The noise model used for the predictions takes into account the distance between the sources and the receptors and the amount of attenuation due to atmospheric absorption. The model also assumes downwind propagation, i.e. a wind direction that assists the propagation of noise from the source to all receptors.

4.0 Environmental Sound Surveys

For the purposes of this assessment it has been agreed between SLR and ESBC that the previous baseline data captured by WYG¹ in August 2014 for a previous development on the same site would be appropriate for determining the background sound levels at the nearest noise-sensitive properties around the proposed development.

An environmental sound survey was undertaken by WYG¹ between 21st and 27th August 2014 to determine background sound levels at the nearest noise-sensitive properties around the proposed development. Attended short-term measurements were undertaken at nine locations during the morning peak, day, evening and night-time periods, with five additional locations being measured unattended over a 144 hour period. For this assessment, the measurements made during the long-term monitoring will be utilised.

4.1 Noise Sensitive Receptors

4.1.1 Lidl Foodstore

For the purposes of this assessment, the closest noise-sensitive receptors are the assumed potential residential properties located to the east of the proposed development off Brookside Road; the existing properties on Arkle Close and Wilsford Avenue to the south; and the existing residential properties on Town Meadows Way to the west of the proposed development site. These receptors are detailed in Table 4-1 and are shown on Figure 03-1 in Appendix 03.

Table 4-1
Closest Noise-Sensitive Receptors

Noise-Sensitive Receptor	Approximate Grid Coordinates (NGR)
Assumed Potential Property 1 (NSR01)	409624, 333426
Assumed Potential Property 2 (NSR02)	409628, 333408
Assumed Potential Property 4 (NSR03)	409632, 333391
Assumed Potential Property 4 (NSR04)	409636, 333374
Assumed Potential Property 5 (NSR05)	409640, 333355
Assumed Potential Property 6 (NSR06)	409642, 333339
Wilsford Avenue 1 (NSR07)	409676, 333252
Wilsford Avenue 2 (NSR08)	409638, 333246
Arkle Close 1 (NSR09)	409608, 333238
Arkle Close 2 (NSR10)	409567, 333233
Town Meadows Way 1 (NSR11)	409443, 333339
Town Meadows Way 2 (NSR12)	409453, 333387

4.2 Background Sound Survey Methodology

A daytime and night time background sound survey was undertaken at locations representative of the existing and the proposed potential closest noise-sensitive receptors from 21st until 27th August 2014. Five survey locations were selected and sound level meters were installed for up to 144 hours at each of the locations. For the purposes of this assessment all survey locations will be included with the exception of survey location 5 which is an outlier to the north-east of the site and distant from any of the noise-sensitive receptors considered in this assessment.

The details of the survey methodology including locations, sound survey measurement equipment, measured noise indices and weather conditions are presented in the WYG¹ report.

The long term (LT) survey locations: LT1, LT2, LT3 and LT4 are shown in Figure 03-1 in Appendix 03.

A summary of the results are shown for the survey locations in Table 4-4 and the full survey results are available upon request from WYG.

Ambient and background noise levels are usually described using the L_{Aeq} index (a form of energy average) and the L_{A90} index (i.e. the level exceeded for 90% of the measurement period) respectively. Road traffic noise is generally described using the L_{A10} index (i.e. the level exceeded for 10% of the measurement period).

The results of the statistical measurements and frequency measurements conducted during the survey are summarised in Table 4-4. All values are sound pressure levels in decibels (dB) (re: 2×10^{-5} Pa).

The lowest derived daytime and night-time L_{A90} levels are shown in bold and will be utilised as the basis for the assessment to represent a worst-case scenario.

Table 4-2
Results of Baseline Noise Monitoring Survey (Average Levels), dB

Period	Duration (T)	Monitoring Date and Times	Location	$L_{Aeq,T}$	L_{A90}	L_{A10}	L_{Amax}
Weekday Day 07:00 – 23:00	37 hours	25/08/2014 - 27/08/2014 07:00 - 12:00	LT1	57.1	48.0	54.4	91.0
Weekday Night 23:00 – 07:00	23 hours	25/08/2014 - 27/08/2014 00:00 - 07:00		49.4	41.3	48.5	79.9
Weekend Day 07:00 – 23:00	23 hours	23/08/2014 - 24/08/2014 15:35 - 23:00		46.5	44.0	51.9	92.2
Weekend Night 23:00 – 07:00	9 hours	21/08/2014 - 21/08/2014 23:00 - 00:00		44.1	38.1	44.4	78.4
Weekday Day 07:00 - 23:00	64 hours	21/08/2014 - 21/08/2014 10:26 - 11:16	LT2	66.2	53.2	68.3	97.0
Weekday Night 23:00 – 07:00	32 hours	23/08/2014 - 24/08/2014 20:00 - 00:00		58.7	38.6	56.9	88.87
Weekend Day 07:00 – 23:00	32 hours	23/08/2014 - 24/08/2014 07:00 - 23:00		64.0	49.6	66.2	97.3
Weekend Night 23:00 – 07:00	16 hours	21/08/2014 - 21/08/2014 23:00 - 07:00		55.3	35.7	55.5	83.2
Weekday Day	65 hours	21/08/2014 - 27/08/2014	LT3	53.4	49.5	54.4	88.7

Period	Duration (T)	Monitoring Date and Times	Location	L _{Aeq,T}	L _{A90}	L _{A10}	L _{Amax}
07:00 - 23:00		11:00 - 11:36					
Weekday Night 23:00 – 07:00	32 hours	21/08/2014 - 27/08/2014 23:00 - 07:00		45.8	41.7	48.6	79.5
Weekend Day 07:00 – 23:00	32 hours	23/08/2014 - 24/08/2014 23:00 - 07:00		52.2	46.6	53.1	80.9
Weekend Night 23:00 – 07:00	16 hours	23/08/2014 - 24/08/2014 00:00 - 00:00		44.8	37.9	46.2	73.5
Weekday Day 07:00 - 23:00	65 hours	21/08/2014 - 27/08/2014 11:25 - 11:35		47.6	43.4	47.9	84.3
Weekday Night 23:00 – 07:00	32 hours	21/08/2014 - 27/08/2014 23:00 - 07:00		43.9	38.2	43.8	74.8
Weekend Day 07:00 – 23:00	32 hours	23/08/2014 - 24/08/2014 23:00 - 07:00	LT4	44.8	40.1	46.7	83.7
Weekend Night 23:00 – 07:00	16 hours	23/08/2014 - 24/08/2014 00:00 - 00:00		41.3	34.6	41.3	71.5

4.3 Soundscape at Receptors and Context

The WYG¹ report states that the existing ambient noise levels around the site are dominated by traffic noise emanating primarily from the A518 Town Meadows Way and the Tesco car park, as well as the associated pedestrian movements. Other notable noise sources include industrial noise sources, including HGV movements and plant noise from Dovefields Industrial Estate to the east of the proposed site and trains passing through Uttoxeter station located to the south of the proposed site.

5.0 Assessment of Impact

The assessment of noise impact in relation to the proposed development has been undertaken with reference to BS4142:2014, whereby the predicted levels associated with the fixed plant and on-site traffic movements have been compared to the measured daytime and night-time background sound levels and assessed accordingly.

5.1 Fixed Plant

5.1.1 Lidl Food Store

The new store will include fixed plant on an external plant area located to the north-east of the site for the proposed new store as detailed in Figure 02-2 in Appendix 02. It is understood that the plant will operate on a 24/7 basis.

The specific details of the external plant to be installed at the site have not been finalised at the time of writing this report. The plant included within the assessment is indicative of the standard specification that Lidl install at their new stores. SLR have recently completed several new store assessments for Lidl over the past few months and the plant included within this assessment is deemed to be representative for the proposed capacity of the store.

The plant details and associated operational noise levels are shown in Table 5-1.

Table 5-1
Proposed External Plant and Operational Noise Levels – Lidl Store

Plant	Sound Pressure Level dB(A)	Sound Power Level dB(A)	Number of Units
Food Refrigeration Dry Cooler & Pump Station	37.0 at 10m	65.0	2 (each unit consists of 3 cooling fans)
AHU Heat Pump Outdoor Unit	59.0 at 1m	67.0	4
VRF Outdoor Unit	62.5 at 1m	70.5	1
Welfare VRF Heat Pump	57.0 at 1m	65.0	1
Cash Room DX Heat Pump	45.0 at 1m	53.0	1

5.1.2 Retail Units

The specific details of any external plant to be installed at the retail units have not been finalised at the time of writing this report. The proposed retail units are for non-food and it is expected that there would only be the requirement for heating and ventilation plant of a similar specification to the Lidl food store.

The plant details and associated operational noise levels are shown in Table 5-2.

**Table 5-2
Proposed External Plant and Operational Noise Levels – Retail Units**

Plant	Sound Pressure Level dB(A)	Sound Power Level dB(A)	Number of Units
AHU Heat Pump Outdoor Unit	59.0 at 1m	67.0	4

5.1.3 Drive-Thru Restaurant

The drive-thru is only speculative at the time of writing this report; therefore there are no details of any external plant to be installed. However for the purposes of this assessment, it has been assumed that there will be a requirement for heating and ventilation as well as a refrigeration plant. The modelled plant has been based on the plant likely to be installed at the Lidl food store.

The plant details and associated operational noise levels are shown in Table 5-3.

**Table 5-3
Proposed External Plant and Operational Noise Levels – Drive Thru**

Plant	Sound Pressure Level dB(A)	Sound Power Level dB(A)	Number of Units
Food Refrigeration Dry Cooler & Pump Station	37.0 at 10.0m	65.0	1 (each unit consists of 3 cooling fans)
VRF Outdoor Unit	62.5 at 1.0m	70.5	1

5.2 Mobile Plant

5.2.1 Deliveries - Lidl Food Store

It is understood from the Transport Assessment² for the proposed development that there will be a maximum of two HGV deliveries per day to the proposed new store. Although delivery times are not yet available, it is understood that they are to be within the proposed opening times of the store.

The deliveries will be to an area at the north-east side of the proposed store as shown in Figure 02-2 in Appendix 02. The worst case scenario is for both the inbound and the outbound movements to occur in the same hour, i.e. two movements per hour.

It is understood that the HGV once on site will reverse up to the enclosed loading dock bay. It is also understood that goods are unloaded directly into the warehouse via a level docking system and there is no movement of goods or empty pallets externally. The goods which are mostly on pallets are then moved internally by an electric pallet truck. The process of delivery and unloading will take approximately 45 minutes.

Based on previously measured noise data held by SLR, each HGV would have a sound power level of 98.0dB(A) and would travel at an average speed of 10km/h whilst within the proposed delivery area. Also taken into consideration is the reverse warning alarm which operates with a sound power level of 89.2dB(A).

² Transport Assessment, Proposed Discount Foodstore, Non-retail and Drive-Thru Restaurant, Uttoxeter, Vectos Transport Planning Specialists, Ref: VN70855, April 2018

It is assumed that the HGVs will have chiller units mounted on the trailers. Based on previously measured noise data held by SLR, each trailer chiller unit would have a sound power level of 84.5dB(A) $L_{Aeq,T}$. The estimated on time would be 50%, therefore the resultant continuous sound power level is 81.5dB(A).

From previous measured noise data held by SLR³ the loading and unloading activities including the service bay door operation and pallet unloading has a typical L_{Aeq} of 58dB(A) at a distance of 5m, which equates to a sound power level of 80.0dB(A).

There will be no HGV movements during the night-time hours.

5.2.2 Customer Vehicles – Lidl Food Store

From the arrival and departure traffic data for the proposed new store as detailed in the Transport Assessment³, the worst case number of vehicles per hour is to be between the hours of 11.00 and 12.00 hours on a Saturday. With 108 arrivals per hour and 95 departures per hour, the proposed development would generate 203 two-way customer vehicle movements during a worst-case peak period on a Saturday.

Based on previously measured noise data held by SLR, each car would have a sound power level of 73.0dB(A) and would travel at an average speed of 10km/h whilst within the proposed car park.

There will be no customer vehicle movements during the night-time hours.

5.2.3 Deliveries – Retail Units

It is understood from the Transport Assessment³ for the development that there will be a maximum of two HGV deliveries per day to each of the proposed new retail units. Although delivery times are not yet available it is understood that they are to be within the proposed opening times of the retail units.

The deliveries will be to an area at the east side of the proposed retail units as shown in Figure 02-2 in Appendix 02. The worst case scenario is for both the inbound and the outbound movements to occur in the same hour, i.e. two movements per hour.

The same values as detailed in Section 5.2.1 for the Lidl deliveries have been implemented for each of the retail units. However, the HGV chiller units mounted on the trailers are not included as the retail units are both proposed to be non-food.

5.2.4 Customer Vehicle – Retail Units

From the arrival and departure traffic data for the proposed new retail units as detailed in the Transport Assessment³, the worst case number of vehicles per hour is to be between the hours of 11.00 and 12.00 hours on a Saturday. With 38 arrivals per hour and 33 departures per hour the proposed development would generate 71 two-way customer vehicle movements during a worst-case peak period on a Saturday.

Based on previously measured noise data held by SLR, each car would have a sound power level of 73.0dB(A) and would travel at an average speed of 10km/h whilst within the proposed car park, which is understood to be shared with the Lidl store.

There will be no customer vehicle movements during the night-time hours.

5.2.5 Deliveries – Drive-Thru

It is understood from the Transport Assessment³ for the development that the drive-thru restaurant would receive deliveries via the customer access junction. It is proposed that there would likely be a single delivery

³ Lidl Store, Bentley, Doncaster, Environmental Noise Survey & Noise Impact Assessment Report 20458/NIA2/B/Rev7, Section 9.2, Hann Tucker Associates, 22 March 2015

per day using a small rigid vehicle. Although delivery times are not yet available it is understood that they are to be within the daytime hours (07:00 – 23:00).

The worst case scenario is for both the inbound and the outbound movements to occur in the same hour, i.e. two movements per hour.

Although only a small rigid vehicle is to be used for deliveries, as a conservative measure the same values as detailed in Section 5.2.1 for the Lidl deliveries have been implemented for the drive-thru.

5.2.6 Customer Vehicle – Drive Thru

From the arrival and departure traffic data for the proposed new drive-thru as detailed in the Transport Assessment³, the worst case number of vehicles per hour is to be between the hours of 16.30 and 17.30 hours on a weekday. With 17 arrivals per hour and 17 departures per hour, the proposed development would generate 34 two-way customer vehicle movements during a worst-case peak period on a weekday.

Based on previously measured noise data held by SLR, each car would have a sound power level of 73.0dB(A) and would travel at an average speed of 10km/h whilst within the proposed car park and drive-thru.

As the drive-thru is only speculative at the time of writing this report, the hours of operation are not known. Therefore, for this assessment as a worst case scenario it is assumed that the drive-thru will operate outwith the daytime hours of 07:00 to 23:00. As a conservative measure, the worst case 34 two-way customer vehicle movements during a worst-case peak period on a weekday will also be used for the night-time assessment.

5.3 Predicted Specific Sound Levels

The specific sound levels generated by the fixed plant, mobile plant and customer vehicle movements associated with the proposed development have been predicted at the closest noise-sensitive receptors using CadnaA®. The specific sound levels are presented in Table 5-4.

The CadnaA® model uses the calculation methodologies contained in ISO 9613-2:1996 and assumes downwind propagation, i.e. a wind direction that assists the propagation of sound from the sources towards the receptors. A ground absorption factor of $G = 0.5$ (mixed ground) has been used.

Specific sound levels have been predicted at 1.5m above ground level to represent a ground floor living room during the daytime and at 4m above ground level to represent a first floor bedroom window at night-time for any two-storey buildings in the assessment. Further to this, the specific sound levels for the flats on Town Meadows Way have been predicted to 4m for both daytime and night-time.

The predictions assume a worst-case situation where all the vehicle movements are operating simultaneously.

**Table 5-4
Predicted Specific Sound Levels, dB**

Receptor (Assessment Location)	Predicted Specific Sound Level $L_{Aeq,Tr}$	
	Daytime	Night-time
NSR01	45	39
NSR02	46	36
NSR03	45	33
NSR04	45	30
NSR05	45	29
NSR06	45	29
NSR07	35	22
NSR08	37	24
NSR09	35	24
NSR10	34	24
NSR11	28	21
NSR12	30	20

5.4 Penalties

The acoustic character of each sound source, and the sound penalty that will be applied in the BS4142:2014 assessment, are detailed in Table 5-5.

**Table 5-5
Acoustic Character of Each Sound Source**

Plant	Sound Tonal	Sound Impulsive	Sound Has Other Characteristic	Sound Intermittent	Comment
Car & HGV movements	No	No	No	Yes	A 3dB intermittency penalty applied to the car & HGV movements. Daytime and night-time; only to include the Drive Thru movements.
HGV reverse warning alarm	No	No	No	No	It is assumed that broadband reversing alarms will be fitted and therefore no tonal element will be present. The alarm will be intermittent but will operate at the same time as the HGV. Daytime only.
Trailer Chiller Unit	No	No	No	No	The chiller unit will be operational throughout the delivery period therefore will have no intermittency or impulsivity features. It would not be expected that the chiller unit would have any tonal features. Daytime only.
Loading/unloading Activities	No	Yes	No	No	Loading and unloading activities may be impulsive in nature due to opening of delivery bay doors. A 3dB penalty will be applied. Daytime only.
External Plant	No	No	No	No	It is considered that noise generated by the plant is not subject to a character correction as it is assumed to be running continuously without impulsivity or intermittent features, and does not have tonal or other acoustic characters, being broadband in nature.

With reference to Table 5-5, the following penalties will be applied to the specific sound level:

- Daytime: 6dB(A).
- Night-Time: 3dB(A).

6.0 Assessment – BS4142:2014

6.1 Predicted Sound Levels and Derived Rating Levels

An assessment has been made in accordance with the guidance contained in BS4142:2014 to determine whether noise emissions from the proposed plant, HGV deliveries and customer vehicles are likely to give rise to adverse impacts at the nearby sensitive receptors.

BS4142:2014 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 sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to plant the sound in context.

Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level from the rating level and consider the following.

- *typically, the greater this difference, the greater the magnitude of the impact;*
- *a difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context*
- *a difference of around +5dB is likely to be an indication of an adverse impact, depending on the context; and*
- *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 that the specific sound source having low impact, depending on the context.”*

The daytime assessment for the hours between 07:00 and 23:00 is presented in Table 6-1 and shows the predicted rating level ($L_{Ar,Tr}$) when penalties in accordance with BS4142:2014 are added. The derived background sound level (L_{A90}) measured for survey location LT1 has been used at receptors NSR07, NSR08, NSR09 & NSR10; for survey location LT2 it has been used at NSR11 & NSR12; and for survey location LT4 it has been used at NSR01, NSR02, NSR03, NSR04, NSR05 & NSR06 for the daytime period. Although survey location LT3 is closer in proximity to the receptors on the eastern boundary of the proposed development, as a conservative measure and in agreement with ESBC, the survey location LT4 values have been utilised as the measured L_{A90} values are lower.

Table 6-1
BS4142:2014 Daytime Assessment (07:00 – 23:00 hours)

Noise-Sensitive Receptor	Representative Background Sound Level, L_{A90}	Predicted Rating Level, $L_{A,r,Tr}$	Difference
NSR01	40	51	+11
NSR02	40	52	+12
NSR03	40	51	+11
NSR04	40	51	+11
NSR05	40	51	+11
NSR06	40	51	+11
NSR07	44	41	-3
NSR08	44	43	-1
NSR09	44	41	-3
NSR10	44	40	-4
NSR11	50	34	-16
NSR12	50	36	-14

The night-time assessment for the hours between 23:00 and 07:00 is presented in Table 6-2 and shows the predicted rating levels ($L_{A,r,Tr}$) which include a penalty only for the vehicle movements associated with the drive-thru.

Table 6-2
BS4142:2014 Night time Assessment (23:00 -07:00 hours)

Noise-Sensitive Receptor	Representative Background Sound Level, L_{A90}	Predicted Rating Level, $L_{A,r,Tr}$	Difference
NSR01	35	42	+7
NSR02	35	39	+4
NSR03	35	36	+1
NSR04	35	33	-2
NSR05	35	32	-3
NSR06	35	32	-3
NSR07	38	25	-13
NSR08	38	27	-11
NSR09	38	27	-11
NSR10	38	27	-11
NSR11	36	24	-12
NSR12	36	23	-13

It can be seen from Table 6-1 that for the daytime assessment the rating levels at the residential properties, due to the proposed development, are predicted to exceed the prevailing background sound level by a maximum margin of +12dB.

With reference to BS4142:2014, the rating level for the daytime operation of the proposed development is such that it is likely to have a significant adverse impact on the nearest residential receptors.

From Table 6-2 for the night-time assessment the rating levels at the residential properties, due to the proposed development, are predicted to exceed the prevailing background sound level by a maximum margin of +7dB. The night-time operation of the proposed development is likely to have an adverse impact on the nearest residential receptors.

Due to the magnitude of the exceedances and the significant adverse impact on the nearest residential receptors during the daytime and night-time due to the operation of the Lidl food store, retail units and drive-thru, mitigation measures will be required and are discussed in Section 8.0 of this report.

7.0 Assessment – BS8233:2014

Table 7-1 shows the daytime predicted noise level due to the development and then logarithmically adds it to the measured daytime ambient noise levels at each of the residential receptors to get the resultant noise level. The table then compares the resultant noise level to the limit as specified in BS8233:2014 for indoor guideline values for resting in a living room of 35dB L_{Aeq} . The table also takes into account an attenuation of 15dB⁴ given by a partially open window.

Table 7-1
BS8233:2014 / WHO Daytime Internal Assessment (07:00 hours-23:00 hours)

Receptor	Predicted Noise Level, $L_{Aeq,Tr}$ (A)	Measured Noise Level, $L_{Aeq,Tr}$ (B)	Resultant Noise Level, dB (A + B)	Predicted Internal Noise Level, dB (-15dB open window)	BS8233:2014 Limit, dB	Difference
NSR01	45	45	48	33	35	-2
NSR02	46	45	49	34	35	-1
NSR03	45	45	48	33	35	-2
NSR04	45	45	48	33	35	-2
NSR05	45	45	48	33	35	-2
NSR06	45	45	48	33	35	-2
NSR07	35	47	47	32	35	-3
NSR08	37	47	47	32	35	-3
NSR09	35	47	47	32	35	-3
NSR10	34	47	47	32	35	-3
NSR11	28	64	64	49	35	+14
NSR12	30	64	64	49	35	+14

It can be seen from Table 7-1 that the predicted internal noise levels associated with the proposed development are below the limit specified by BS8233:2014 for the majority of the noise-sensitive receptors. BS8233:2014 adopts an internal noise level of 35dB L_{Aeq} , as recommended by the WHO, for resting within a living room during the daytime.

The exception to this is NSR11 and NSR12. However, it should be noted that the predicted noise level due to the proposed development at each of the locations does not contribute to the resultant noise level since there is greater than 10dB difference between the values. In acoustic practice it is generally accepted that where there is a 10dB difference between the noise levels from two sources, there is no cumulative impact and the smaller source can be ignored.

⁴ Section G1 of BS8233:2014 states; If partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB

Table 7-2 shows the night-time predicted noise level due to the development and then logarithmically adds it to the measured night-time ambient noise levels at each of the residential receptors to get the resultant noise level. The table then compares the resultant noise level to the limit as specified in BS8233:2014 for indoor guideline values for bedrooms of 30dB L_{Aeq} . The table also takes into account an attenuation of 15dB given by a partially open window.

Table 7-2
BS8233:2014 / WHO Night-time Internal Assessment (23:00 hours-07:00 hours)

Receptor	Predicted Noise Level, $L_{Aeq,Tr}$ (A)	Measured Noise Level, $L_{Aeq,Tr}$ (B)	Resultant Noise Level, dB (A + B)	Predicted Internal Noise Level, dB (-15dB open window)	BS8233:2014 Limit, dB	Difference
NSR01	39	41	43	28	30	-2
NSR02	36	41	42	27	30	-3
NSR03	33	41	42	27	30	-3
NSR04	30	41	41	26	30	-4
NSR05	29	41	41	26	30	-4
NSR06	29	41	41	26	30	-4
NSR07	22	44	44	29	30	-1
NSR08	24	44	44	29	30	-1
NSR09	24	44	44	29	30	-1
NSR10	24	44	44	29	30	-1
NSR11	21	55	55	40	30	+10
NSR12	20	55	55	40	30	+10

It can be seen from Table 7-2 that the predicted internal noise levels associated with the proposed development are below the limit specified by BS8233:2014 for the majority of the noise-sensitive receptors. BS8233:2014 adopts an internal noise level of 30dB L_{Aeq} , as recommended by the WHO, for sleeping within a bedroom at night-time.

The exception to this is NSR11 and NSR12. However, it should be noted that the predicted noise level due to the proposed development at each of the locations does not contribute to the resultant noise level since there is greater than 10dB difference between the values.

The noise level within bedrooms, assuming attenuation of 15dB is provided by a partially open window, would be below 30dB and therefore unlikely to affect the sleep of nearby residents.

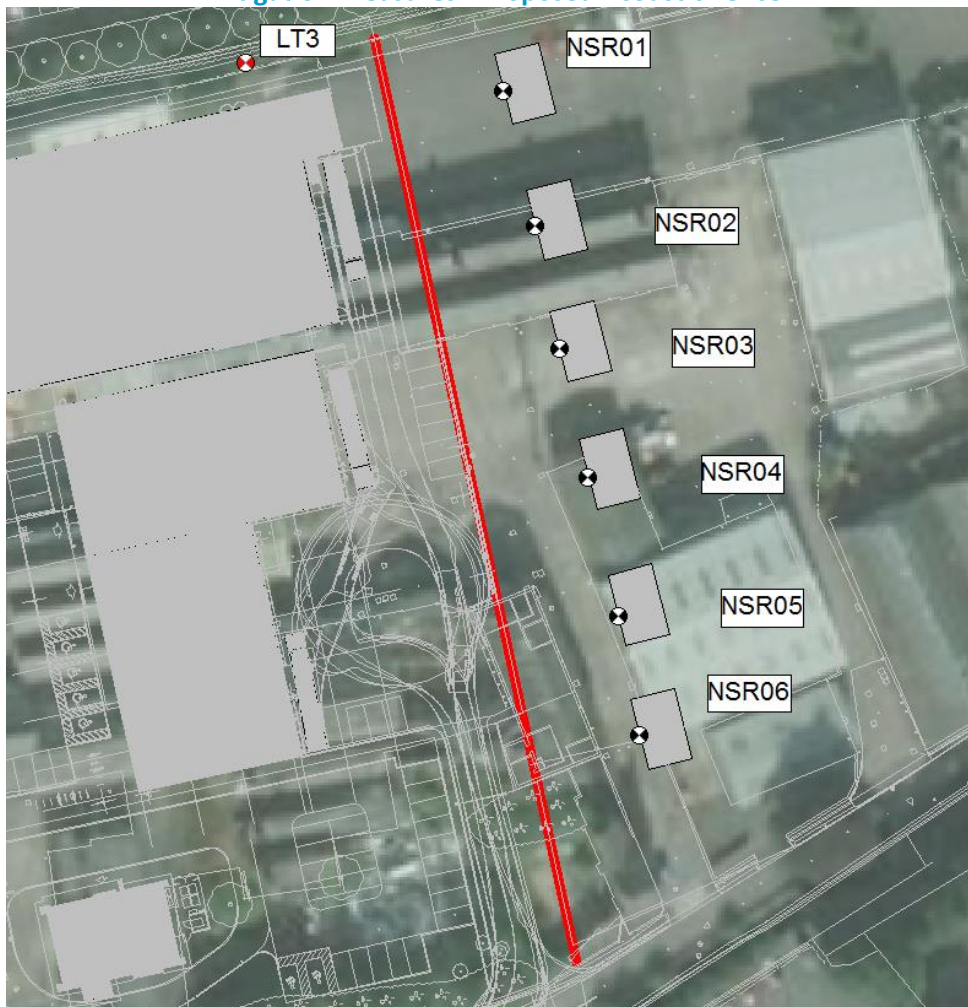
8.0 Mitigation

Based on the results of the BS4142:2014 assessment, and with reference to the predicted rating levels, the assessment results indicate that there is likely to be a significant adverse impact on the nearest residential receptors to the east of the proposed development during the daytime due to the operation of the Lidl food store, retail units and drive-thru. In view of this, mitigation measures are considered necessary in order to reduce the impact at the nearest noise-sensitive receptors.

Figure 8-1 shows the extent of the acoustic fence (red line) required in order to mitigate and reduce the significance of the impact from the noise associated with the development at the nearest noise-sensitive receptors. The proposed fence would run down the entire eastern boundary of the site.

The fence would need to be at least 4m high, be sealed at the base with no gaps, and have a superficial density of at least 12.5 kg/m^2 .

Figure 8-1
Mitigation Measures - Proposed Acoustic Fence



8.1 Mitigated Assessment – BS4142:2014

A mitigated assessment has been made in accordance with the guidance contained in BS4142:2014 to determine whether noise emissions from the proposed plant are likely to give rise to adverse impacts at the nearby sensitive receptors.

8.1.1 Mitigated Predicted Specific Sound Levels

The specific sound levels generated by the fixed plant, mobile plant and customer vehicle movements associated with the proposed development have been predicted at the closest noise-sensitive receptors using CadnaA®. An acoustic fence of height 4m is modelled in CadnaA®.

The mitigated specific sound levels have been predicted at 1.5m above ground level to represent a ground floor living room during the daytime and at 4m above ground level to represent a first floor bedroom window at night-time for the properties, NSR01 to NSR06, which had exceedances in accordance with BS4142:2014 when no mitigation measures were applied.

Table 8-2
Mitigated Predicted Specific Sound Levels, dB

Receptor	Predicted Specific Sound Level $L_{Aeq,Tr}$	
	Daytime	Night-time
NSR01	34	26
NSR02	35	24
NSR03	34	23
NSR04	34	22
NSR05	34	22
NSR06	35	24

The mitigated daytime assessment for the hours between 07:00 and 23:00 are presented in Table 8-3 and show the predicted rating level ($L_{Ar,Tr}$) when penalties (+6dB) in accordance with BS4142:2014 are added.

Table 8-3
BS4142:2014 Daytime Assessment (07:00 – 23:00 hours)

Noise Sensitive Receptor	Representative Background Sound Level, L_{A90}	Predicted Rating Level, $L_{Ar,Tr}$	Difference
NSR01	40	40	+1
NSR02	40	41	0
NSR03	40	40	0
NSR04	40	40	0
NSR05	40	40	0
NSR06	40	41	+1

The mitigated night-time assessment for the hours between 23:00 and 07:00 are presented in Table 8-4 and show the predicted rating level ($L_{Ar,Tr}$) which include a penalty only for the vehicle movements associated with the drive-thru.

Table 8-4
BS4142 Night time Assessment (23:00 -07:00 hours)

Noise Sensitive Receptor	Representative Background Sound Level, L_{A90}	Predicted Rating Level, $L_{Ar,Tr}$	Difference
NSR01	35	29	-6
NSR02	35	27	-8
NSR03	35	26	-9
NSR04	35	25	-10
NSR05	35	25	-10
NSR06	35	27	-8

It can be seen from Table 8-3 that for the daytime mitigated assessment the rating level at the residential properties, due to the proposed development, are predicted to exceed the prevailing background sound level by a maximum of +1dB. This indicates potential for impact, although it is not anticipated to be adverse as the rating level is only 1dB greater than the background noise level.

When considered in the context of the existing ambient noise levels of 45dB(A), the contribution of the proposed scheme is predicted to have no effect on the ambient noise levels during the day. This suggests that the proposed scheme would have a low impact during the day.

It should be noted that the predicted rating level is a worst case scenario which assumes that all fans/coolers will be operational at the same time and that the maximum movement of customer vehicles and HGV deliveries and unloading activities all happen within the same hour period.

In the context of the existing noise environment, it was noted during the attended survey that there was noise from nearby commercial and retail premises that was similar in character to the noise to be generated from the proposed development. During the survey it was stated that *“the existing ambient noise levels around the site are dominated by traffic noise emanating primarily from the A518 Town Meadows Way and the Tesco car park as well as the associated pedestrian movements. Other notable noise sources include industrial noise sources including HGV movements and plant noise from Dovefields Industrial Estate to the east of the proposed site.”*

From Table 8-4 for the mitigated night-time assessment, the rating level at the considered residential properties, due to the proposed development, are predicted to be at least 6dB below the prevailing background sound level. With mitigation measures in place, the night-time operation of the proposed development is likely to have a low impact on the nearest residential receptors.

With reference to BS4142:2014, *“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.”*

Therefore, with reference to BS4142:2014, the mitigated daytime and night-time operation of the proposed development would have a “*low impact*” at the closest noise-sensitive receptors.

9.0 Conclusion

Lidl has appointed SLR to undertake a noise impact assessment for a proposed new foodstore, two retail units and a drive-thru restaurant located on Brookside Road in Uttoxeter.

The assessment for the proposed development has been conducted in accordance with the requirements of East Staffordshire Borough Council (ESBC) and the guidance contained in BS4142:2014.

Further to this, the assessment also refers to the BS8233:2014, with respect to noise levels for indoor living areas during daytime and night-time periods. The stated limits in BS8233:2014 mirror those prescribed in the World Health Organisation (WHO) 1999: *Guidelines for Community Noise*.

The assessment is based on background sound measurements and associated observations at the nearest noise-sensitive locations to proposed development during representative daytime and night-time periods.

The assessment considers the suitability of the site for its proposed use in terms of the potential impact of noise generated by the proposed new foodstore, two retail units and drive-thru restaurant on the sensitive receptors close to the site.

BS4142:2014

For the daytime assessment the rating levels at the residential properties, due to the proposed development, are predicted to exceed the prevailing background sound level by a maximum margin of +12dB.

With reference to BS4142:2014, the rating level for the daytime operation of the proposed development is such that it is likely to have a significant adverse impact on the nearest residential receptors.

For the night-time assessment the rating levels at the residential properties, due to the proposed development, are predicted to be exceed the prevailing background sound level by a maximum margin of +7dB. The night-time operation of the proposed development is likely to have an adverse impact on the nearest residential receptors.

Based on the results of the BS4142:2014 assessment, and with reference to the predicted rating levels, the assessment results in a significant adverse impact at the nearest proposed future residential receptors. In view of this, mitigation measures are considered necessary in order to reduce the impact at the nearest proposed noise-sensitive receptors.

BS8233:2014

The predicted daytime internal noise levels associated with the proposed development are below the limit specified by BS8233:2014 for the majority of the noise-sensitive receptors. BS8233:2014 adopts an internal noise level of 35dB L_{Aeq} , as recommended by the WHO, for resting within a living room during the daytime.

The predicted night-time internal noise levels associated with the proposed development are below the limit specified by BS8233:2014 for the majority of the noise-sensitive receptors. BS8233:2014 adopts an internal noise level of 30dB L_{Aeq} , as recommended by the WHO, for sleeping within a bedroom at night-time.

The exception to this is NSR11 and NSR12. However, it should be noted that the predicted noise level due to the proposed development at each of the locations does not contribute to the resultant noise level since there is greater than 10dB difference between the values.

The noise level within bedrooms, assuming attenuation of 15dB is provided by a partially open window, would be below 30dB and therefore unlikely to affect the sleep of nearby residents.

Mitigation

Mitigation measures are considered necessary in order to reduce the impact of the proposed development at the nearest noise-sensitive receptors. An acoustic fence of height 4m is proposed along the eastern boundary of the proposed development in order to mitigate and reduce the significance of the impact from the noise associated with the development at the nearest noise-sensitive receptors.

For the daytime mitigated assessment the rating levels at the residential properties, due to the proposed development, are predicted to exceed the prevailing background sound level by a maximum of +1dB. This indicates potential for impact although it is not anticipated to be adverse as the rating level is only 1dB greater than the background noise level.

For the mitigated night time assessment the rating level at the considered residential properties, due to the proposed development, are predicted to be at least 6dB below the prevailing background sound level. With mitigation measures in place the night time operation of the proposed development is likely to have a low impact on the nearest residential receptors.

With reference to BS4142:2014, *“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.”*

Therefore, with reference to BS4142:2014, the mitigated daytime and night-time operation of the proposed development would have a *“low impact”* at the closest noise-sensitive receptors.

In conclusion, assuming that the fixed plant specified within the assessment or an equivalent model is installed and that the mitigation measures of the proposed acoustic fence is installed on the eastern boundary of the development, it is considered that noise should not pose a material constraint for the development of the new Lidl store, retail units and drive-thru at Brookside Road in Uttoxeter.

APPENDIX 01

Glossary of Terminology

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0dB (the threshold of hearing) to over 120dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

Table 01-1
Sound Levels Commonly Found in the Environment

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

Acoustic Terminology

- dB (decibel)** The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2×10^{-5} Pa).
- dB(A)** A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
- L_{Aeq}** L_{Aeq} is defined as the notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.
- L_{10} & L_{90}** If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L_{10} index to describe traffic noise.
- L_{Amax}** L_{Amax} is the maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.

APPENDIX 02

Site Layout Drawing

Figure 02-1
Existing Site Conditions for Proposed Development

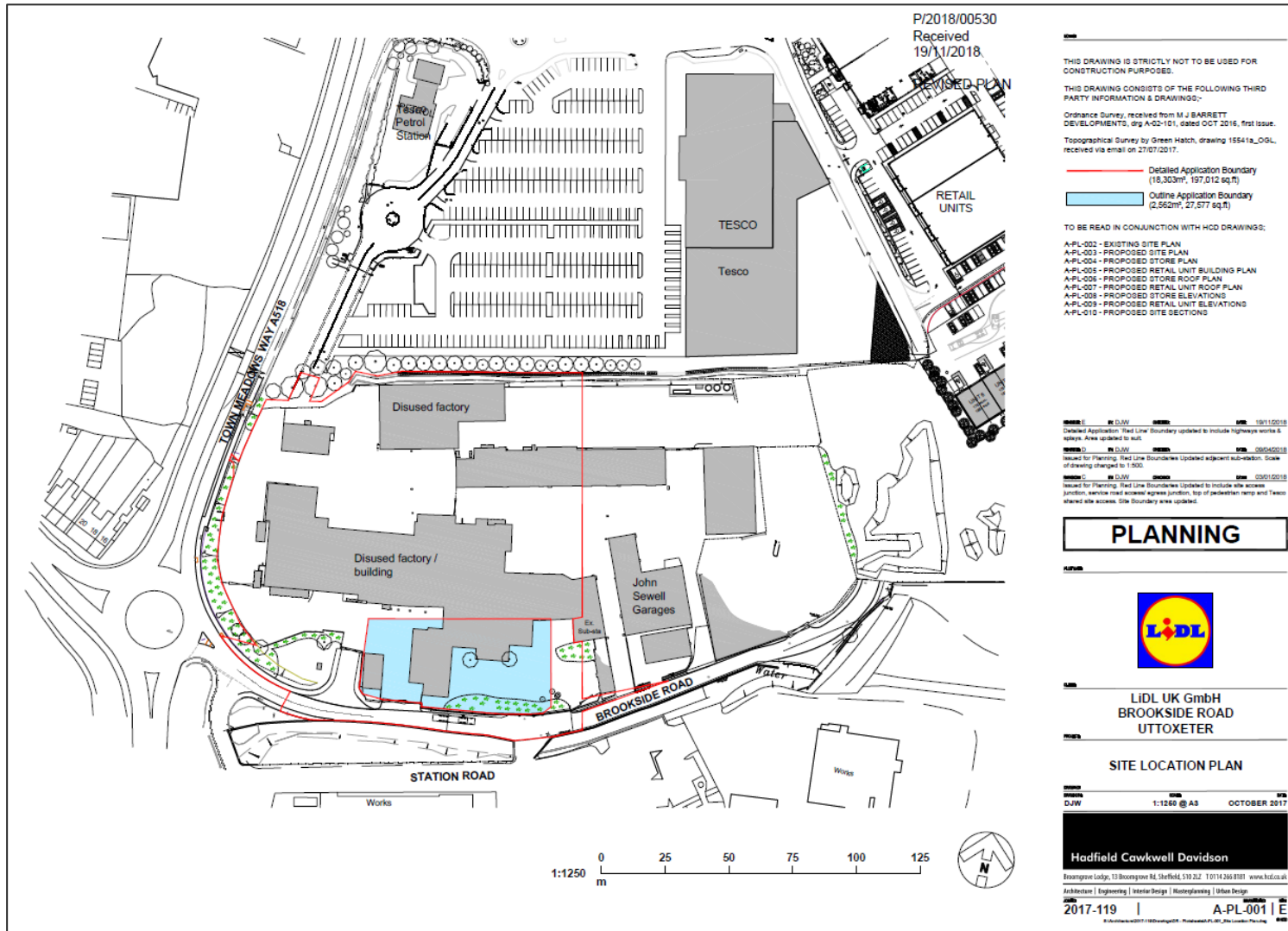


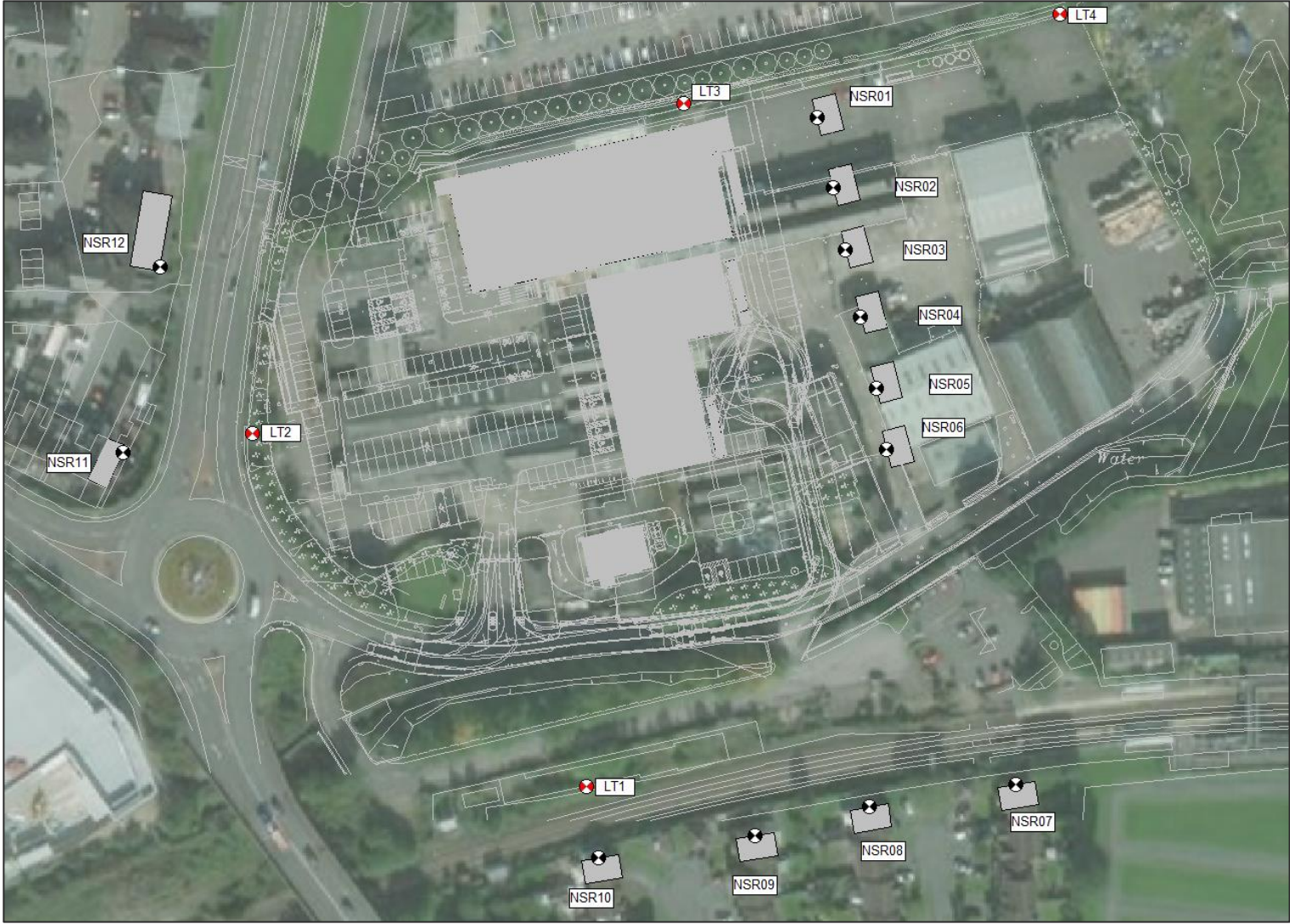
Figure 02-2
Proposed Site Layout for Development



APPENDIX 03

Monitoring Locations and Noise Sensitive Receptors

Figure 03-1
Monitoring Locations (LT) and Noise Sensitive Receptors (NSR)



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EXETER

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GLASGOW

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