

Co-Op, The Red Lion, Wrexham

Variance of Planning Condition 10 – Acoustic Report

On behalf of **New River Retail Ltd.**



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Revision	Date	Description	Prepared	Reviewed	Approved

This report has been prepared by Peter Brett Associates LLP ('PBA') on behalf of its client to whom this report is addressed ('Client') in connection with the project described in this report and takes into account the Client's particular instructions and requirements. This report was prepared in accordance with the professional services appointment under which PBA was appointed by its Client. This report is not intended for and should not be relied on by any third party (i.e. parties other than the Client). PBA accepts no duty or responsibility (including in negligence) to any party other than the Client and disclaims all liability of any nature whatsoever to any such party in respect of this report.

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1 Introduction

1.1 Background

- 1.1.1 Peter Brett Associates LLP (PBA) has been commissioned by New River REIT (UK) Ltd. to undertake a noise impact assessment to support an application for the variation of Planning Condition 10 associated with a Co-Operative convenience store at land at The Red Lion, Wrexham.
- 1.1.2 Full planning permission (Planning Reference No. P/2012/0830) was granted through appeal (Appeal Reference No. APP/H6955/A/13/2209711) in June 2014 for a convenience store with associated car parking, access arrangements and landscaping. Condition 10 pertains to the timing of deliveries to the store. The applicant wishes to vary the timing restrictions associated with this condition, which will require agreement from Wrexham County Borough Council.
- 1.1.3 This report assesses the existing noise climate at the site and considers the potential impact on nearby noise sensitive receptors associated with a change to delivery times. Recommendations for appropriate mitigation measures are identified where appropriate, to determine the likely acceptability to the Local Authority of varying Planning Condition 10.

1.2 Objectives

- To establish, by means of an attended environmental sound survey, the existing A-weighted (dBA) L_{90} , L_{eq} and L_{max} environmental sound levels at a position considered representative of the sound climate at the nearest noise sensitive receptor.
- To undertake an assessment of the potential noise impact associated with delivery operations during the proposed extended delivery hours at the nearest noise sensitive receptor and comment on acceptability;
- If required, to suggest appropriate mitigation measures in order to reduce potential noise impacts to an acceptable level;
- To determine the likely suitability of the application to modify the restrictions of Planning Condition 10 with respect to the likely noise impact on nearby noise sensitive receptors.

1.3 Acoustic Terminology

- 1.3.1 This report is technical in nature. To assist the reader, an explanation of the terminology used in this report is contained in **Appendix A**.

2 Site Description and Location

2.1 Site Location

- 2.1.1 The site is located on the B5445 Chester Road, opposite its junction with Woodlands Road in Marford, Wrexham. A map showing the location of the site is shown in **Figure 1**.



Figure 1: Location Map (Contains Ordnance Survey © Crown Copyright and Database Right 2017)

2.2 Site Description

- 2.2.1 The site is currently occupied by a Co-Operative convenience store and associated car parking, access, landscaping and service yard area. Chester Road borders the site to the north. Landscaping surrounds the site to the immediate east, south and west. Residential dwellings accessed by Wynnstay Lane lie to the south of the site.

3 Local Authority, Standards and Criteria

3.1 Local Authority

- 3.1.1 Wrexham County Borough Council (the Local Planning Authority) has conditioned a restriction of delivery hours to the convenience store, which the applicant wishes to vary.
- 3.1.2 The condition addressed in this report is as follows, taken from the decision notice issued by Wrexham County Borough Council on 24 June 2014:

Condition 10: *"No deliveries of goods to or collection of refuse from the retail unit hereby approved shall take place outside the hours of 07.30 and 22.00 on Mondays to Saturdays, nor outside of the hours of 10.00 and 18.00 on Sundays, with the exception of delivery of newspapers".*

3.2 Standards

BS4142:2014 Methods for Rating and Assessing Industrial and Commercial Sound

- 3.2.1 BS4142: 2014 *'Methods for rating and assessing industrial and commercial sound'* (BS4142) describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods described in the standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.
- 3.2.2 The standard is used to determine the rating levels for sources of sound of an industrial and/or commercial nature and the ambient, background and residual sound levels at outdoor locations. These levels could be used for the purposes of investigating complaints; assessing sound from proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature; and assessing sound at proposed new dwellings or premises used for residential purposes. However, the determination of noise amounting to a nuisance is beyond the scope of the standard.
- 3.2.3 The standard should not be used to assess sound from the passage of vehicles on public roads and railway systems; recreational activities; music and other entertainment; shooting grounds; construction and demolition; domestic animals; people; public address systems for speech and other sources falling within the scopes of other standards or guidance. The standard cannot be applied to the derivation of indoor sound levels arising from sound levels outside, or the assessment of indoor sound levels.
- 3.2.4 The procedure contained in BS4142 assesses the significance of sound which depends upon the margin by which the rating level of the specific sound sources exceeds the background sound level and the context in which the sound occurs/will occur.
- 3.2.5 An initial estimate of the impact of the specific sound is obtained by subtracting the measured background sound level from the rating level and considering 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; 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 of the specific sound source having a low impact, depending on the context.
- 3.2.6 Where the initial estimate of the impact needs to be modified due to the context, the following factors should be considered:
- The absolute level of sound;
 - The character and level of the residual sound compared to the character and level of the specific sound; and
 - The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions such as:
 - Façade insulation treatment;
 - Ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and
 - Acoustic screening.

3.3 Proposed Assessment Criteria

- 3.3.1 Activities generating noise at the proposed site associated with deliveries to the approved retail store are likely to include the following:
- Delivery vehicles arriving, parking and departing;
 - General loading activities (loading/unloading/movement of trolleys).
- 3.3.2 The assessment of deliveries to the convenience store is to be assessed in general accordance with BS4142:2014.

4 Project Details

4.1 Development Details

- 4.1.1 The development exists of a convenience store with associated car parking area consisting of 29 spaces, access arrangements, landscaping and service yard area. A detailed site plan for the site is shown in **Figure 2**.

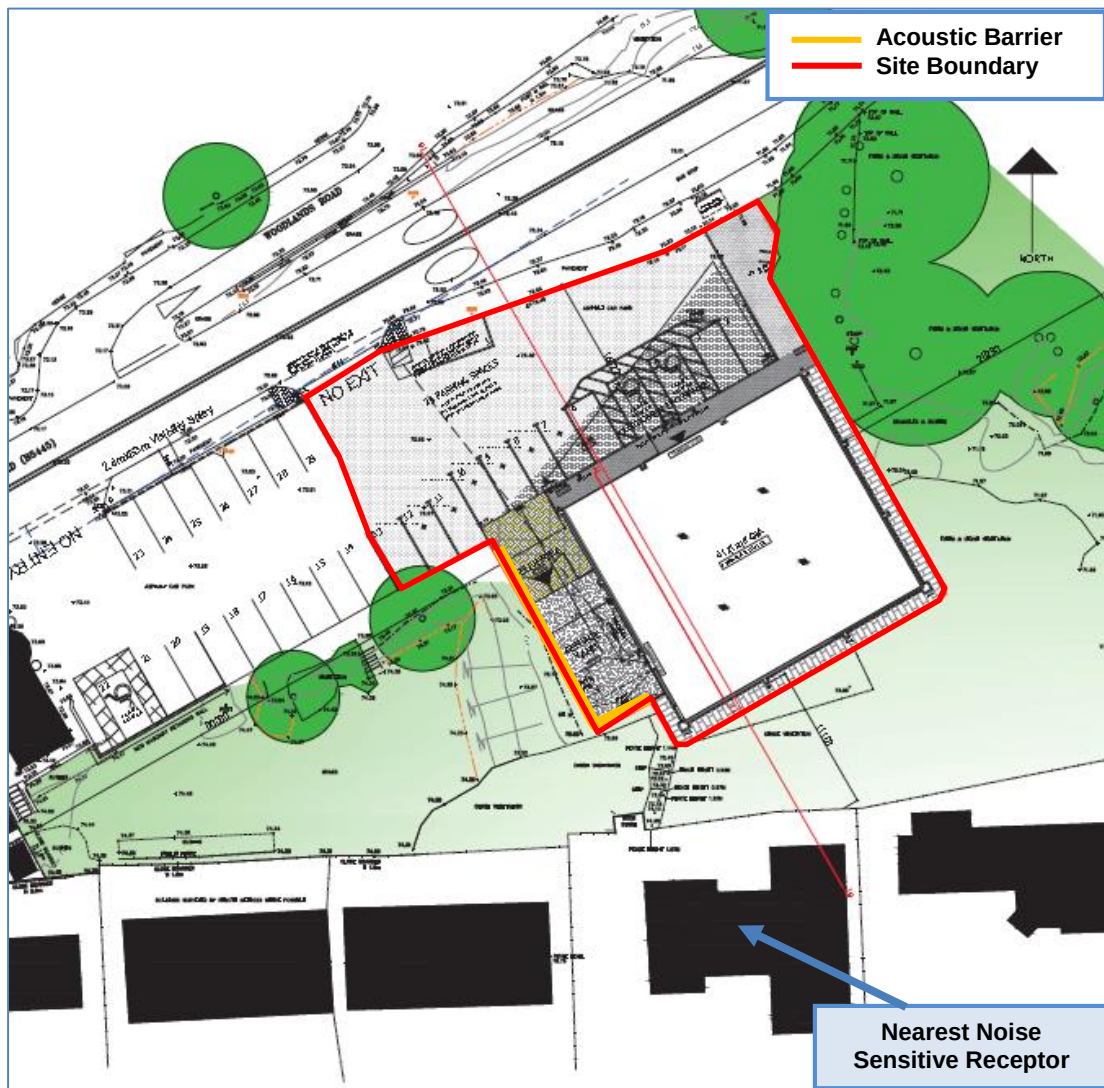


Figure 2: Site Plan Showing the Site Boundary and Retail Store Location (courtesy of KMB Ltd.).

- 4.1.2 A 3.5 m high acoustic fence exists around the western and southern edge of the refuse, service yard and plant area.

4.2 Variance of Planning Condition

- 4.2.1 **Table 4.1** summarises the existing conditioned delivery hours and the proposed delivery hours. No changes are proposed to the delivery hours as already conditioned on Sundays and Bank Holidays. The proposed variation applying to deliveries occurring Mondays to Saturdays, where the delivery period is to be extended by 30 minutes in the morning.

Table 4.1: Conditioned and Proposed Delivery Hours

Days	Conditioned Delivery Hours	Proposed Delivery Hours
Mondays to Saturdays	0730 – 2000 hours	0700 – 2000 hours
Sundays and Bank Holidays	1000 – 1800 hours	1000 – 1800 hours

4.3 Deliveries

- 4.3.1 It is understood that the typical daily deliveries to the store would be as follows. Delivery information has been provided by the project's transport consultants.

Table 4.2: Typical Daily Deliveries

Delivery	Frequency	Vehicle	Dwell Time	Target Delivery Window
Co-operative Delivery	Weekly x 6 Daily x 1	10 m rigid HGV	30-40 mins	07:00 – 20:00 hours

5 Environmental Sound Survey

5.1 Methodology

- 5.1.1 An automated, unattended environmental sound survey was undertaken from approximately 13:00 hours on Friday 01 December to approximately 09:30 hours on Monday 04 December 2017 in order to determine the existing sound climate at the site.
- 5.1.2 The survey was undertaken over a 68-hour period so as to obtain critical period sound levels on both weekday and weekend periods, to include times in which the proposed deliveries to the store will occur.
- 5.1.3 Measurements were taken at a single position at the site, selected so as to represent the typical background sound climate experienced at the nearest noise sensitive receptor. The measurement position is shown in **Figure 3**.

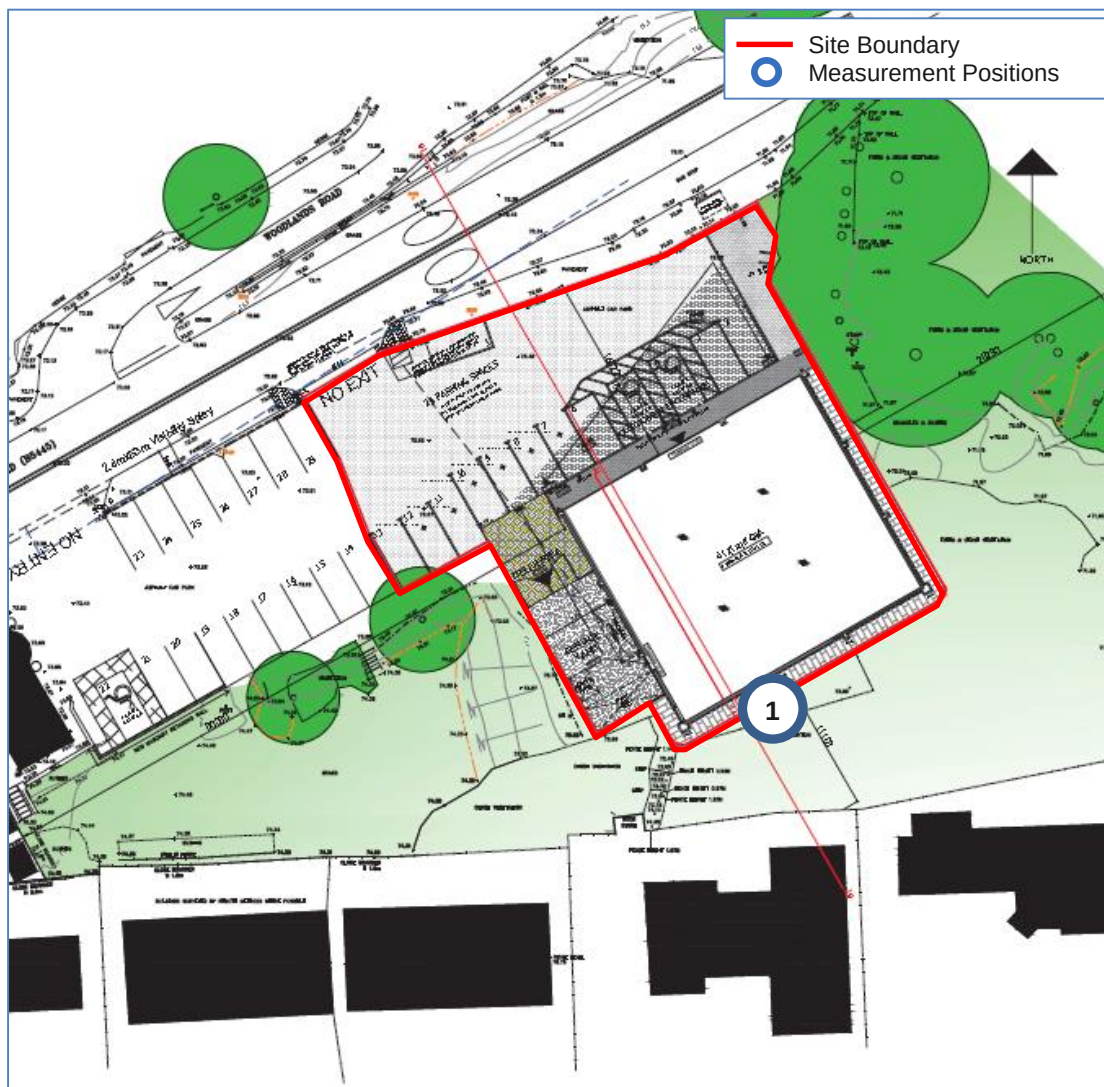


Figure 3: Site Plan Showing Measurement Locations (courtesy of KMB Ltd.).

- 5.1.4 The microphone was positioned at an approximate height of 1.5 m above ground level in a free-field position, on an extending pole, on the southern site boundary, approximately 30 m from

Chester Road and approximately 7 m from the nearest noise sensitive receptor located on Wynnstay Lane.

- 5.1.5 Due to the nature of the survey (i.e. unmanned), it is not possible to accurately comment on the weather conditions throughout the entire survey period. However, at the beginning of the survey period, the temperature was cold (approx. 5 °C) with a light breeze from the south-west (approx. 2 ms⁻¹) and approximately 10% cloud cover, with no precipitation. At the end of the survey period, the temperature was cool (approx. 10 °C) with a light breeze from the north west (approx. 3 ms⁻¹) and was overcast with no precipitation. A period of rainfall occurred on the evening of Saturday 02 December. However, this has not been judged to have significantly affected the results. For the rest of the survey period, the weather conditions were understood to be similar to that described above. Therefore, the weather conditions were considered suitable for obtaining representative measurements.
- 5.1.6 The $L_{Aeq,T}$, $L_{A90,T}$ and L_{AFMax} levels were measured over 15 minute periods for the duration of the survey.
- 5.1.7 The sound level meter was located in an environmental case, with the microphone connected to the meter via an extension cable. The microphone was fitted with the manufacturer's windshield.
- 5.1.8 The instrumentation used in the survey is listed in **Table 5.1**. Field calibration were performed before and after the measurements with no significant fluctuation recorded (< 0.5 dB). Calibration certificates are available on request.

Table 5.1: Instrumentation

Description	Manufacturer	Type	Serial Number	Laboratory Calibration Date
Sound Level Meter	Bruel & Kjaer	2250	2626232	10/11/2017
Pre-amplifier		ZC0032	19626	
½" Pre-polarised microphone		4189	2626211	
Calibrator	Bruel & Kjaer	4231	2389171	14/02/2017

5.2 Assumptions/Limitations

- 5.2.1 The engineer noticed nothing unusual in terms of the noise climate at the time of the survey. This report refers to, within the limitations stated, to the environment of the site in the context of the surrounding area at the time of the inspections. Environmental conditions can vary and no warranty is given as to the possibility of changes in the environment of the site and surrounding area at different times.

5.3 Environmental Sound Climate

- 5.3.1 For the duration of both survey periods, it was noted that the dominant noise sources across the site was vehicular movements on Chester Road. Delivery activities occurring at the convenience store were noted to be dominant, when occurring.

5.4 Environmental Sound Survey Results

- 5.4.1 **Table 5.2** details the average measured background sound levels at Position 1 during the survey periods. A time-history graph detailing the full results of the unattended environmental sound survey can be found in **Appendix B**.

Table 5.2: Summary of Environmental Sound Survey Results

Date	Measurement Period	Sound Level (dB)	
		Typical L _{A90,15minutes}	dB L _{Aeq,T}
Saturday 02 December 2017	Proposed Extended Delivery Period (07:00 – 07:30 hours)	42	45
	Conditioned Delivery Period (07:30 – 08:00 hours)	43	46
	Assessment Period (07:00 – 08:00 hours)	42	45
Monday 04 December 2017	Proposed Extended Delivery Period (07:00 – 07:30 hours)	44	48
	Conditioned Delivery Period (07:30 – 08:00 hours)	45	48
	Assessment Period (07:00 – 08:00 hours)	45	48

6 Noise Impact Assessment

6.1 Purpose of Assessment

- 6.1.1 An assessment of the likely noise impact associated with deliveries to the approved store has been undertaken in general accordance with BS4142:2014 to determine whether the delivery hour restrictions detailed in Planning Condition 10 and outlined in **Table 4.2** are likely to be considered acceptable by the Local Authority.

6.2 Noise Sources

- 6.2.1 Delivery activities generating noise at the proposed site associated with the operation of the retail store are considered to include the following: -

- Delivery vehicles arriving, parking and departing;
- General loading activities (loading/unloading/movement of trolleys, operation of doors and tailgates).

6.3 Noise Sensitive Receptors

- 6.3.1 The nearest existing noise sensitive receptors have been identified as follows. The location of the noise sensitive receptor is also illustrated in **Figure 2**.

Table 6.1: BS4142:2014 Assessment Receptor

Receptor	Description
1	Ground-floor of May Tree, the residential dwelling overlooking the convenience store at 7 Wynnstay Lane, approximately 8 m to the south of the service yard area.

6.4 Assessment Assumptions

- 6.4.1 The following has been assumed:

- The proposed extended delivery times are between 07:00 and 20:00 hours, Monday to Saturday. It is not proposed to extend the condition delivery hours on Sundays and Bank Holidays (10:00 – 18:00 hours).
- All deliveries are made on site, within the unloading area. Stock cages are unloaded within the service yard area and wheeled into the store;
- One 10 m rigid HGV delivery is made to the store during the morning. A total of nine deliveries are made to the store during a typical week;
- A maximum of one delivery is made to the store during any one-hour period and during the assessment period (07:00 – 08:00 hours);
- No deliveries are made to the store during the night-time period (23:00 – 07:00 hours);
- Delivery vehicles will enter the car parking area from Ruthin Road and then reverse into the unloading area.

6.5 Calculation Procedure

- 6.5.1 Calculations have been undertaken of deliveries to the convenience store for a one-hour period which includes the proposed extended delivery period on Mondays and Saturdays (07:00 and 08:00 hours).
- 6.5.2 **Table 6.2** details the activities associated with the delivery operations at the approved store, the associated noise level and the number of activities taking place during the one-hour assessment period.
- 6.5.3 PBA have previously undertaken measurements of delivery operations at a similar convenience store. Unless otherwise stated, sound levels are based on these measurements. The survey methodology for obtaining these measurements can be found in **Appendix C**.

Table 6.2: Noise Levels Associated with Deliveries

Measurement Description	Single Event Level SEL (dB)	Source Level Measurement Distance (metres)	Number of Events for Convenience Store Delivery
Lorry Arriving	68	1	1
Reversing Alarm	94	1	1
Lorry Door Slam	82	1	2
Opening/Closing Lorry Shutter	76	1	2
Lowering/Raising Tail Lift	78	1	6
Locking/Unlocking Support Bars	88	4	4
Wheeling Cages onto Tail Lift	94	1	2
Lowering Tail Lift Flaps	112	1	2
Wheeling Cages Away from Lorry	97	1	2
Wheeling Empty Cages to Lorry	92	3	2
Wheeling Empty Cages onto Tail Lift	95	1	2
Wheel Empty Cages in Lorry	93	3	2
Starting Lorry Engine	89	1	1
Lorry Driving Away	90	1	1

- 6.5.4 The specific sound level of a delivery to the store has been calculated by considering each noise generating activity as an individual sound event, which is then combined to obtain the associated specific sound level for assessment period (one hour during the daytime).

6.6 Acoustic Feature Correction and Screening

- 6.6.1 Some sources have been considered to emit noise that is tonal, impulsive or intermittent in nature. For these sources, corrections have been applied (maximum of +6 dB for tonality, +9 dB for impulsivity and +3 dB for intermittency).
- 6.6.2 Considering the location of the delivery area, the location and orientation of the nearest residential dwelling, the existing acoustic fence and the change in ground level between the service yard area and the receptor, screening of each noise generating activity has been considered for the assessment receptor.
- 6.6.3 Full details of the screening and acoustic feature corrections applied can be found in detailed calculations contained within **Appendix D**.

6.7 Preliminary Assessment Results

- 6.7.1 **Table 6.3** presents the preliminary results of the BS4142:2014 assessment of deliveries to the convenience store. Full calculations can be found in **Appendix E**.

Table 6.3: BS4142:2014 Preliminary Assessment Results

Description	Receptor 1
Combined Rating Level at Receptor (dB L _{Aeq,1hour})	43
Background Sound Level (dB L _{A90,T})	42
Excess of Rating over Daytime Background Sound Level (dB)	+1
Assessment of Impact	Likely to be an indication of having a low impact, depending on the context

6.8 Context and Mitigating Factors

- 6.8.1 The above assessment details the results of the initial numerical assessment of sound levels at the nearest noise sensitive receptor. It is important to recognise context in the assessment of the likely noise impact on the proposed development site arising from deliveries to the approved store.
- 6.8.2 The following factors should be taken into consideration:
- The absolute sound level;
 - The character and level of the residual and specific sound levels; and
 - The sensitivity of the receptor and use of mitigation measures.

Absolute Sound Levels

- 6.8.3 The calculated rating sound level at the nearest noise sensitive receptor falls below the relevant criteria in World Health Organisation and BS8233 guidelines with respect to noise in external amenity areas.
- 6.8.4 Furthermore, the calculated rating sound level at the nearest noise sensitive receptor is approximately 2 dBA below the existing ambient sound level. Therefore, the rating sound level is not likely to increase the existing ambient sound level significantly.

Receptor Sensitivity

- 6.8.5 It should be highlighted that as the assessment presented is considered worst case, delivery activities may take less time than assumed and the background sound level could be higher. Both these factors would reduce the impact of the delivery operations.
- 6.8.6 The assessment considers the impact of delivery operations at ground floor rooms in the nearest affected dwellings. A reasonable assumption can be made that residents are likely to be within ground level rooms during daytime periods.
- 6.8.7 The proposed delivery period is between 07:00 and 20:00 hours, Mondays to Saturdays. The currently conditioned delivery period is between 07:30 and 20:00 hours, Mondays to Saturdays. It should be noted that the background sound level between the assessment period (07:00 - 08:00 hours) is the same as that of the following one-hour period (08:00 – 09:00 hours). Therefore, it is likely there would be no change in the background sound climate experienced at the receptor between the conditioned and proposed delivery periods.

Mitigation

6.8.8 The following mitigation measures should be considered in order to assist in reducing noise. The below measures should be considered for inclusion within a Service and Delivery Management Plan for the development.

- Once stationary, engines of delivery vehicles should be turned off;
- Use of reversing beepers should be minimised where possible;
- Drop heights should be reduced to their lowest practicable levels;
- A low noise, rubber floor should be considered in both delivery vehicles and around the delivery area with consideration given to low noise surfaces to the areas where the trolleys are moved;
- Plastic (ideally rubber) wheels should be used on trolleys;
- Use of radios should not be permitted;
- All staff (including delivery drivers) should be made aware of the necessity to keep noise to a minimum.

6.9 Uncertainty

- 6.9.1 Care has been taken to reduce uncertainty as far as reasonably possible. However, it should be recognised that in any environmental sound survey and assessment process uncertainty exists.
- 6.9.2 Uncertainty in measured background sound levels can occur due to variation in temporary/non representative meteorological conditions. In this instance all possible steps were taken to minimise the risk of meteorological conditions affecting the survey results. However, it should be recognised that there is a degree of uncertainty inherent in the baseline environmental sound data.
- 6.9.3 Uncertainty in measured source data for delivery activities can occur due to variation in temporary/non representative meteorological conditions. In this instance all possible steps were taken to minimise the risk of meteorological conditions affecting the measurements. Given the location of the measurements (i.e. 1-4 m from the source) the effect of meteorological conditions is considered insignificant, however it should be recognised that there is a degree of uncertainty inherent in the measured source level data.
- 6.9.4 The source noise data for the delivery activities that form the basis of the assessment are based on activities considered representative of future delivery activities. Therefore, a degree of uncertainty is inherent in the source level data used. It is considered however that the delivery activities measured are an accurate representation of future deliveries.
- 6.9.5 The delivery activities considered in this assessment are based on typical information. However, it should be recognised that a degree of uncertainty associated with the exact delivery process exists (e.g. if a different HGV type is used). Nevertheless, it is considered that the assessment herein is a reasonable assessment of a delivery to the convenience store during a one-hour period.

6.10 Summary of Assessment

- 6.10.1 The initial assessment indicates that the level of impact associated with deliveries to the convenience store during the proposed extended delivery hours at Receptor 1 is likely to be of a level that is 'likely to be an indication of having a low impact, depending on the context'.

- 6.10.2 The assessment of delivery noise concludes that, when considering the results of the assessment and the context of the proposals, deliveries to the store during the proposed extended delivery periods are likely to be acceptable and therefore supports the application to vary Planning Condition 10.

7 Conclusions

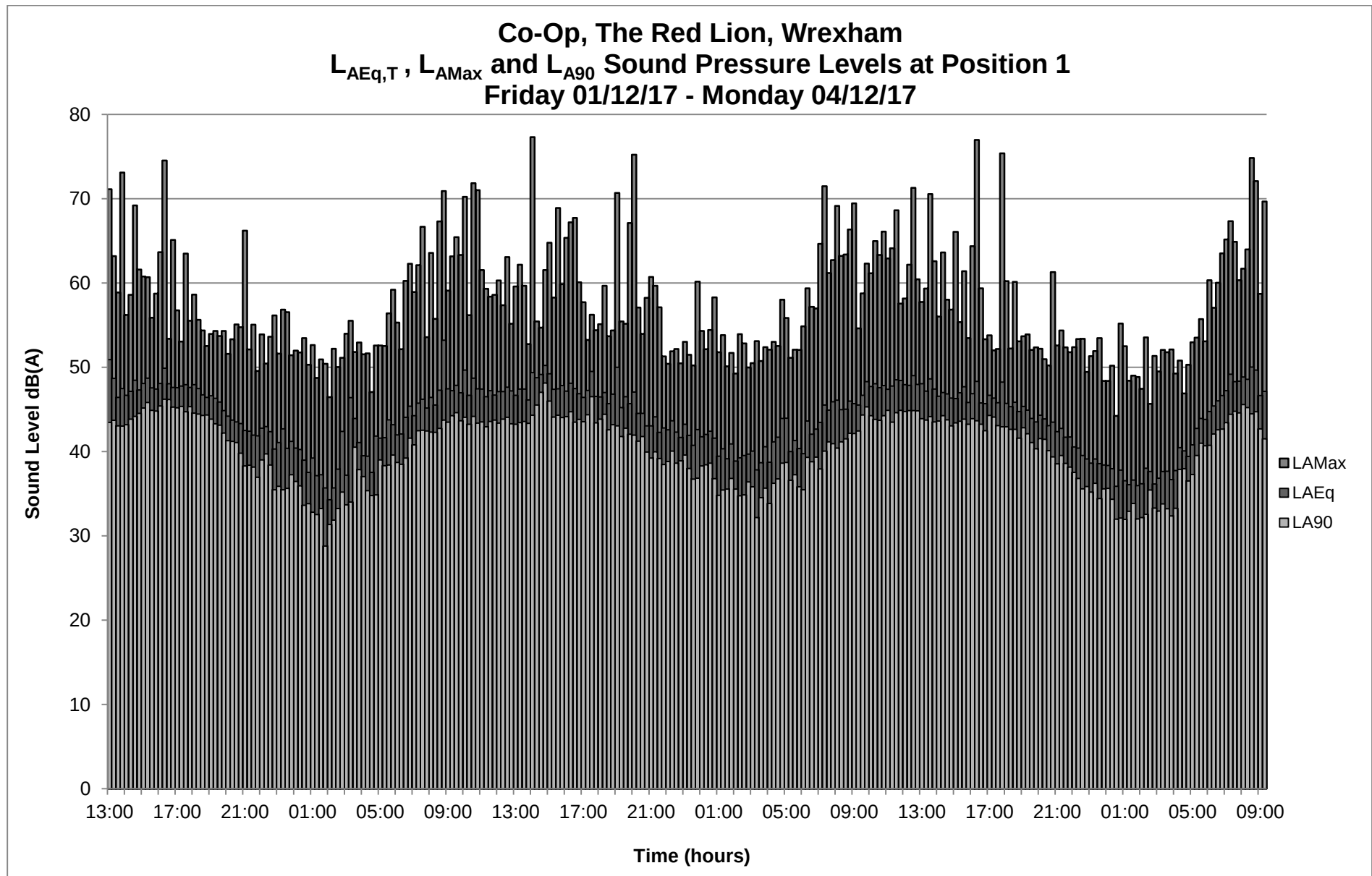
- 7.1.1 Peter Brett Associates LLP (PBA) has been commissioned by New River REIT (UK) Ltd. to undertake a noise impact assessment to support an application for the variation of Planning Condition 10 associated with an approved Co-Operative convenience store at land at The Red Lion, Wrexham.
- 7.1.2 Full planning permission (Planning Reference No. P/2012/0830) was granted through appeal (Appeal Reference No. APP/H6955/A/13/2209711) in June 2014 for a convenience store with associated car parking consisting of 29 spaces, access arrangements and landscaping. Condition 10 pertains to the timing of deliveries to the store. The applicant wishes to vary the timing restrictions associated with these condition, which will require agreement from Wrexham County Borough Council.
- 7.1.3 An automated, unattended environmental sound survey was undertaken from approximately 13:00 hours on Friday 01 December to approximately 09:30 hours on Monday 04 December 2017 in order to determine the existing background sound climate at the site.
- 7.1.4 The survey was undertaken over a 68-hour period so as to obtain critical period sound levels on both weekday and weekend periods, to include times in which the proposed deliveries to the store will occur.
- 7.1.5 The initial assessment indicates that the level of impact associated with deliveries to the convenience store during the proposed extended delivery hours at Receptor 1 is likely to be of a level that is 'likely to be an indication of having a low impact, depending on the context'.
- 7.1.6 The assessment of delivery noise concludes that, when considering the results of the assessment and the context of the proposals, deliveries to the store during the proposed extended delivery periods are likely to be acceptable and therefore supports the application to vary Planning Condition 10.

Appendix A Glossary of Acoustic Terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Daytime	The period 07:00-23:00 hours.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10} (s_1/s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is $20 \mu\text{Pa}$. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
Insertion Loss	Insertion loss is the difference in sound pressure level at a single fixed position before and after a noise control element (e.g. enclosure, barrier etc.) is installed.
L_{AE} or SEL	A noise level which, if maintained for a period of 1 second, would cause the same A-weighted sound energy to be received as is actually received from a given noise event.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, 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.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A – weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.
$L_{90,T}$ or Background Noise Level	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
LOAEL	Lowest Observed Adverse Effect Level. This is the noise level above which adverse effects on health and quality of life can be detected.
Night-time	The period 23:00-07:00 hours.
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.
Noise Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
SOAEL	Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level, L_p	The sound pressure level, L_p is the sound pressure relative to a standard reference pressure of $20\mu\text{Pa}$ (20×10^{-6} Pascals) on a decibel scale.
Specific Noise Level	The noise source under investigation for assessing the indication of impact, measured as and $L_{Aeq,T}$
Rating Noise Level	The specific noise source plus any adjustment for the characteristic features of the noise, denoted by $L_{Ar,T}$.

Appendix B Sound Time-History Graph



Appendix C BS4142:2014 Survey Methodology

- C.1.1 A manned sound survey was undertaken between 06:45 and 09:00 on Tuesday 16 August 2016 in order to obtain sound levels associated with deliveries to the convenience store.
- C.1.2 Ambient sound level measurements were taken approximately 1 - 4m away from each delivery activity. Residual sound level measurements were also taken before and after the delivery period.
- C.1.3 **Table D.1** outlines the weather information for the survey period.

Table D.1: Weather Information for BS4142:2014 Manned Survey of Convenience Store Operation

Description	Tuesday 16 August 2016 06:45 – 09:00 hours
Temperature (°C)	20
Precipitation (mm)	None
Cloud Cover (%)	5
Wind Speed (m/s)	1
Wind Description	Light Air
Wind Direction	NW

- C.1.4 For both sound surveys undertaken, background sound levels were measured in the absence of sound from the source under consideration. Measured background sound levels are considered representative of background sound levels at the proposed development.
- C.1.5 The A-weighted $L_{Aeq,T}$, $L_{A90,T}$ and L_{AFMax} levels were taken for each measurement.
- C.1.6 The sound level meter was fixed to a tripod at a height of 1.5 m above ground level. The microphone was fitted with the manufacturers windshield.
- C.1.7 The instrumentation details for the survey undertaken can be found in **Table D.2**. Field calibrations were performed before and after the measurements with no significant fluctuations recorded (<0.5 dB).

Table D.2: BS4142:2014 Measurement Instrumentation

Description	Manufacturer	Type	Serial Number	Laboratory Calibration Date
Sound Level Meter	Brüel & Kjær	2250	2626231	28/01/2016
Pre-amplifier		ZC0032	8125	
½" Pre-polarised microphone		4189	2621209	
Calibrator	Brüel & Kjær	4231	2389171	15/02/2016

* Calibration data correct at the time of the survey.

Appendix D BS4142:2014 Delivery Noise Impact Calculations

BS4142 Assessment Delivery Noise 07:00 - 08:00 hours	Lorry Arriving	Reversing Alarm	Lorry Door Slam	Opening Lorry Shutter	Raising Tail lift	Unlocking Support Bars	Wheeling Cages onto Tail Lift	Lowering Tailift	Lowering Tail Lift Flaps	Wheeling Cages Away from Lorry	Wheeling Empty Cages to Lorry	Wheeling Empty Cages onto Tail Lift	Raising Tailift	Wheel Cages into Lorry	Lock Support Bars	Lowering Tailift	Closing Lorry Shutter	Lorry Door Slam	Starting Lorry Engine	Lorry Driving Way
Sound Exposure Level (SEL)	68	94	82	76	78	88	94	78	112	97	92	95	78	93	88	78	76	82	89	90
Source Measurement Distance	1	1	1	1	1	4	1	1	1	1	3	1	1	3	4	1	1	1	1	1
Number of Events	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1
Average Distance to Receptor (m)	25	20	21	16	16	18	18	17	16	13	13	16	16	18	18	16	16	21	21	25
Distance Loss	-28	-26	-26	-24	-24	-13	-25	-25	-24	-22	-13	-24	-24	-16	-13	-24	-24	-26	-26	-28
Reflections	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acoustic Feature Correction	0	9	0	3	0	0	3	0	0	3	3	3	0	3	0	0	3	0	0	0
Acoustic Screening	-10	-11	-10	-14	-14	-22	-22	-14	-14	-14	-14	-14	-14	-22	-22	-14	-14	-10	-10	-10
Rating Level (dB L _{aeq, 1hour})	-6	30	10	5	4	20	17	6	41	31	35	27	7	25	20	4	5	10	17	16
Combined Rating Level (dB L _{aeq, 1hour})	43																			
Background Noise Level	42																			
Comparison	1																			