NSL
Noise Solutions Ltd

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Convenience Store

Land Off High Street
Rocester
Uttoxeter
ST14 5JU

Delivery Noise Impact Assessment

On behalf of

SEP
Properties Limited

Project Reference: 90461 | Revision: 01 | Date: 4th February 2022
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1.0 Introduction

1.1. Noise Solutions Ltd (NSL) has been commissioned by SEP Properties Ltd to undertake a delivery noise impact assessment for the convenience store to be sited on the land off High Street in Rocester.

1.2. This report presents the results of an environmental noise survey and a noise impact assessment of delivery activities to the convenience store.

1.3. To assist with the understanding of this report a brief glossary of acoustic terms can be found in **Appendix A**. A more in-depth glossary of acoustic terms can be assessed at the following web address http://www.acoustic-glossary.co.uk/.

2.0 Site layout and development proposals

2.1. It is proposed to develop a new convenience store on the land off High Street and on the corner of Riversfield Drive.

2.2. **Appendix B** contains an aerial photograph showing the site and surrounding area, with an overlay of the proposed development. A site plan is shown in **Appendix C**.

3.0 Noise policy

Noise Policy Statement for England

3.1. The Noise Policy Statement for England (NPSE[1]), published in March 2010, sets out the long-term vision of Government noise policy. The Noise Policy aims, as presented in this document, are: "*Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*

- *avoid significant adverse effects on health and quality of life;*
- *mitigate and minimise adverse effects on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life.*"

3.2. The NPSE makes reference to the concepts of NOEL (No Observed Effect Level) and LOAEL (Lowest Observed Adverse Effect Level) as used in toxicology but applied to noise impacts. It also introduces the concept of SOAEL (Significant Observed Adverse Effect Level) which is described as the level above which significant adverse effects on health and quality of life occur.

[1] Noise Policy Statement for England, Defra, March 2010

3.3. The first aim of the NPSE is to avoid significant adverse effects, taking into account the guiding principles of sustainable development (as referenced in Section 1.8 of the NPSE). The second aim seeks to provide guidance on the situation that exists when the potential noise impact falls between the LOAEL and the SOAEL, in which case: *"...all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development."*

3.4. Importantly, the NPSE goes on to state that: "This does not mean that such adverse effects cannot occur."

3.5. The NPSE does not provide a noise-based measure to define SOAEL, acknowledging that the SOAEL is likely to vary depending on the noise source, the receptor and the time in question. NPSE advises that: *"Not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available."*

3.6. It is therefore likely that other guidance will need to be referenced when applying objective standards for the assessment of noise, particularly in reference to the SOAEL, whilst also taking into account the specific circumstances of a proposed development.

National Planning Policy Framework

3.7. A new edition of NPPF was published in July 2021 and came into effect immediately. The original National Planning Policy Framework (NPPF[2]) was published in March 2012, with revisions in July 2018 and February 2019 - this document replaced the existing Planning Policy Guidance Note 24 (PPG 24) "Planning and Noise." The 2021 revised edition contains no new directions or guidance with respect to noise, and hence, all previous references remain extant. The paragraph references quoted below relate to the July 2021 edition.

3.8. Paragraph 174 of the NPPF states that the planning system should contribute to and enhance the natural and local environment by (amongst others) *"preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, water or noise pollution or land stability."*

3.9. The NPPF goes on to state in Paragraph 185:

"planning policies and decisions should ...

a) Mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development, - and avoid noise giving rise to significant adverse impacts on health and quality of life;

[2] National Planning Policy Framework, DCLG, March 2012

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason …

3.10. The NPPF document does not refer to any other documents or British Standards regarding noise other than the Noise Policy Statement for England (NPSE[3]).

3.11. Paragraph 2 of the NPPF states that *"planning law requires that applications for planning permission must be determined in accordance with the development plan unless material considerations indicate otherwise."*

3.12. Paragraph 12 of the NPPF states that *"The presumption in favour of sustainable development does not change the statutory status of the development plan as the starting point for decision making. Where a planning application conflicts with an up-to-date development plan (including any neighbourhood plans that form part of the development plan), permission should not usually be granted. Local planning authorities may take decisions that depart from an up-to-date development plan, but only if material considerations in a particular case indicate that the plan should not be followed".*

3.13. Paragraph 119 states that *"Planning policies and decisions should promote an effective use of land in meeting the need for homes and other uses, while safeguarding and improving the environment and ensuring safe and healthy living conditions. Strategic policies should set out a clear strategy for accommodating objectively assessed needs, in a way that makes as much use as possible of previously-developed or 'brownfield' land".*

Planning Practice Guidance – Noise

3.14. An updated Planning Practice Guidance (PPG[4]) for noise was published on 22 July 2019 and provides additional guidance and elaboration on the NPPF. It advises that when plan-making and decision-taking, the Local Planning Authority should consider the acoustic environment in relation to:

- Whether or not a significant adverse effect is occurring or likely to occur;
- Whether or not an adverse effect is occurring or likely to occur; and
- Whether or not a good standard of amenity can be achieved.

[3] Noise Policy Statement for England, DEFRA, March 2010

[4] Planning Practice Guidance – Noise, https://www.gov.uk/guidance/noise--2, 22 July 2019

3.15. This guidance introduced the concepts of NOAEL (No Observed Adverse Effect Level), and UAEL (Unacceptable Adverse Effect Level). NOAEL differs from NOEL in that it represents a situation where the acoustic character of an area can be slightly affected (but not such that there is a perceived change in the quality of life). UAEL represents a situation where noise is 'very disruptive' and should be 'prevented' (as opposed to SOAEL, which represents a situation where noise is 'disruptive', and should be 'avoided').

3.16. As exposure increases above the LOAEL, the noise begins to have an adverse effect and consideration needs to be given to mitigating and minimising those effects, taking account of the economic and social benefits being derived from the activity causing the noise. As the noise exposure increases, it will then at some point cross the SOAEL boundary.

3.17. The LOAEL is described in PPG[5] as the level above which *"noise starts to cause small changes in behaviour and attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard"*.

3.18. PPG identifies the SOAEL as the level above which *"noise causes a material change in behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present."*

3.19. In line with the Explanatory Note of the NPSE, the PPG goes on to reference the LOAEL and SOAEL in relation to noise impact. It also provides examples of outcomes that could be expected for a given perception level of noise, plus actions that may be required to bring about a desired outcome. However, in line with the NPSE, no objective noise levels are provided for LOAEL or SOAEL although the PPG[6] acknowledges that *"...the subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation."*

3.20. The relevant guidance in the PPG in relation to the adverse effect levels is summarized below:

Table 1 PPG Noise effects table

Response	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not Present	No Effect	No Observed Effect	No specific measures required

[5] Paragraph: 005 Reference ID: 30-005-20190722
[6] Paragraph: 006 Reference ID: 30-006-20190722

Response	Examples of Outcomes	Increasing Effect Level	Action
No Observed Adverse Effect Level			
Present and not Intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and Intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and Disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very Disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

3.21. The Planning Practice Guidance[7] states the following in relation to mitigation measures:

> *"For noise sensitive developments, mitigation measures can include avoiding noisy locations in the first place; designing the development to reduce the impact of noise from adjoining activities or the local environment; incorporating noise barriers; and optimising the sound insulation provided by the building envelope."*

[7] Paragraph: 010 Reference ID: 30-010-20190722

3.22. In addition, the Guide notes that it may also be relevant to consider[8]:

> *"... whether any adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time (and the effect this may have on living conditions). In both cases a suitable alternative means of ventilation is likely to be necessary. Further information on ventilation can be found in the Building Regulations".*

Local Policy

3.23. The NPPF is very clear in that local authorities must update their local plans (one year from publication of the NPPF) and that if the local plan contains policies which do not closely align with the aims of the NPPF, then a decision must be made based on an assessment which shows compliance with the NPPF. Therefore, it is of paramount importance that local authorities have updated local plans which closely align with the aims in the NPPF.

4.0 Acoustic Standards and Guidance

BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings.

4.1. This Standard provides recommended guideline values for internal noise levels within dwellings which are similar in scope to guideline values contained within the World Health Organisation (WHO) document, Guidelines for Community Noise (19999). These guideline noise levels are shown in Table 2, below:

Table 2 BS 8233:2014 Desirable Internal Ambient Noise Levels for Dwellings

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

4.2. BS 8233:2014 advises that: *"regular individual noise events...can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$ depending on the character and number of events per night. Sporadic noise events could require separate values."* While the current edition of the standard gives no specific guidance on internal night-time L_{Amax} sound levels, the previous edition[10] recommended that:

[8] Paragraph: 006 Reference ID: 30-006-20190722
[9] World Health Organisation Guidelines for Community Noise, 1999
[10] BS 8233:1999 Sound insulation and noise reduction for buildings – Code of practice

For a reasonable standard in bedrooms at night, individual noise events (measured with F time-weighting) should not normally exceed 45 dB L_{AMax}.

4.3. The standard also provides advice in relation to design criteria for external noise. It 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.

…

In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space."

BS 4142:2014 Methods for Rating and Measuring Industrial and Commercial Sound

4.4. British Standard (BS) 4142:2014 describes a method for rating and assessing sound of an industrial or commercial nature, which includes:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

4.5. The industrial or commercial sound is assessed outside a dwelling or premises used for residential purposes, upon which sound is incident.

4.6. The procedure contained in BS 4142 is to quantify the "specific sound level", which is the measured or predicted level of sound from the source in question over a one hour period for the daytime and a 15-minute period for the night-time. Daytime is defined in the standard as 07:00 to 23:00 hours, and night-time as 23:00 to 07:00 hours.

4.7. The specific sound level is converted to a rating level by adding penalties on a sliding scale to account for either potentially tonal or impulsive elements. The standard sets out objective methods for determining the presence of tones or impulsive elements, but notes that it is acceptable to subjectively determine these effects.

4.8. The penalty for tonal elements is between 0dB and 6dB, and the standard notes: "Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible."

4.9. The penalty for impulsive elements is between 0dB and 9dB, and the standard notes: "Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible."

4.10. The background sound level should be established in terms of the LA90 noise index. The standard states that the background sound level should be measured over a period of sufficient length to obtain a representative value. This should not normally be less than 15-minute intervals. The standard states that: "A representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value."

4.11. The assessment outcome results from a comparison of the rating level with the background sound level. The standard states:

a) Typically, the greater this difference, the greater the magnitude of the impact.

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

d) 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.

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."

The standard goes on to note that: "Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."

4.12. In addition to the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, the 2014 edition places emphasis upon an appreciation of the context, as follows:

"An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context."

4.13. BS 4142 requires uncertainties in the assessment to be considered, and where the uncertainty is likely to affect the outcome of the assessment, steps should be taken to reduce the uncertainty.

5.0 Environmental sound levels

Environmental sound surveys

5.1. An unattended environmental sound pressure level survey was undertaken between 14.15 hours on Friday 14 January and 12.30 hours on Monday 17 January 2022. Measurements were made on Riversfield Drive, at position L1 as shown in **Appendix B**.

5.2. Full details of the survey are provided in **Appendix D** with a history graph of the unattended measurements.

5.3. The relevant results of the survey have been summarised in Table 3 below.

Table 3 Summary of survey results

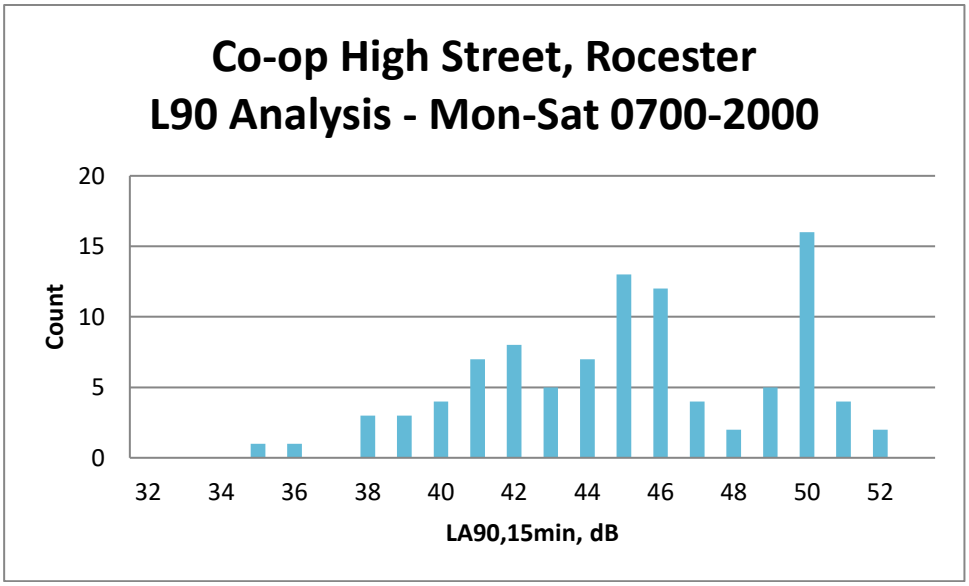
Measurement location	Measurement period	Range of recorded sound pressure levels (dB)			
		$L_{Aeq(15mins)}$	$L_{AFmax(15mins)}$	$L_{A10(15mins)}$	$L_{A90(15mins)}$
Riversfield Drive (L1) (14 – 17 Jan)	Daytime (07.00 – 23.00 hours)	43-66	59-92	40-69	35-52
	Night-time (23.00 – 07.00 hours)	35-57	41-78	36-60	33-50

5.4. The data presented above are the free-field levels recorded from the sound level meter.

Background sound levels

5.5. Background ($L_{A90\ 15min}$) sound levels have been analysed to determine representative values, as required by BS 4142:2014. Data has been analysed for typical main depot delivery hours (07.00 to 20.00 hours).

Figure 1 Histogram of L_{A90} background sound pressure levels, weekdays 07.00 – 20.00 hours



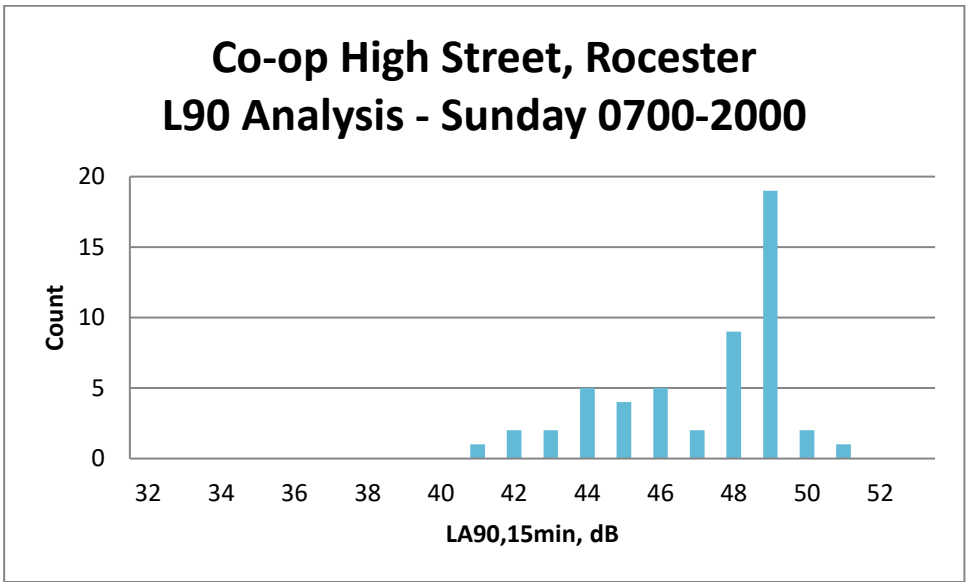
5.6. Additional statistical analysis has been undertaken. As shown in Table 4, the mean, median, and modal values have been calculated:

Table 4 Statistical analysis of $L_{A90,15min}$ levels during likely weekday delivery hours

dB, L_{A90} Sunday 07.00-20.00 hours	
Mean	45
Mode	50
Median	45

5.7. From reviewing the above histogram, 45dB has been selected to be representative of the background sound level in the area between 07.00 and 20.00 hours Monday to Saturday.

Figure 2 Histogram of L_{A90} background sound pressure levels, Sunday 07.00 – 20.00 hours



5.8. Additional statistical analysis has been undertaken. As shown in Table 5, the mean, median, and modal values have been calculated:

Table 5 Statistical analysis of $L_{A90,15min}$ levels during likely Sunday delivery hours

dB, L_{A90} Sunday 07.00-20.00 hours	
Mean	47
Mode	49
Median	48

5.9. It is to be noted that there were strong gusts of wind occurring on Sunday which consequently increased the overall noise level on that day. To ensure a more robust and representative assessment, a lower typical background level has been selected to be representative of the background sound level in this area during Sunday delivery hours.

5.10. Therefore, the following values are considered as representative of the existing background sound pressure levels at nearby noise sensitive premises:

- 45 dB L_{A90} between 07.00 and 20.00 hours Monday to Saturday;
- 44 dB L_{A90} between 07.00 and 20.00 hours on Sunday.

6.0 Retail store delivery noise assessment

Deliveries

6.1. For stores of this type, main warehouse deliveries are typically made by vehicles no bigger than 12m rigid lorries. Each delivery will take no longer than one hour to complete, the deliveries would not be within the same hour, and no overlap would occur. Ambient deliveries would typically be made three times a week, between 07.00 and 20.00 hours, with fresh and frozen deliveries made six times a week (usually between 07.00 and 13.00 hours).

6.2. Smaller deliveries will be made via third party suppliers (bread, sandwiches, newspapers, etc.); however, the vehicles and loads associated with these deliveries are not anticipated to result in any significant noise impact, since they are smaller vehicles and metal roll cages are not used.

6.3. The proposed loading bay is at the rear of the store, on the west elevation. Vehicles will enter the store car park from Riversfield Drive in forward gear, reverse to the rear of the unit which in turn will take up several car-park spaces along the western and northern façades of the store, and unload. Goods will be unloaded into the BOH by trolleys. The delivery vehicles will leave the store in forward gear onto Riversfield Drive before turning onto the main High Street.

Nearest noise sensitive receptors

6.4. The nearest noise sensitive properties to the loading bay and BoH entrance are the houses to the east of the BOH entrance (Receptor R1), to the west of the car park entrance where the lorries will be arriving and departing (Receptor R3) and to the north of the BOH entrance (Receptor R4). These receptors are shown in **Appendix B**. Please note that for consistency with other reports, the receptor labels are to remain the same. The house to the south of the store's car park (labelled Receptor R2 in other reports) encounters more distance attenuation as it is further away from the delivery bay. As this receptor is not as noise sensitive as R1, R3 and R4, the receptor has been omitted from this assessment.

Sound pressure levels of activities associated with store deliveries

6.5. The sound pressure levels associated with refrigerated lorry deliveries were established by measurement of a delivery at a similar convenience store in operation. The measurements included all aspects of the delivery including, but not limited to, the arrival, unloading, movement of cages and the departure of the lorry. The sound pressure levels were normalised to a distance of 10m from the delivery area and have been converted to Sound Exposure Levels (SEL) for ease of comparison/calculation. Typical L_{Amax} levels were also established.

6.6. It should be noted that the example delivery represented a standard operation; the refrigeration unit was switched off as standard.

6.7. Table 6, below, details typical source noise levels, used within the assessment, with the data presented in terms of SEL and maximum individual noise event levels (L_{AFmax}).

Table 6 Reference noise data for delivery activities (at 10m)

Noise Source	SEL, dB(A)	L_{Afmax}, dB(A)
Lorry arrives and manoeuvres	68	62
Unloading cages on to lift	71	74
Unloading pallets on to lift	75	73
Lift up	73	65
Lift down	71	71
Unloading cages into BoH	78	75
Lorry departure	75	68

Predicted impact

6.8. The information contained in Table 10 was used to 'build-up' a source noise level based on the number of activity events over the required assessment period using the following equation:

$$L_{Aeq,T} = SEL + 10.\log\left(\frac{1}{T}\right) + 10.log(N) \quad \text{(Equation 1)}$$

Where:
SEL is the L_{Aeq} over a one second period, and represents the noise energy from an event (e.g. cage movement) compressed into one second;
T is the reference time period in seconds; and
N is the number of movements in the time period, T.

6.9. The delivery noise level at the nearest receptor has been predicted. Full calculations are shown in **Appendix E** and are summarised in Table 7.

Table 7 Predicted delivery noise levels

Receptor	Predicted noise levels at window of most affected residential dwelling	
	$L_{Aeq,T}$, dB	Range of L_{Afmax} (dB)
R1, house to east	54 $L_{Aeq,1hr}$	58-75
R3, house to west	49 $L_{Aeq,1hr}$	56-74
R4, house to north	51 $L_{Aeq,1hr}$	57-74

BS 4142:2014 delivery noise assessment

6.10. Table 8 below presents the initial assessment of the likely impact during the daytime period in accordance with the BS 4142:2014 methodology at the flats above the store, where noise levels are predicted to be highest:

Table 8 Assessment of predicted external delivery noise levels at Receptor R1 using BS 4142:2014 during the daytime

Results	Mon-Sat 07.00 – 20.00	Sunday 07.00 – 20.00	Relevant Clauses of BS 4142:2014	Commentary
Background Sound level	L_{A90} = 45dB	L_{A90} = 44dB	8.1, 8.2	Representative typical background sound level during permitted delivery period, determined from a range of measurements
Assessment made during the daytime, so the reference interval is one hour			7.2	
Specific Sound Level	$L_{Aeq,T}$ = 54dB		7.3.6	Calculations presented in Appendix E
Acoustic Feature Correction	6dB		9.2	Impulsivity (bangs and clatters) could be perceptible (See Appendix E for calculations)
Rating Level	(54+6) dB = 60dB			
Excess of Rating Level over background sound level	(60-45) dB = +15dB	(60-44) dB = +16dB		
Context	Site is on a road with local traffic, producing short periods of high noise levels			
Assessment of impact:	Potential significant adverse impact			

6.11. The assessment indicates that, for deliveries made within the typical delivery periods as noted, the rating level is 15-16 dB above the representative background sound level and there is therefore the possibility of a significant adverse noise impact.

6.12. It should be noted, however, that deliveries do not occur in the early morning or late evening, and that there are only up to nine main depot deliveries in a week. The majority of the deliveries would be made between 07.00 and 13.00 hours, when sound levels are higher, and would therefore result in a less significant adverse impact.

Recommended Delivery Noise Mitigation

6.13. It is recommended that the store implements a noise management plan to reduce the noise impact of deliveries on the neighbours as much as possible. A typical set of mitigation measures is given below.

Noise Management Plan for deliveries

- Drivers contact the store prior to arrival to ensure staff are ready to assist;
- Deliveries are scheduled and agreed with the store to reduce to a minimum the time taken to deliver the goods and therefore limit potential for noise impact;
- Delivery doors are well maintained to minimise noise when opening / closing;
- Lorry engine and refrigeration is turned off as soon as practicable and they are not left running during deliveries;
- An isolating mat is placed under the tail/scissor lift to reduce the noise of the plates on the pavement or the loading bay;
- The radio in the lorry cabin is switched off / muted before arrival;
- All employees speak in hushed voices;
- All employees avoid going over drains and loose paving when moving cages.
- There is a general requirement for all drivers to minimise noise at all times;
- Delivery vehicles are driven around the area in a considerate manner, e.g. speed being kept to a practical minimum and all items properly fastened in order to ensure rattles and bangs are kept to a minimum;
- If a complaint arises, employees will follow a set of guidelines which set out how to deal with complaints quickly and effectively and to address any issues raised.

7.0 Discussion of results and uncertainties

7.1. Where possible uncertainty in the above assessments has been minimised by taking the following steps:

- The measurement of the background sound levels was taken over a 72-hour weekend period.
- The meter and calibrator used have a traceable laboratory calibration and was field calibrated before and after the measurements.
- Uncertainty in the calculated impacts has been reduced by the use of well-established calculation methods.

8.0 Summary

8.1. Noise Solutions Ltd (NSL) has been commissioned to undertake a delivery noise impact assessment for the proposed Convenience store sited in Rocester.

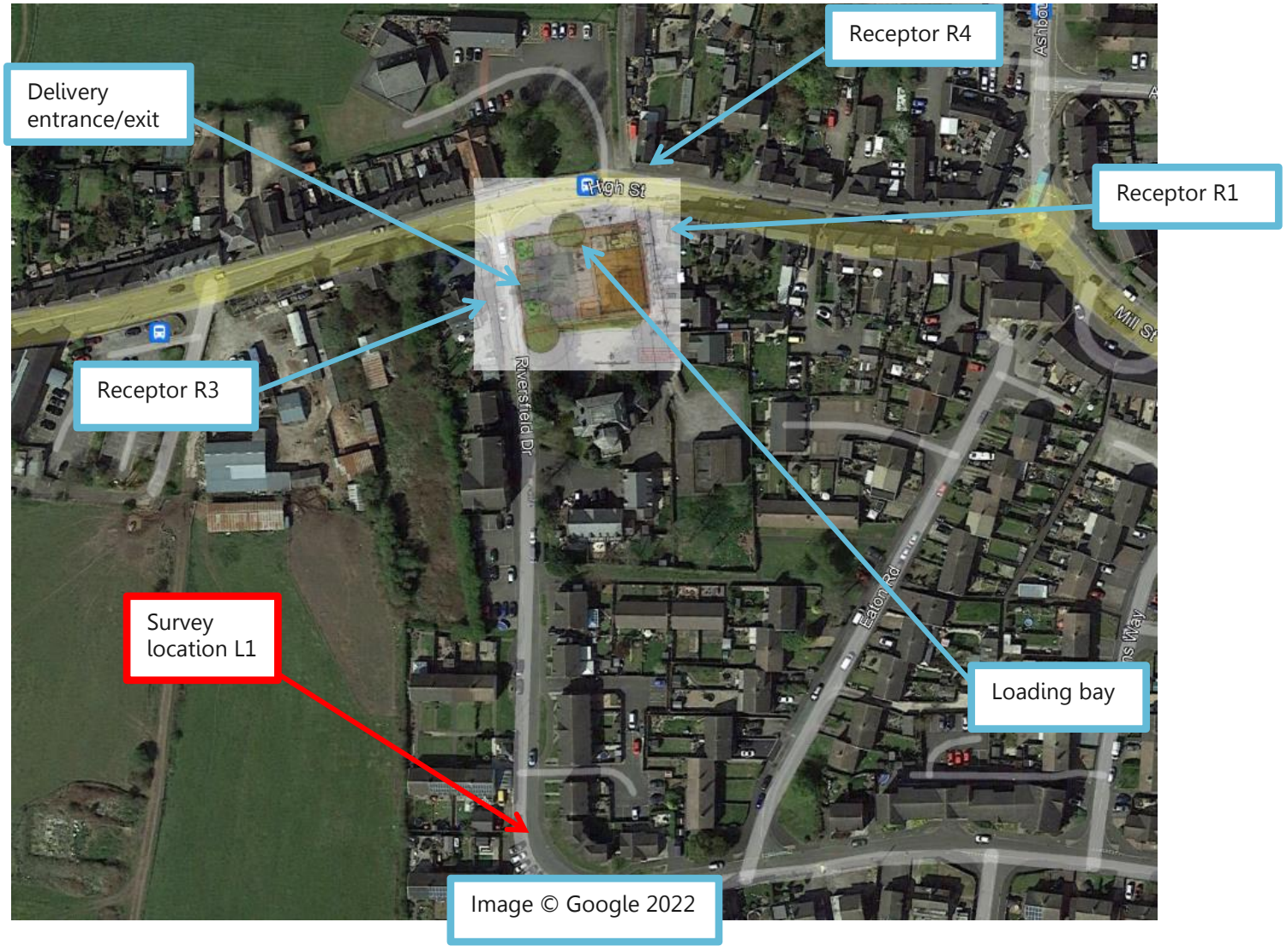
8.2. The results of the assessments were analysed and reviewed in line with the aims and advice contained within the relevant planning policies and recognised Standards and guidance.

8.3. For main store deliveries made between 07.00 hours and 20.00 hours there could be a significant adverse noise impact. The impact may be minimised by implementation of an appropriate noise management plan. It should be noted that there are expected to be only nine main store deliveries a week, with the majority taking place between 07.00 and 13.00 when ambient sound levels are higher. No main depot deliveries would be made during the early morning or late evening.

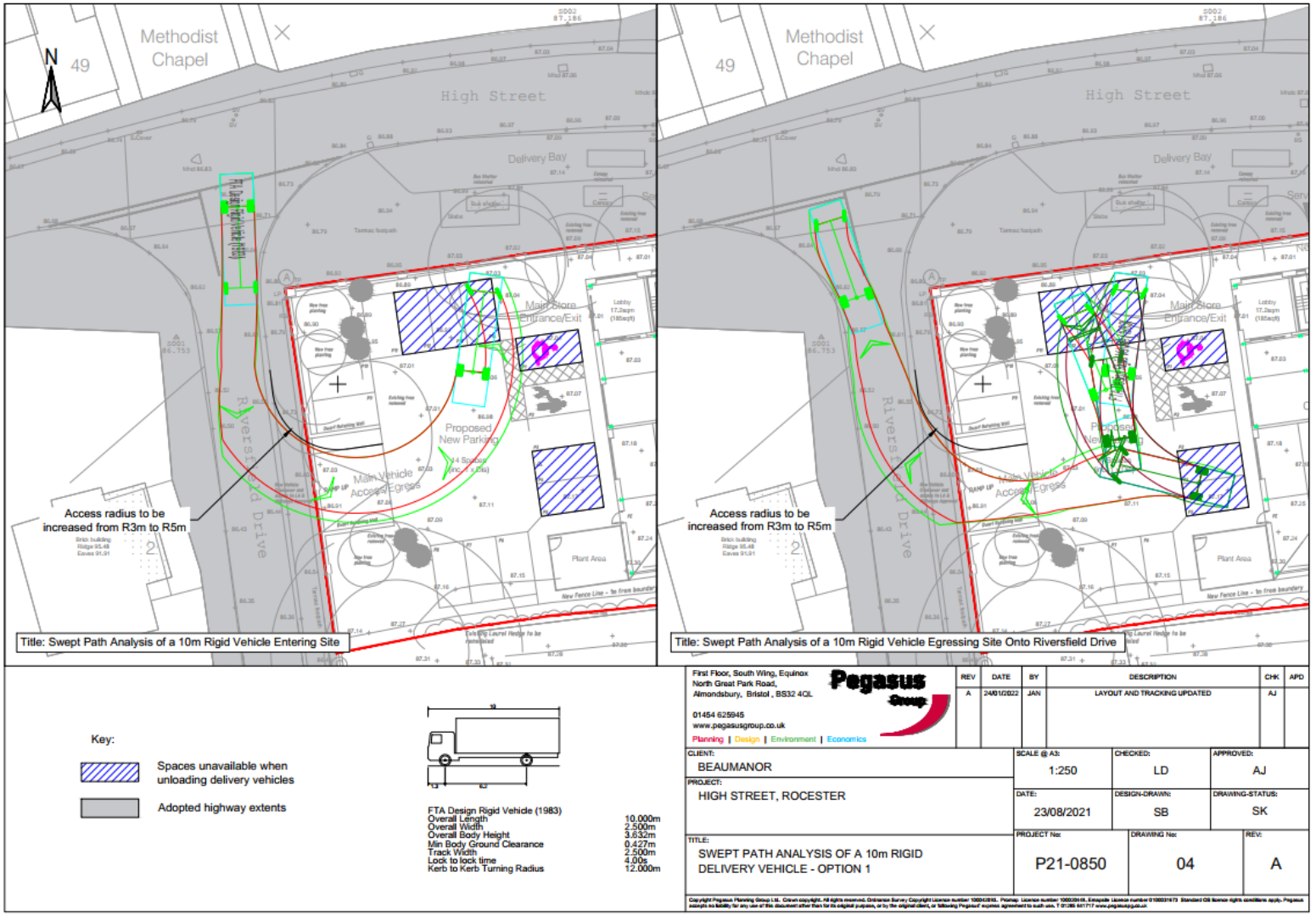
Appendix A Acoustic terminology

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 ($L_{Aeq,T}$).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 $\log_{10}$ (s1/s2). 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 20µPa. 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.
$L_{Aeq,T}$	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.
$L_{90,T}$	A noise level index. The noise level that is exceeded for 90% of the measurement time interval, T. It gives an indication of the lower levels of fluctuating noise. It is often used to describe the background noise level and can be considered to be the "average minimum" noise level and is a term used to describe the level to which non-specific noise falls during quiet spells, when there is lull in passing traffic for example.

Appendix B Aerial photograph of site with overlaid development plan



Appendix C Delivery plan



Appendix D Environmental sound survey

Details of environmental sound survey

D.1 Measurements of the existing background sound levels were undertaken between 14.15 hours on Friday 14 January and 12.30 hours on Monday 17 January 2022.

D.2 The sound level meter was programmed to record the A-weighted L_{eq}, L_{90}, L_{10} and L_{max} noise indices for consecutive 15-minute sample periods for the duration of the survey.

Measurement position

D.3 Unattended measurements were made at position L1 shown in **Appendix B**. The meter was secured to a lamp column with the microphone approximately 3m above the ground.

D.4 In accordance with BS 7445-2:1991 *'Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use'*, the measurements were undertaken under free-field conditions.

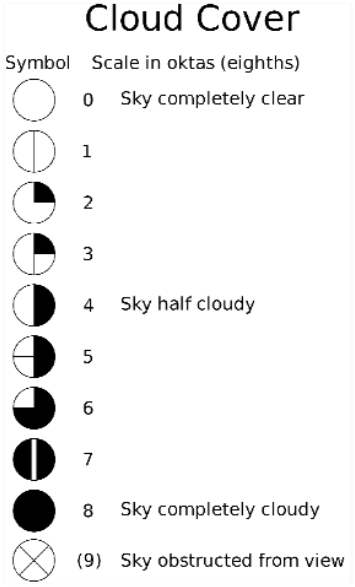
Equipment

D.5 Details of the equipment used during the survey are provided in the table below. The sound level meter was calibrated before and after the survey; no significant change (+/-0.2 dB) in the calibration level was noted.

Period	Description	Model / serial no.	Calibration date	Calibration certificate no.
14-17 January	Class 1 Sound level meter	Rion NL-52 / 00654035	07/06/2021	1500431
	Condenser microphone	Rion UC-59 /08290		
	Preamplifier	Rion NH-25 / 54080		
	Calibrator	Rion NC-74 /34235932	23/09/2021	1500910-1

Weather Conditions

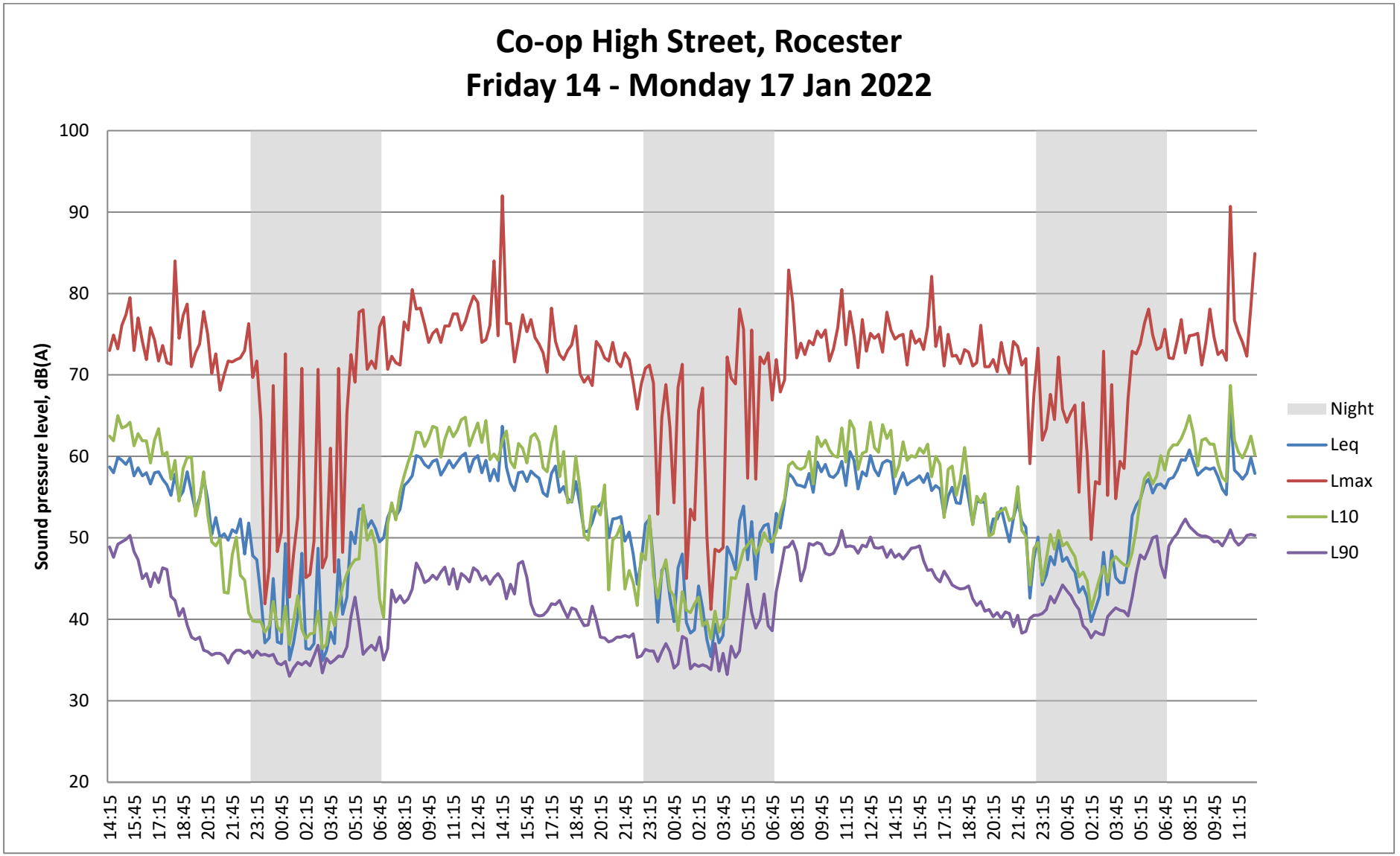
D.6 Weather conditions were determined both at the start and on completion of the survey. It is considered that the meteorological conditions were appropriate for environmental noise measurements. The table below presents the weather conditions recorded on site at the beginning and end of the survey.

Weather Conditions				
Measurement Location	**Date/Time**	**Description**	**Start of Survey**	**End of survey**
As indicated on Appendix B	14.15 14 Jan - 12.30 17 Jan 2022	Temperature (°C)	4	7
		Precipitation:	No	No
		Cloud cover (oktas - see guide)	1	0
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	Damp	Damp/Wet
		Wind Speed (m/s)	<1	1.9
		Wind Direction	S	SW
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	n/a	n/a

Results and observations

D.7 The noise climate at the measurement position was dominated by local road traffic and birdsong.

D.8 The results of the unattended survey are presented in a time history graph overleaf.


Co-op High Street, Rocester
Friday 14 - Monday 17 Jan 2022
Sound pressure level, dB(A)
100
90
80
70
60
50
40
30
20
14:15
15:45
17:15
18:45
20:15
21:45
23:15
00:45
02:15
03:45
05:15
06:45
08:15
09:45
11:15
12:45
14:15
15:45
17:15
18:45
20:15
21:45
23:15
00:45
02:15
03:45
05:15
06:45
08:15
09:45
11:15
12:45
14:15
15:45
17:15
18:45
20:15
21:45
23:15
00:45
02:15
03:45
05:15
06:45
08:15
09:45
11:15
Night
Leq
Lmax
L10
L90

Appendix E Delivery noise calculations

Receptor R1

Activity	Measured noise levels		Correction for no. of occurrences		Distance correction		Resultant SEL at receptor (dB)	BS 4142:2014 Feature Correction	Resultant SEL inc. feature (dB)	Resultant L_{Amax} at receptor (dB)
	SEL @ 10m	L_{Amax} @10m	No. of occurrences	Correction (dB)	Distance (m)	Correction (dB)				
Lorry arrives and manouvres	68	62	1	0	5	6	74	3	77	68
Unloading cages on to lift	71	74	10	10	23	-7	74	6	80	67
Unloading pallets on to lift	75	73	10	10	23	-7	78	6	84	66
Lift up	73	65	10	10	23	-7	76	3	79	58
Lift down	71	71	10	10	23	-7	74	6	80	64
Trollies moved from lorry to store entrance	78	75	10	10	10	0	88	6	94	75
Lorry departure	75	68	1	0	5	6	81	3	84	74
						Cumulative SEL:	90		95	
						$L_{Aeq\ (1\ hour)}$:	54		60	
						Range of L_{Amax}:				58 - 75

Receptor R3

Activity	Measured noise levels		Correction for no. of occurrences		Distance correction		Resultant SEL at receptor (dB)	BS 4142:2014 Feature Correction	Resultant SEL inc. feature (dB)	Resultant L_{Amax} at receptor (dB)
	SEL @ 10m	L_{Amax} @10m	No. of occurrences	Correction (dB)	Distance (m)	Correction (dB)				
Lorry arrives and manouvres	68	62	1	0	5	6	74	3	77	68
Unloading cages on to lift	71	74	10	10	28	-9	72	6	78	65
Unloading pallets on to lift	75	73	10	10	28	-9	76	6	82	64
Lift up	73	65	10	10	28	-9	74	3	77	56
Lift down	71	71	10	10	28	-9	72	6	78	62
Trollies moved from lorry to store entrance	78	75	10	10	45	-13	75	6	81	62
Lorry departure	75	68	1	0	5	6	81	3	84	74
						Cumulative SEL:	85		89	
						$L_{Aeq\ (1\ hour)}$:	49		53	
						Range of L_{Amax}:				56 - 74

Receptor R4

Activity	Measured noise levels		Correction for no. of occurrences		Distance correction		Resultant SEL at receptor (dB)	BS 4142:2014 Feature Correction	Resultant SEL inc. feature (dB)	Resultant L_{Amax} at receptor (dB)
	SEL @ 10m	L_{Amax} @10m	No. of occurrences	Correction (dB)	Distance (m)	Correction (dB)				
Lorry arrives and manouvres	68	62	1	0	5	6	74	3	77	68
Unloading cages on to lift	71	74	10	10	27	-9	73	6	79	65
Unloading pallets on to lift	75	73	10	10	27	-9	76	6	82	65
Lift up	73	65	10	10	27	-9	74	3	77	57
Lift down	71	71	10	10	27	-9	73	6	79	63
Trollies moved from lorry to store entrance	78	75	10	10	20	-6	82	6	88	69
Lorry departure	75	68	1	0	5	6	81	3	84	74
						Cumulative SEL:	86		91	
						$L_{Aeq\ (1\ hour)}$:	51		56	
						Range of L_{Amax}:				57 - 74