NSL
Noise Solutions Ltd

Co-op
George Hotel, Duke Street, Southport, PR8 5DH

Noise Impact Assessment

On behalf of

The co-operative

Central England Co-operative

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For and on behalf of Noise Solutions Ltd				

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1	6/12/2023	Revised demolition and construction	ACM	NAC

Contents

Appendices

1.0 Introduction

1.1. Noise Solutions Ltd (NSL) has been commissioned by the Central England Co-operative to undertake a noise impact assessment for their proposed store on the site of the George Hotel, Duke Street, Southport, PR8 5DH.

1.2. An environmental sound survey has been undertaken to establish the prevailing background sound pressure levels at a location representative of the sound levels outside the nearest noise sensitive receptors to the site.

1.3. Predicted delivery noise levels have been predicted at the nearest noise sensitive receptors based on available information relating to proposed delivery times, vehicle type, etc and the guidance provided in BS 4142:2014+A1:2019 '*Methods for rating and assessing industrial and commercial sound*' and BS8233:2014' *Guidance on sound insulation and noise reduction for buildings*'.

1.4. The potential noise impact from car park and pedestrian usage associated with operational use of the store has been predicted at the nearest noise sensitive receptors and assessed in accordance with the National Planning Policy Framework and IOA/IEMA guidance.

1.5. An assessment of the potential impact of fixed plant noise has been undertaken based on the typical local authority requirements and the guidance provided in BS 4142:2014+A1:2019 '*Methods for rating and assessing industrial and commercial sound*'.

1.6. This report contains recommendations based on project information available at the time of the assessment and the results of the baseline noise survey.

1.7. A glossary of acoustic terminology is given in Appendix A.

2.0 Details of site, operating hours and deliveries

2.1. The proposal is for the demolition of the existing building and construction of a new ground floor food store and creation of 4no. residential units on the first floor.

2.2. Refrigeration and air conditioning (AC) plant will be located externally within a yard at the rear of the store. The proposed AC unit is to be housed within an acoustic enclosure.

2.3. The AC plant will operate only when the store is open; the refrigeration plant will operate at all times but will typically run at reduced duty at night.

2.4. The store will open between 7am and 10pm, Monday to Sunday.

2.5. 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. It is understood that between two and four such deliveries would occur per day, between 08.00 and 20.00 hours, for both weekdays and weekend daytime periods. Vehicles will be limited to 12m HGVs.

2.6. 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.

2.7. A site plan showing the site and surrounding area and the noise monitoring location used in this assessment is presented in Appendix B. A layout drawing for the proposed development is given in Appendix C.

3.0 Nearest noise sensitive receptors

3.1. The area surrounding the site is a mixture of commercial and residential properties.

3.2. The nearest noise sensitive properties to the potential noise sources are the house at 145 Duke Street to the north-west (R1) and the new flats above the store (R2). Slightly different locations (front and side of the flat) are used in the various assessments at R2 to ensure a worst-case in all instances.

3.3. Appendix C shows the locations of the receptors.

4.0 Policy Context

National Planning Policy Framework

4.1. A new edition of the NPPF was published in September 2023 and came into effect immediately. The original National Planning Policy Framework (NPPF[1]) was published in March 2012, with subsequent revisions made periodically - this document replaced the existing Planning Policy Guidance Note 24 (PPG 24) "Planning and Noise." The 2023 revised edition contains no new directions or guidance with respect to noise. The paragraph references quoted below relate to the September 2023 edition.

4.1. Paragraph 174 of the NPPF states that the planning system should contribute to and enhance the natural and local environment by, (amongst others) *"preventing 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 instability."*

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

4.1. 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;

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 ...

4.1. The NPPF document does not refer to any other documents or British Standards regarding noise other than the Noise Policy Statement for England (NPSE[2]).

4.1. 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."*

4.1. 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*".

4.7. 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*".

Noise Policy Statement for England

4.8. The Noise Policy Statement for England (NPSE[5]), 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;

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

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

mitigate and minimise adverse effects on health and quality of life; and

where possible, contribute to the improvement of health and quality of life."

4.9. 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.

4.10. 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."*

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

4.12. 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."*

4.13. 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.

Planning Practice Guidance – Noise

4.14. An updated Planning Practice Guidance (PPG[6]) 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.

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

4.15. 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').

4.16. 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.

4.17. The LOAEL is described in PPG[7] 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".

4.18. 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."

4.19. 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[8] 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."*

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

Table 1 Table of effects (Planning Policy Guidance)

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

[7] Paragraph: 005 Reference ID: 30-005-20190722
[8] 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

4.21. The Planning Practice Guidance[9] states the following in relation to mitigation measures:

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

"*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.*"

4.22. In addition, the Guide notes that it may also be relevant to consider[10]:

"*... 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*".

Sefton Metropolitan Borough Council

4.23. The Sefton Local Plan published in April 2017 contains the following:

EQ4 POLLUTION AND HAZARDS

1. *Development proposals should demonstrate that environmental risks have been evaluated and appropriate measures have been taken to minimise the risks of adverse impacts which include amenity, damage to health and wellbeing, property and the natural environment (including internationally important nature sites) from:*

    a. *Pollution of the land, water (including surface water and groundwater) and the air,*

    b. *Hazardous substances,*

    c. *Noise/vibration, dust, odour or artificial light pollution.*

2. *Development will be permitted where it can be demonstrated that:*

    a. *Appropriate measures are incorporated into proposals to avoid pollution to air, water and soil,*

    b. *There would be no unacceptable risk to the users of the site, occupiers of neighbouring land or the environment from the presence of hazardous substances. Proposals for sensitive uses close to existing sources of pollution*

[10] Paragraph: 006 Reference ID: 30-006-20190722

must demonstrate that there will be no detrimental impact on the amenity of existing or future occupiers,

c. The impact of noise/vibration and lighting will not be significant or can be reduced to an acceptable level.

3. Development must lead to no deterioration of, and where practicable improve, water quality, and must protect and enhance Sefton's waterbodies and water environment.

The cumulative effects of pollution will be taken into account in terms of the impact of a number of developments in an area. The effects of a combination of various types of pollution will also be considered.

4.24. NSL has engaged with the Environmental Health team in relation to previous, similar, assessments to agree the scope and the expected requirements. In relation to commercial noise and BS4142:2014 assessments, the response from an Environmental Health Officer[11] stated:

"..the environmental health team would expect the excess over background (L90) to be 0dB at the highest. We would prefer to see minus values etc."

5.0 Noise assessment (policy and guidance)

BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound

5.1. BS 4142:2014+A1:2019 is intended to be used to assess the likely effects of sound on people residing in nearby dwellings. The scope of BS 4142:2014+A1:2019 includes *"sound from the loading and unloading of goods and materials at industrial and/or commercial premises*".

5.2. The procedure contained in BS 4142:2014+A1:2019 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.

5.3. 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.

[11] Telephone and email correspondence with Alan McGing dated 10 November 2020

5.4. 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."*

5.5. 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."*

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

> *Typically, the greater this difference, the greater the magnitude of the impact.*
>
> *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;*
>
> *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context;*
>
> *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*

5.7. The standard does state 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."*

5.8. 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."*

5.9. 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."*

5.10. BS 4142:2014+A1:2019 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.

BS 8233:2014 Guidance on sound insulation and noise reduction for buildings.

5.11. 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 (1999[12]). These guideline noise levels are shown in Table 2, below:

Table 2 BS 8233 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 $L_{Aeq,8h}$

5.12. 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."*

World Health Organisation, Guidelines for Community Noise, 1999 (WHO)

5.13. The World Health Organisation (WHO) Guidelines for Community Noise (1999) recommends suitable internal and external noise levels based on dose response research. The levels recommended in this guidance could be correlated to the LOAEL. Relevant guidance from this document is presented below.

Sleep Disturbance (Night-time internal LOAEL): If negative effects on sleep are to be avoided, the equivalent sound pressure level should not exceed 30dBA indoors for continuous noise.

[12] World Health Organisation Guidelines for Community Noise, 1999

Interference with Communication (Daytime internal LOAEL): Noise tends to interfere with auditory communication, in which speech is a most important signal. However, it is also vital to be able to hear alarming and informative signals such as door bells, telephone signals, alarm clocks, fire alarms etc., as well as sounds and signals involved in occupational tasks. The effects of noise on speech discrimination have been studied extensively and deal with this problem in lexical terms (mostly words but also sentences). For communication distances beyond a few metres, speech interference starts at sound pressure levels below 50 dB for octave bands centred on the main speech frequencies at 500, 1 000 and 2 000 Hz. It is usually possible to express the relationship between noise levels and speech intelligibility in a single diagram, based on the following assumptions and empirical observations, and for speaker-to-listener distance of about 1 metre:

a) Speech in relaxed conversation is 100% intelligible in background noise levels of about 35dBA, and can be understood fairly well in background levels of 45dBA.

b) Speech with more vocal effort can be understood when the background sound pressure level is about 65dBA.

World Health Organisation (WHO) 2009

5.14. The introduction of the Directive on Environmental Noise obliges Member States to assess and manage noise levels. With the support of the European Commission, the WHO Regional Office for Europe has developed night noise guidelines for Europe to help Member States develop legislation to control noise exposure.

5.15. The guidelines are based on scientific evidence on the effects of noise and the thresholds above which these effects appear to harm human health.

5.16. There is limited evidence that night noise is related to hypertension, heart attacks, depression, changes in hormone levels, fatigue and accidents.

5.17. The WHO report summarises the threshold levels of night noise above which a negative effect starts to occur or above which the impact becomes dependent on the level of exposure. For example, the threshold level for waking in the night and/or too early in the morning was 42 dB.

5.18. It also establishes that there are differences in the intensity and frequency of noise depending on the source, which lead to different impacts. Road traffic is characterised by low levels of noise per event, but as there are a high number of events, on average it has a greater effect on awakenings than air traffic, which has high levels of noise per event but fewer events.

5.19. Integrating these findings, the report proposed a guideline target limit of outdoor night noise of 40 dB (annual average defined as 'L_{night}' in the Environmental Noise Directive). There is not sufficient evidence that the biological effects observed below this level are harmful to health but adverse effects are observed above 40dB.

Institute of Environmental Management & Assessment 'Guideline for Environmental Noise Impact Assessment', October 2014

5.20. The guidelines address the key principles of noise impact assessment and are applicable to all development proposals where noise effects are likely to occur. The guidelines provide specific support on how noise impact assessment fits within the Environmental Impact Assessment (EIA) process. They cover:

How to scope a Noise Assessment;

Issues to be considered when defining the baseline noise environment;

Prediction of changes in noise levels as a result of implementing development proposals; and

Definition and evaluation of the significance of the effect of changes in noise levels (for use only where the assessment is undertaken within an EIA).

5.21. Although the guidance states that it is only applicable for use in an Environmental Impact Assessment (EIA), in the absence of any other relevant guidance for assessing changes in ambient noise levels, it is the most appropriate document for establishing significance of effect.

5.22. Table 3 categorises the change in noise level for a noise sensitive receptor such as a residential dwelling.

Table 3 Effect Descriptors

Change in Ambient Noise Level	Effect
>10dB	Very substantial
5.0dB – 9.9dB	Substantial
3.0dB – 4.9dB	Moderate
<2.9dB	None / not significant

5.23. The criteria above reflect key benchmarks that relate to human perception of sound. A change of 3dB is generally considered to be the smallest change in noise that is perceptible and a 10dB change in noise represents a doubling or halving of the noise level. The difference between the minimum perceptible change and the doubling or halving of the noise level is split to provide greater definition to the rating of noise changes.

6.0 Existing noise climate

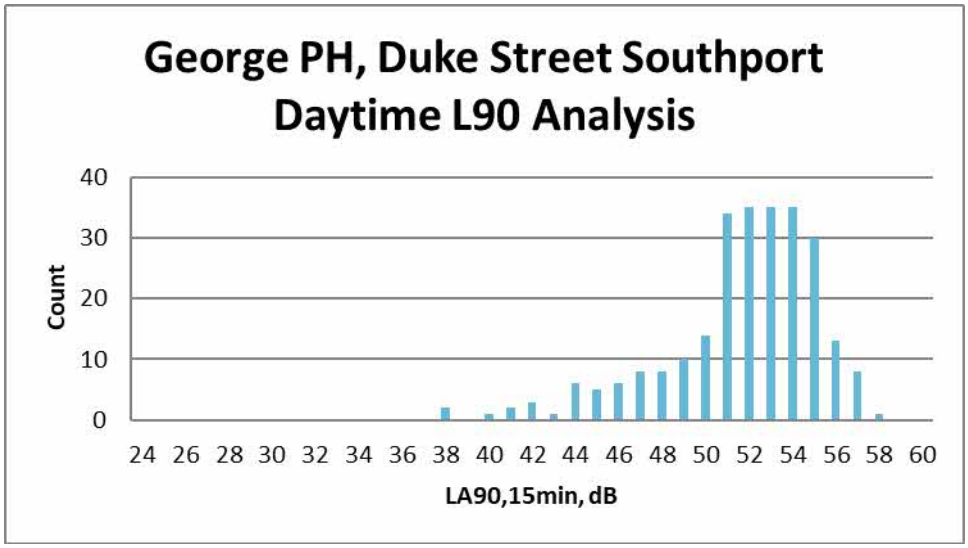
6.1. An environmental noise survey was undertaken to establish the typical background sound levels at a location representative of the noise climate outside the façades of the nearest noise sensitive receptors to the site.

6.2. The results of the environmental sound survey are summarised in Table 4 below. The full set of measurement results and details of the survey methodology are presented in Appendix D.

Table 4 Summary of survey results

Measurement period	Range of recorded sound pressure levels (dB)			
	$L_{Aeq(15mins)}$	$L_{Amax(15mins)}$	$L_{A10(15mins)}$	$L_{A90(15mins)}$
Daytime (07.00 – 23.00 hours)	56-74	71-100	56-71	38-58
Night-time (23.00 – 07.00 hours)	45-71	66-100	40-68	28-52

Figure 1 Histogram of daytime L_{A90} background sound pressure levels



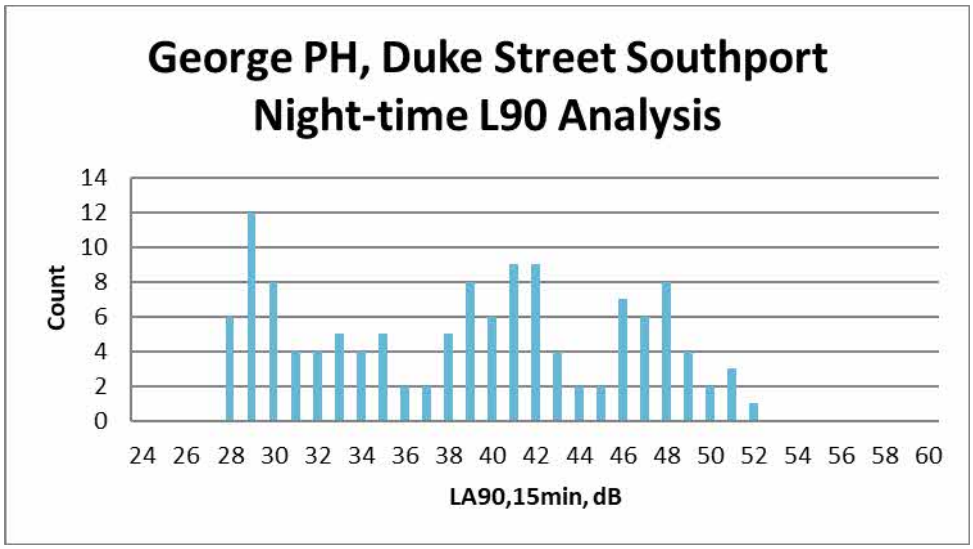
6.3. Further statistical analysis has been carried out on the data; the mean, modal and median values are shown in Table 5 below.

Table 5 Statistical analysis of $L_{A90,15min}$ levels during the daytime period

dB, L_{A90} daytime period	
mean	52
modal	53
median	52

6.4. From review of the time history chart, 38 dBA has been selected to be a robust representation of the background noise level during the daytime period.

Figure 2 Histogram of night-time L_{A90} background sound pressure levels



6.5. Further statistical analysis has been carried out on the data; the mean, modal and median values are shown in Table 6 below.

Table 6 Statistical analysis of $L_{A90,15min}$ levels during the night-time period

dB, L_{A90} night-time period	
mean	39
modal	29
median	39

6.6. Again, from the time history chart, 28 dBA has been selected to be a robust representation of the background sound level during the night-time period.

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

38dB L_{A90} during the daytime period; and

28dB L_{A90} during the night-time period.

Covid-19

6.8. It should be noted that the environmental noise survey discussed in this report was undertaken in January 2022, at a time when the coronavirus pandemic was causing potentially very minor disruption to typical working patterns and other activity. It is therefore possible that recorded sound levels are slightly lower than would otherwise be expected where dominated by road or air traffic. While the data should therefore be treated with an element of caution, where it has been used to establish background sound levels the only potential effect of these conditions is a possible underestimate of the existing background sound levels, resulting in a more stringent, robust assessment.

7.0 Summary of criteria

7.1. For the BS 4142:2014 assessment of plant and deliveries, the limits are presented in terms of the rating level at the nearest residential receptors.

7.2. It is initially proposed, based upon Sefton Council's criterion, that the cumulative rating level of the plant should not exceed the existing background noise level at the nearest receptor.

7.3. However, due to the exceptionally low prevailing environmental noise levels determined during the night-time period, it is suggested that the plant noise design criteria at the nearest residences should be capped at 30dBA. This proposed criterion is based on guidance found in Section 11 of BS 4142:2014 which states:

> *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.*

7.4. A plant noise level of 30dBA at the façade would result in an internal noise level of 15dBA, which is likely to be lower than self-generated noise internally (for example, from domestic refrigerators). This assumption is based on guidance found in BS 8233:2014, which states that approximately 15dB of insulation is provided by a partially open window.

7.5. The cumulative noise level for the proposed plant at the nearest residential receptors should not therefore exceed the limits shown in the table below:

Table 7 Proposed plant noise emissions level limits at noise sensitive residential receptors

Period	Cumulative plant noise level, dB(A)
Daytime (07.00 – 23.00 hours)	38
Night-time (23.00 – 07.00 hours)	30

7.6. For operational usage and assessment of car park noise, a change of level of <2.9 dB will be sought, corresponding to 'no effect'.

8.0 Plant noise impact assessment

8.1. The cumulative plant noise levels at the most potentially affected noise sensitive receptors have been calculated, and the potential impact of the installed plant assessed.

8.2. It should be noted that the proposed plant is not anticipated to exhibit any tonal or impulsive characteristics provided it is well maintained. All proposed plant will be inverter driven and, therefore, will gently ramp up and down depending on the demands on the various systems. In order to be robust, however, a penalty of 3dB as described in BS 4142:2014 has been applied for the possible presence of "...*characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment...".*

8.3. The calculations are inclusive of the VRF being housed within an acoustic enclosure providing an overall sound reduction of 20dB, and the 2.4m close-boarded fencing around the service yard.

8.4. Table 8, below, summarises the results of the assessment at the nearest noise-sensitive receptors. In this case R2 refers to the windows most nearly overlooking the plant area. All other receptors benefit from increased distance/screening to the plant. The full set of calculations can be found in **Appendix G**.

Table 8 Plant noise impact assessment

Receptor	Period	Predicted rating levels at receptor window, L_{Aeq} (dB)	Noise criterion at receptor window (dB)	Difference (dB)
R1. House	Daytime (07.00 - 23.00 hrs)	38	38	0
	Night-time (23.00 - 07.00 hrs)	28	30	-2
R2 Flats above	Daytime (07.00 - 23.00 hrs)	34	38	-4
	Night-time (23.00 - 07.00 hrs)	29	30	-1

8.5. The predictions demonstrate that cumulative noise emissions from the proposed plant will comply with the proposed limits, inclusive of the acoustic enclosure housing the VRF unit.

8.6. As BS 4142:2014 advises, the impact must be considered within the context of the site and the surrounding acoustic environment. The following must, therefore, also be taken into consideration when determining the potential impact that may be experienced:

The assessment is undertaken at representative, nearest residential windows. The impact on all other nearby residential windows will be lower due to screening and distance attenuation.

Assessment of uncertainties

8.7. Where possible uncertainty in this assessment has been minimised by taking the following steps:

The measurement of the background sound levels was undertaken over a period including the quietest times of the day and night.

The sound level meter and calibrator used have a traceable laboratory calibration and the meter was field calibrated before and after the measurements.

Uncertainty in the calculated impact has been reduced by the use of a well-established calculation method.

Care was taken to ensure that the measurement position was representative of the noise climate outside the nearby residential dwellings and not at a position where higher noise levels are present.

9.0 Car park and pedestrian noise assessment

9.1. The proposed store has 28 no. spaces of which 22 are for general use, 4 for residents use and 2 for staff. This assessment considers noise from the 22 general use spaces for shop customers.

9.2. Receptor R1 is approximately 4m away from the nearest parking space; 32m from the store entrance; and 40m from the furthest parking space.

9.3. Receptor R2 overlooks the car park above the entrance; it is approximately 7m away from the nearest parking space; 4m from the store entrance; and 27m from the furthest parking space for which it has line-of-sight. A small number of spaces are not visible from R2 but nonetheless are included in the modelling for a robust assessment.

9.4. BS 4142:2014 is explicit in its scope that noise from vehicles in car parks should not be assessed using its methodology, so reference is made to the ambient noise climate and absolute levels in the context of the IOA/IEMA guidance. As a robust assessment, the later part of the evening will be assessed.

9.5. The lowest recorded ambient (average) noise level ($L_{Aeq,1hr}$) measured during the environmental noise survey during proposed opening hours (07.00 – 22.00 hours) was 63dB. This occurred on the morning of Sunday 30th January between 07.00 and 08.00 hours.

9.6. It is appreciated that early in the morning customers may have a preference to use car parking spaces closer to the entrance. To ensure a robust assessment however, it is assumed that all spaces will be used in the early morning. It is also assumed that each space will be 'turned over' twice per hour, resulting in a total of 88 movements from 44 cars entering and exiting the car park in an hour. Additionally, arrivals on foot are considered.

9.7. Assessing noise from cars arriving at and departing from the spaces and including noise from people talking (as they may arrive in pairs/groups or talk on the phone to and from the store), the one-hour noise level at Receptor R1 is 41dB $L_{Aeq,1hr}$. The one-hour noise level at Receptor R2 is 46dB $L_{Aeq,1hr}$. Full calculations can be seen in Appendix E.

9.8. The following table considers these levels in the context of the existing ambient noise level as per the methodology of the IOA/IEMA guidance. The prevailing ambient level used is the lowest $L_{Aeq,1hr}$ recorded during the proposed opening hours.

Table 9 Car park noise impact assessment

Receptor	Predicted due to car park etc. $L_{Aeq,1hr}$ (dB)	Lowest measured ambient $L_{Aeq,1hr}$ (dB)	Total level with car park usage $L_{Aeq,1hr}$ (dB)	Change $L_{Aeq,1hr}$ (dB)	Effect descriptor
R1	41	63	63	0.0	None/Not significant
R2	46	63	63	0.1	None/Not significant

9.9. The effect descriptor is found to be 'None/ Not significant'.

10.0 Delivery noise assessment

Sound pressure levels due to store deliveries

10.1. The sound pressure levels associated with refrigerated lorry deliveries have been quantified using measurement of a 12m HGV delivery at a similar convenience store from the NSL acoustic library. 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.

10.2. Sound pressure levels have been normalised to a distance of 10m from the delivery area and have been converted to Sound Exposure Levels (SEL) for ease of comparison/calculation.

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

10.4. The table below details typical source noise levels used within the assessment, with the data presented in terms of SEL. Acoustic feature corrections are also tabulated here (see below).

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

Noise Source	SEL, dB(A)	Penalty	Penalty notes
Lorry arrives and manoeuvres	68	3	distinct against environment
Lorry manoeuvring-first movement (no reversing alarms)	75	3	distinct against environment
Unloading cages on to lift	71	6	perceptible impulsivity
Unloading pallets on to lift	75	6	perceptible impulsivity
Lift up	73	3	distinct against environment
Lift down	71	6	perceptible impulsivity
Unloading cages into BoH (each haul "zone")	69	6	perceptible impulsivity
Lorry departure	75	3	distinct against environment

10.5. 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:

$$L_{A\ e,Tq} = S\ \ E + L10.\log\ (\frac{1}{T}) + 10.l\ \ o\ (N) \quad \text{(Equation 1)}$$

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**.

10.6. Corrections have been made for the distance between each part of the delivery activities and the receptors, and, where appropriate, for the effects of acoustic screening provided by the store building envelope. For HGV movements, consideration has been given to the proportion of a traverse relative to the receptor, using the methodology outlined in F.2.5 in BS 5228-1:2009 + A1:2014[13].

[13] *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*

10.7. Acoustic feature corrections based on audible characteristics have been added to each event before overall summation.

10.8. The delivery noise levels at the nearest receptors have therefore been predicted. Full calculations are shown in Appendix G.

Table 11 Predicted delivery noise rating level

Receptor	Predicted noise rating level at window of most potentially affected residential dwellin
	L_{Ar}, dB
R1 (residential facade)	48
R2 (residential facade)	51

BS 4142:2014+A1:2019 delivery noise assessment

10.9. Table 12 below presents the initial assessment of the likely impact at R1 during various intervals with emphasis on those stated to be of interest in received EHO comment (note – deliveries are currently proposed between 08.00 and 20.00 hours daily).

10.10. Assessment is in accordance with BS 4142:2014+A1:2019 methodology, and using the commercial noise criterion received from Sefton Council:

Table 12 BS 4142:2014+A1:2019 Assessment of predicted external delivery noise levels at Receptor R1.

Period	Noise rating level L_{Ar}(dBA)	Background level L_{A90} (dB)			Difference (dB)		
		Weekday	Saturday	Sunday	Weekday	Saturday	Sunday
0800-0900 (first hr)	48	57	52	45	-8	-3	**4**
Typical		54	53	51	-6	-4	-3
1900-2000 (last hr)		51	50	54	-2	-2	-5

10.11. Table 13 below presents the same assessment at Receptor R2, above the proposed store.

Table 13 BS4142:2014+A1:2019 Assessment of predicted external delivery noise levels at Receptor R2

Period	Noise rating level L_{Ar}(dBA)	Background level L_{A90} (dB)			Difference (dB)		
		Weekday	Saturday	Sunday	Weekday	Saturday	Sunday
0800-0900 (first hr)	51	57	52	45	-6	-1	**6**
Typical		54	53	51	-4	-2	-1
1900-2000 (last hr)		51	50	54	0	**1**	-3

10.12. The assessment indicates that, for deliveries made during the delivery periods considered, the rating level is above the representative background sound level for

the first opening hour of Sunday morning at Receptor R1 and R2

the final opening hour of Saturday at Receptor R2.

10.13. Note that background noise levels on the Sunday evening were slightly elevated due to weather conditions, and so the exceedance predicted on Saturday is also likely to also apply to Sunday evenings.

10.14. For these periods then, there is found to be between a low to adverse noise impact.

10.15. The following must, therefore, also be taken into consideration when determining the potential daytime impact that may be experienced:

The assessment is undertaken at the worst-affected residential windows. The impact on all other residential windows will be lower due to distance/screening losses.

The assessment has assumed the worst-case scenario in terms of the levels of noise produced. Providing that the trollies are well maintained, it is likely that the noise from the deliveries will be quieter than the levels predicted above.

Robust BS 4142:2014+A1:2019 penalties have been included.

The number of expected deliveries by lorries is low.

Receptor R2 is a new residential premises proposed above a convenience store. It is reasonable that occupants of these premises should expect some noise from store operations.

It is to be appreciated that the BS 4142 assessment relates to external noise levels only. To assess internal noise levels, it would be necessary to take into account the sound attenuation provided by windows and ventilation provisions at nearby dwellings and to assess internal noise levels according to guidelines in BS 8233 and WHO.

BS 8233:2014 delivery noise assessment

10.16. A BS 4142:2014 assessment considers only external noise levels at the location of sensitive receptors and does not consider the attenuation offered by the building envelope and the resulting internal noise level.

10.17. The sound attenuation offered by a building will be governed by its weakest element, acoustically speaking. This is invariably the glazing and any natural ventilation provision.

10.18. With windows open for ventilation, and assuming a 15dB attenuation (as referenced in BS 8233:2014) and four deliveries per day, internal noise levels of 23dB $L_{Aeq,16\ hours}$ would be expected within overlooking facades at R1 and 24 dB $L_{Aeq,16\ hours}$ within overlooking facades at R2.

10.19. With windows closed, internal noise levels would be approximately 10dB lower, at 13 and 14 dBA respectively.

10.20. In both cases, the BS 8233:2014 internal daytime noise guideline level of 35dB $L_{Aeq,16\ hours}$ would be comfortably met.

Mitigation: Noise Management Plan for deliveries

10.21. The BS 4142 assessment indicates that noise from deliveries is of potential adverse impact, however, within the context of existing noise levels affecting the receptors and the small numbers and short durations of deliveries this should be acceptable, with adherence to a noise management plan.

10.22. 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.

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 avoid raised 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 the complaint.

Context and uncertainties

10.23. 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 several full days including the Sunday.

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 a well-established calculation method.

Care was taken to ensure that the measurement positions were representative of the noise climate outside the nearby residential dwellings and not in positions where higher noise levels were present.

11.0 Summary

11.1. Noise Solutions Ltd (NSL) has been commissioned by Central England Co-operative Limited to undertake a noise impact assessment for their proposed store on the site of the former George Hotel, Duke Street, Southport.

11.2. An environmental noise survey has been undertaken to establish the existing prevailing noise levels at locations representative of the noise climate outside the nearest noise sensitive receptors.

11.3. Noise levels from car park activity and pedestrian use when assessed at the most affected receptors in the context of the prevailing noise climate result in a finding of no significant effect, even early on weekend mornings when levels are quieter. Therefore, operation during all hours of the daytime period (07.00-22.00 hours) is unlikely to have an adverse noise impact on the closest residents.

11.4. The results of the survey have been used to undertake an assessment of the likely noise impact from deliveries at the store. For the purposes of the assessment, the methodology used in BS 4142:2014+A1:2019 was used. In most cases a low impact is found, though an adverse impact is indicated on Saturday evenings, and Sunday mornings and evenings.

11.5. Further assessments were undertaken taking into consideration guidance from BS 8233:2014, and no impact is found.

11.6. All best practicable means have been considered to lessen the impact of deliveries including the inclusion of a suitable noise management plan. The conclusion also takes into account that the HGV deliveries will be limited to four per day.

11.7. Noise levels due to the proposed plant have been predicted for the most potentially affected noise sensitive receptors and assessed using the typical requirements of Sefton Council and the guidance provided in BS 4142:2014 *'Methods for rating and assessing industrial and commercial sound'*. The assessment requires that the proposed VRF unit is housed within an acoustic enclosure providing an overall noise reduction of 20dB.

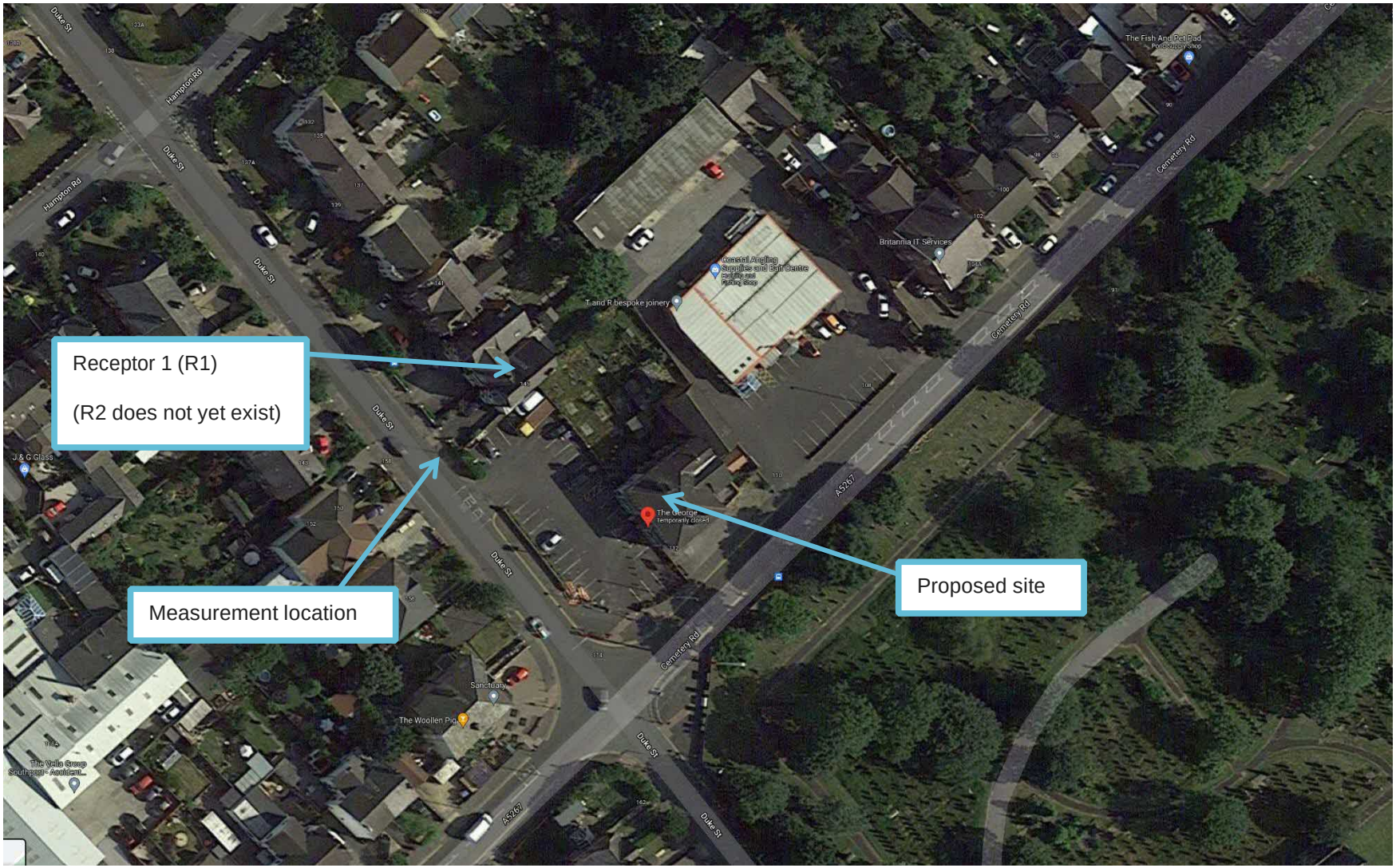
11.8. The results of the assessment demonstrate that noise levels at the most affected noise sensitive receptors will meet the proposed criteria.

11.9. Noise from the proposed store should not, therefore, be reason for refusal of planning permission.

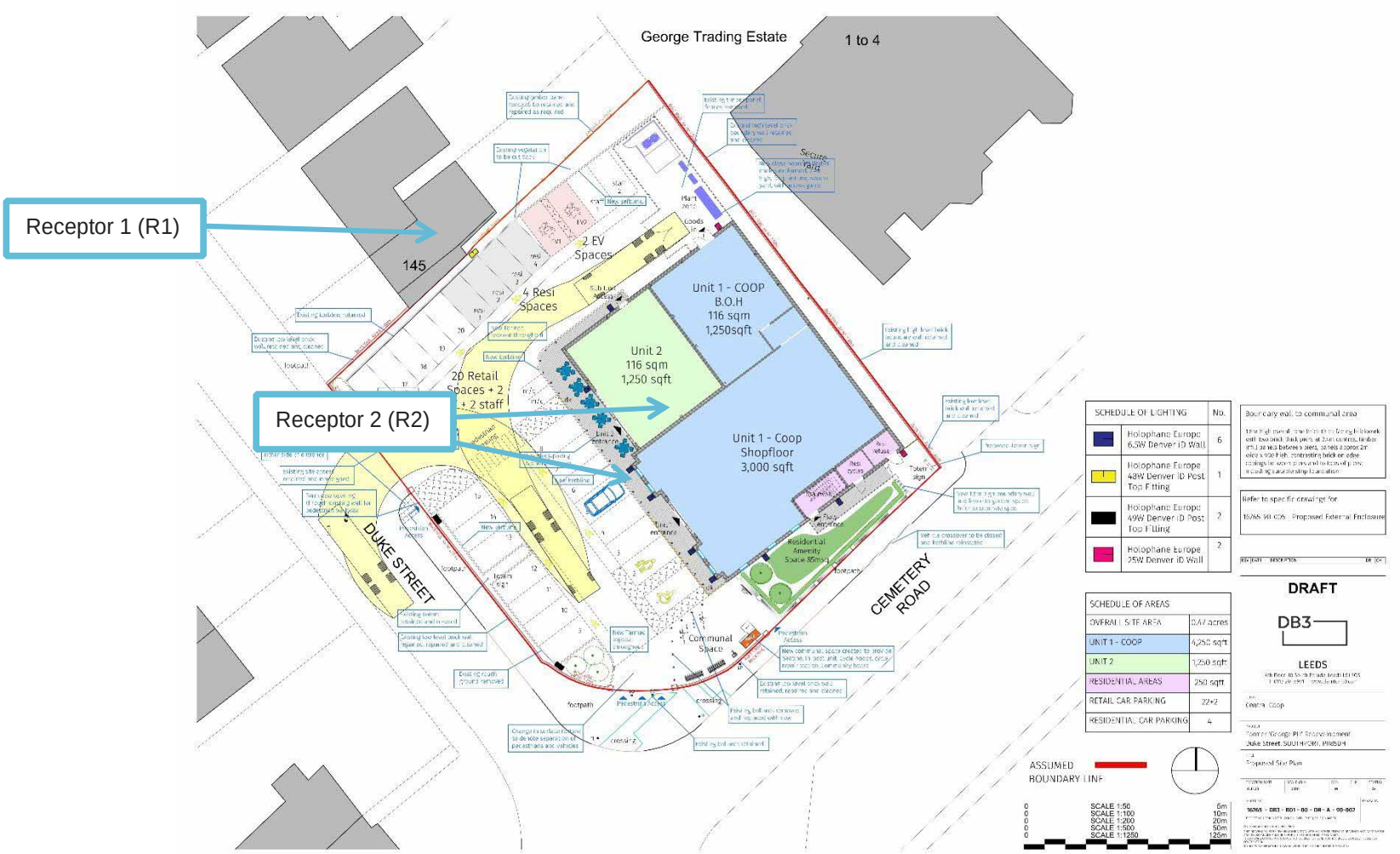
Appendix A Acoustic terminology

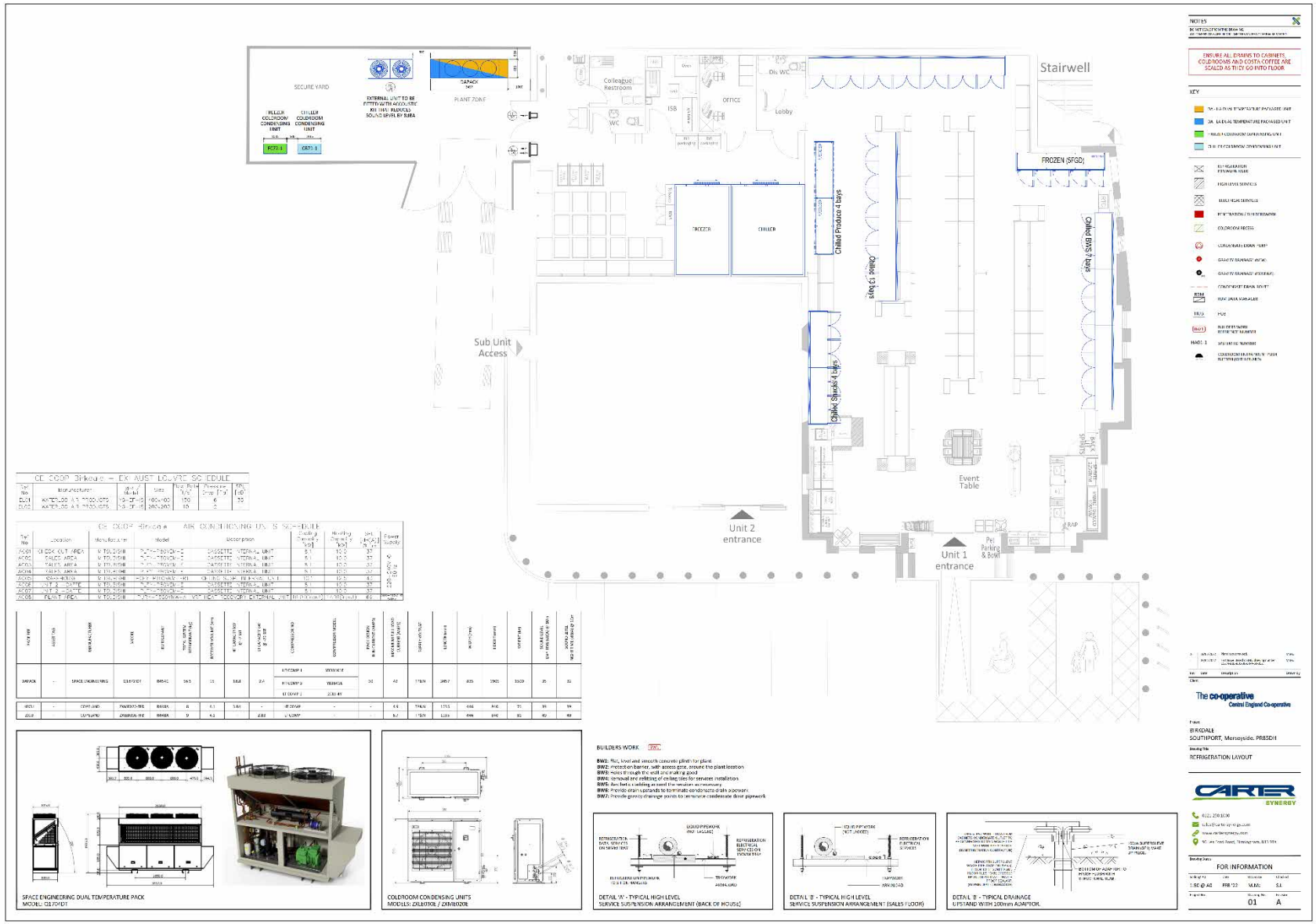
Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. 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 Photograph of site showing areas of interest



Appendix C Site layout plans




Stairwell
Colleague Restroom
Dis WC
WC
ISB
OFFICE
Lobby
FROZEN (SFSD)
TROLLEY
CHILLER
Chilled Produce 4 bays
Chilled 10 bays
Chilled BWS 7 bays
Chilled Steaks 4 bays
Sub Unit Access
Unit 2 entrance
Unit 1 entrance
Event Table
Pet Parking & Bowl
SECURE YARD
PLANT ZONE
EXTERNAL UNIT TO BE FITTED WITH ACOUSTIC KIT (NSL REPORT) TO ACHIEVE SOUND LEVELS BY BIRA
BUILDERS WORK
BW1: Plot, level and smooth concrete plinth for plant
BW2: Protection barrier, with access gate, around the plant location
BW3: Holes through the wall and making good
BW4: Removal and refitting of ceiling tiles for services installation
BW5: Box bed a cladding around the services as necessary
BW6: Provide drain upstands to terminate condensate drain pipework
BW7: Provide gravity drainage points to terminate condensate drain pipework
SPACE ENGINEERING DUAL TEMPERATURE PACK MODEL: Q170HDT
COLDROOM CONDENSING UNITS MODELS: ZXLE030L / ZXME020E
DETAIL 'A' - TYPICAL HIGH LEVEL SERVICE SUSPENSION ARRANGEMENT (BACK OF HOUSE)
DETAIL 'B' - TYPICAL HIGH LEVEL SERVICE SUSPENSION ARRANGEMENT (SALES FLOOR)
DETAIL 'B' - TYPICAL DRAINAGE UPSTAND WITH 100mm ADAPTOR.
The co-operative
Central England Co-operative
BIRKDALE
SOUTHPORT, Merseyside, PR85DH
REFRIGERATION LAYOUT
CARTER
ENERGY
FOR INFORMATION
01
A

Appendix D Environmental sound survey

Details of environmental sound surveys

D.1 Measurements of the existing background sound levels were undertaken from 12.30 on Thursday 27th Jan to 12.45 on Monday the 31st Jan 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 fifteen-minute sample periods for the duration of the survey.

Measurement position

D.3 The representative measurement position was located on a lamppost on Duke Street, (location indicated on the site plan in Appendix B). In accordance with BS 7445-2:21991 *'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.4 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.

Description	Model / serial no.	Calibration date	Calibration certificate no.
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

D.5 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	**Time/ Date**	**Description**	**Beginning of Survey**	**End of Survey**
As indicated on Appendix B	12.15 27/1/22 - 12.30 31/1/22	Temperature (°C)	9	8
Cloud Cover Symbol Scale in oktas (eighths) 0 Sky completely clear 1 2 3 4 Sky half cloudy 5 6 7 8 Sky completely cloudy (9) Sky obstructed from view		Precipitation:	No	No
		Cloud cover (oktas – see guide)	1	3
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	No	Yes
		Wind Speed (m/s)	2.4	1-2
		Wind Direction	NW	NW
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	-	-

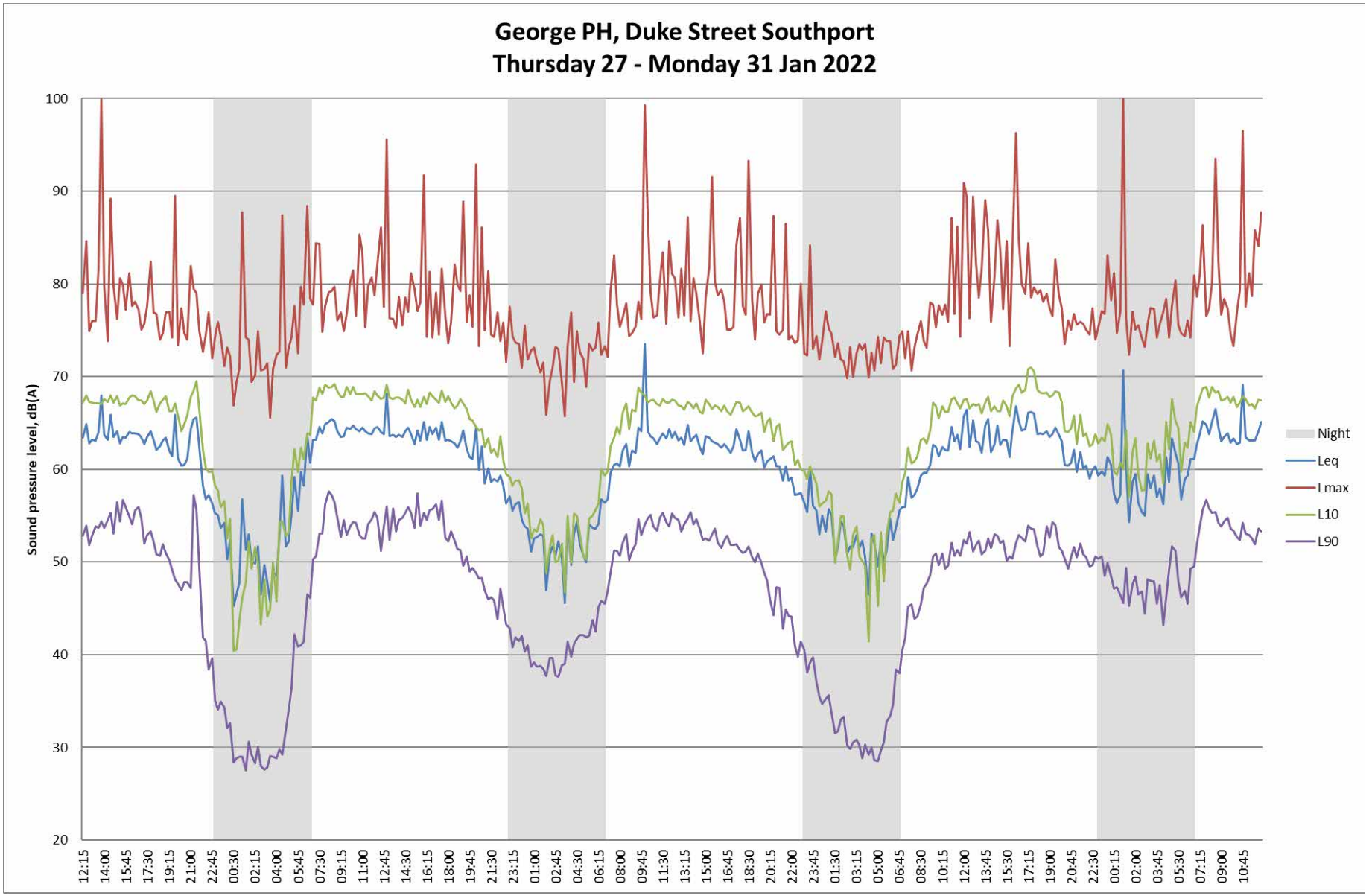
Results

D.6 The results of the survey are considered to be representative of the background sound pressure levels at the façades of the most affected noise sensitive receptors during the quietest times at which store is operational.

D.7 During setup, the noise climate at the measurement position was noted to be dominated by birdsong and local traffic. Light aircraft were also audible

D.8 At collection, the sources noted were light aircraft, local traffic, pedestrians and buses.

D.9 The results of the survey are presented in a time history graph overleaf.


George PH, Duke Street Southport
Thursday 27 - Monday 31 Jan 2022
Sound pressure level, dB(A)
100
90
80
70
60
50
40
30
20
12:15
14:00
15:45
17:30
19:15
21:00
22:45
00:30
02:15
04:00
05:45
07:30
09:15
11:00
12:45
14:30
16:15
18:00
19:45
21:30
23:15
01:00
02:45
04:30
06:15
08:00
09:45
11:30
13:15
15:00
16:45
18:30
20:15
22:00
23:45
01:30
03:15
05:00
06:45
08:30
10:15
12:00
13:45
15:30
17:15
19:00
20:45
22:30
00:15
02:00
03:45
05:30
07:15
09:00
10:45
Night
Leq
Lmax
L10
L90

Appendix E Car park noise calculations

Source SELs

Source	Reference distance, m	Time, s	Reference SEL, dB(A)
Car movement	3	15	58
Person talking	1	15	60

Calculation of average level at Receptor R1

Activity noise level predictions at R1 in the busiest 1 hour period

Activity	Measurement Data				No. Events / Hour	Normalised at 10m	$L_{Aeq,1hr}$ @ 10m	Receptor Distance, m	Distance correction, dB	Screening, dB	Resultant at R1
	$L_{Aeq,T}$	Dist (m)	Time (s)	SEL		SEL, 10m					
ZONE A (nr entrance)	**Spaces:**	**15**		**Turnover/ hr:**	**2**						
Car Passby	58	3	15	70	60	60	42	30	-10	0	32
People talking	60	1	15	72	30	52	31	30	-10	0	22
ZONE B (row on NW boundary)	**Spaces:**	**7**		**Turnover/ hr:**	**2**						
Car Passby	58	3	15	70	28	60	38	8	2	0	40
People talking	60	1	15	72	14	52	28	8	2	0	30
No zone: Pedestrian arrivals	**Number:**	**15**									
People talking	60	1	15	72	30	52	31	30	-10	0	22
										$L_{Aeq,1hr}$	**41**

Calculation of average level at Receptor R2

Activity noise level predictions at R2 in the busiest 1 hour period

Activity	Measurement Data				No. Events / Hour	Normalised at 10m	$L_{Aeq,1hr}$ @ 10m	Receptor Distance, m	Distance correction, dB	Screening, dB	Resultant at R1
	$L_{Aeq,T}$	Dist (m)	Time (s)	SEL		SEL, 10m					
ZONE A (nr entrance)	Spaces:	15		Turnover/ hr:	2						
Car Passby	58	3	15	70	60	60	42	7	3	0	45
People talking	60	1	15	72	30	52	31	7	3	0	34
ZONE B (row on NW boundary)	Spaces:	7		Turnover/ hr:	2						
Car Passby	58	3	15	70	28	60	38	23	-7	0	31
People talking	60	1	15	72	14	52	28	23	-7	0	21
No zone: Pedestrian arrivals	Number:	15									
People talking	60	1	15	72	30	52	31	7	3	0	34
										$L_{Aeq,1hr}$	46

Appendix F Manufacturer plant noise emissions

Ref / Item	Manufacturer / Model	No. of units	Description	dBA
DAPACK	Space Engineering Q1704DT	1	Sound pressure level @10m Day	35
			Sound pressure level @10m Night	32
Chiller condenser HBCU	Copeland ZXME020-TFD	1	Sound pressure level @10m Day/Night	39
Chiller condenser LCCU	Copeland ZXLE030E-TFD	1	Sound pressure level @10m Day/Night	40
AC-08 VRF	Mitsubishi PURY-P550-YNW-A	1	Sound power level @1m Day	89

Appendix G Plant noise impact assessment

RECEPTOR R1 House to North-West

Daytime

Plant	Plant noise level at source		DISTANCE		DIRECTIVITY	ATTENUATION	SCREENING	BS4142 FEATURE		RESULTANT AT RECEPTOR (dB)
	Noise level (dBA)	Distance (m)	(m)	Correction (dB)	Correction (dB)	Correction (dB)	Correction (dB)	Applicable (Y/N)	Correction (dB)	
DAPACK	35	10	21	-6	2	0	-5	y	3	29
Coldroom condenser HBCU	39	10	13	-2	-3	0	-15	y	3	22
Coldroom condenser LCCU	40	10	13	-2	-3	0	-15	y	3	23
VRF	89	Lw	16	-32	2	-20	-5	y	3	37
									CUMULATIVE:	38

Night-time

Plant	Plant noise level at source		DISTANCE		DIRECTIVITY	ATTENUATION	SCREENING	BS4142 FEATURE		RESULTANT AT RECEPTOR (dB)
	Noise level (dBA)	Distance (m)	(m)	Correction (dB)	Correction (dB)	Correction (dB)	Correction (dB)	Applicable (Y/N)	Correction (dB)	
DAPACK	32	10	21	-6	2	0	-5	y	3	26
Coldroom condenser HBCU	39	10	13	-2	-3	0	-15	y	3	22
Coldroom condenser LCCU	40	10	13	-2	-3	0	-15	y	3	23
									CUMULATIVE:	28

RECEPTOR R2 Flats above store

Daytime

Plant	Plant noise level at source		DISTANCE		DIRECTIVITY	ATTENUATION	SCREENING	BS4142 FEATURE		RESULTANT AT RECEPTOR (dB)
	Noise level (dBA)	Distance (m)	(m)	Correction (dB)	Correction (dB)	Correction (dB)	Correction (dB)	Applicable (Y/N)	Correction (dB)	
DAPACK	35	10	17	-5	0	0	-10	y	3	23
Coldroom condenser HBCU	39	10	22	-7	-3	0	-7	y	3	25
Coldroom condenser LCCU	40	10	24	-8	-3	0	-7	y	3	25
VRF	89	Lw	21	-35	0	-20	-5	y	3	32
									CUMULATIVE:	34

Night-time

Plant	Plant noise level at source		DISTANCE		DIRECTIVITY	ATTENUATION	SCREENING	BS4142 FEATURE		RESULTANT AT RECEPTOR (dB)
	Noise level (dBA)	Distance (m)	(m)	Correction (dB)	Correction (dB)	Correction (dB)	Correction (dB)	Applicable (Y/N)	Correction (dB)	
DAPACK	32	10	17.3	-5	0	0	-10	y	3	20
Coldroom condenser HBCU	39	10	22	-7	-3	0	-7	y	3	25
Coldroom condenser LCCU	40	10	24	-8	-3	0	-7	y	3	25
									CUMULATIVE:	29

Appendix H Delivery noise impact calculations

Receptor R1 – Nearest residential facade

Activity	Measured noise levels	Correction for no. of occurrences		Proportion of traverse correction (dB)	Distance correction		BS 4142 feature correction (dB)	Screening correction (dB)	Resultant SEL at receptor (dB)
	SEL @ 10m	No. of occurrences	correction (dB)		Distance (m)	Correction (dB)			
Lorry arrival	68	1	0	0	21	-3	3	0	68
Lorry manoeuvring-first movement (no reversing alarms)	75	1	0	0	12	-2	3	0	77
Unloading cages on to lift	71	10	10	0	22	-7	6	-8	72
Unloading pallets on to lift	75	10	10	0	22	-7	6	-8	76
Lift up	73	5	7	0	22	-7	3	-8	68
Lift down	71	5	7	0	22	-7	6	-8	69
Cages to Store	78	10	10	0	22	-7	6	-8	79
Lorry departure	75	1	0	0	12	-2	3	0	77
							Cumulative SEL		84
							$L_{Aeq\ (1hour)}$		48

Receptor R2 – Nearest residential facade

Activity	Measured noise levels	Correction for no. of occurrences		Proportion of traverse correction (dB)	Distance correction		BS 4142 feature correction (dB)	Screening correction (dB)	Resultant SEL at receptor (dB)
	SEL @ 10m	No. of occurrences	correction (dB)		Distance (m)	Correction (dB)			
Lorry arrival	68	1	0	-3	14	-3	3	0	65
Lorry manoeuvring-first movement (no reversing alarms)	75	1	0	-8	9	1	3	0	74
Unloading cages on to lift	71	10	10	0	11	-1	6	-10	76
Unloading pallets on to lift	75	10	10	0	11	-1	6	-10	80
Lift up	73	5	7	0	11	-1	3	-10	72
Lift down	71	5	7	0	11	-1	6	-10	73
Cages to Store	78	10	10	0	11	-1	6	-10	83
Lorry departure	75	1	0	-3	14	-3	3	-10	62
Lorry departure	75	1	0	-3	14	-3	3	0	72
							Cumulative SEL		86
							$L_{Aeq\ (1hour)}$		51