

A Noise Assessment for Reading Retail Park, Reading

On behalf of Threadneedle UK Property Authorised Investment Fund

June 2022



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Member of the Association of Noise Consultants

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I INTRODUCTION

- I.1 Resound Acoustics Limited has been appointed by Threadneedle UK Property Authorised Investment Fund to undertake a noise assessment for a proposed development at Reading Retail Park, Reading. Threadneedle UK Property Authorised Investment Fund is seeking to submit a planning application for a new food store and a noise assessment is required to consider the potential impacts of the scheme.
- I.2 The scope of this assessment includes consideration of the existing noise climate in the area, the likely noise emissions from plant and car parking noise from the proposed development, and local and national planning policy.
- I.3 An assessment of HGV servicing is set out in a noise assessment produced by Acoustic Consultants Limited titled *Noise Impact Assessment* (reference 9360/BL Rev B, dated 13th December 2021); this noise report should be read in conjunction with the Acoustic Consultants Limited noise assessment.
- I.4 While reasonable efforts have been made to produce a report that is easy to understand, it is technical in nature. To assist the reader, an introduction to noise and an explanation of the terminology used in this report is contained in Appendix A.

2 SITE DESCRIPTION

Existing Site Conditions

- 2.1 Reading Retail Park is located to the west of Reading, Berkshire, and is bounded by residential properties to the south and east, by Norcot Industrial Estate to the west, and by Oxford Road to the north.
- 2.2 Reading Retail Park currently comprises three large commercial buildings and a drive-thru fast food restaurant, with associated car parking and service yard areas.
- 2.3 The noise-sensitive receptors closest to the site are residential properties to the south on Craig Avenue and Moriston Close, the closest of which is approximately 7 metres from the edge of the site.
- 2.4 A site location plan is shown in Figure B.1 in Appendix B.

Proposed Site Conditions

- 2.5 It is understood that Threadneedle UK Property Authorised Investment Fund intends to submit a planning application for a new food store. The food store will be a redevelopment of existing Units 2 and 6, which are non-food retail units.
- 2.6 The proposed site layout is shown in The Harris Partnership drawing *Proposed Site Plan* (drawing reference 15044-1-108, dated 10th May 2022), which is included as Figure B.2 in Appendix B.

3 GUIDANCE

Local Authority Consultation

- 3.1 The Environmental Health Department of Reading Borough Council (RBC) was contacted during the preparation of this assessment so that their views were taken into account.
- 3.2 RBC confirmed that it was acceptable to re-use background sound level data gathered in 2017 as part of a previous assessment at the site.
- 3.3 RBC stated that the specific sound levels from new plant items should be at least 10dB below background level.

National Planning Policy Framework

- 3.4 The Department for Communities and Local Government published the *National Planning Policy Framework* (NPPF) on 27th March 2012 and upon its publication, the majority of planning policy statements and guidance notes were withdrawn, including Planning Policy Guidance (PPG) 24 *Planning and Noise*, which until the emergence of the NPPF, set out the Government's position on how noise should be dealt with in the planning system.
- 3.5 The NPPF was most recently revised on 20th July 2021.
- 3.6 The general guiding principle in the NPPF is contained in Section 15 under the heading *Conserving and enhancing the natural environment*. Paragraph 174 states:

"Planning policies and decisions should contribute to and enhance the natural and local environment by:

- (e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;"*

- 3.7 The noise planning policy is contained in paragraph 185, which also appears in Section 15 of the NPPF:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

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

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

- 3.8 A footnote to the point paragraph 185(a) refers to the *Explanatory Note of the Noise Policy Statement for England*, which defines both “significant adverse impacts on health and quality of life” and “adverse impacts on health and quality of life.”

Noise Policy Statement for England

- 3.9 The Department for Environment, Food and Rural Affairs published the *Noise Policy Statement for England* (NPSE) in March 2010. The explanatory note of the NPSE defines the terms used in the NPPF:

“2.20 There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

2.21 Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.”

- 3.10 The NPSE does not define the SOAEL numerically, stating at paragraph 2.22:

“2.22 It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.”

- 3.11 There is no local or national guidance on how the three terms should be defined numerically.

- 3.12 There are three aims in the NPSE, two of which relate to the first bullet point in paragraph 185 of the NPPF:

“The first aim of the Noise Policy Statement for England

Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

2.23 The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided while also taking into account the guiding principles of sustainable development (paragraph 1.8).

The second aim of the Noise Policy Statement for England

Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

2.24 The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur.

The third aim of the Noise Policy Statement for England

Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

2.25 This aim seeks, where possible, positively to improve health and quality of life through the pro-active management of noise while also taking into account the guiding principles of sustainable development (paragraph 1.8), recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.”

Planning Practice Guidance

3.13 In March 2014, the Government released Planning Practice Guidance (PPG) on noise, titled Noise. This document sets out a number of principles in the form of questions and answers, and reinforces the guidance set out in the NPPF and the NPSE. The most recent version of this document was published in July 2019.

3.14 The noise PPG notes that:

“Noise needs to be considered when new development may create additional noise and when new developments would be sensitive to the prevailing acoustic environment (including any anticipated changes to that environment from activities that are permitted but not yet commenced).”

3.15 It goes on to note that:

“Plan-making and decision taking need to take account of the acoustic environment and in doing so consider:

- *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.”*

3.16 The noise PPG broadly repeats the NPSE definitions of the NOEL, LOAEL and SOAEL and it provides a summary table to explain how the terms relate to each other and to typical human reactions to sound. The table is replicated below in Table 3.1.

Table 3.1: Planning Practice Guidance summary of noise exposure hierarchy

Perception	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not present	No effect	No observed effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No observed adverse effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed adverse effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep the 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

Perception	Examples of Outcomes	Increasing Effect Level	Action
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

3.17 It is noted that the text in paragraph 005 of the PPG for noise reiterates the point illustrated in Table 3.1, that there are degrees of adverse effect above the SOAEL. Table 3.1 defines two degrees of significant adverse effect: a significant observed adverse effect, which is deemed noticeable and disruptive, and an unacceptable adverse effect, which is deemed noticeable and very disruptive.

3.18 The distinction between these two degrees of significant adverse effect is expanded upon in the text in paragraph 005 of the PPG for noise:

“005 Increasing noise exposure will at some point cause the ‘significant observed adverse effect’ level boundary to be crossed. Above this level the 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. If the exposure is predicted to be above this level the planning process should be used to avoid this effect occurring, for example through the choice of sites at the plan-making stage, or by use of appropriate mitigation such as by altering the design and layout. While such decisions must be made taking account of the economic and social benefit of the activity causing or affected by the noise, it is undesirable for such exposure to be caused.

At the highest extreme, noise exposure would cause extensive and sustained adverse changes in behaviour and / or health without an ability to mitigate the effect of the noise. The impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, this situation should be avoided.”

3.19 The PPG, which is the most recent manifestation of Government advice on how noise should be treated within the planning system, as opposed to policy itself, is clear that a significant adverse effect, which lies above the SOAEL but below an unacceptable adverse effect, can be addressed (or ‘avoided’ in the terms of the PPG) through the provision of mitigation, including noise insulation; it is not until an unacceptable adverse effect is reached that the cause of the effect should be prevented.

3.20 The noise PPG provides advice on how to mitigate the effects of noise, noting that there are options to reduce noise at source, to optimise site layouts, to use planning conditions, and providing insulation within affected properties.

3.21 The noise PPG also notes that:

“Noise impacts may be partially offset if residents have access to one or more of:

- *a relatively quiet façade (containing windows to habitable rooms) as part of their dwelling;*
- *a relatively quiet external amenity space for their sole use, (e.g. a garden or balcony). Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced if this area is exposed to noise levels that result in significant adverse effects;*
- *a relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or*
- *a relatively quiet, protected, external publically accessible amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minute walking distance)."*

Local Planning Policies

- 3.22 Reading Borough Council (RBC) adopted the *Reading Borough Local Plan* in November 2019.
- 3.23 Policy EN16 *Pollution and Water Resources* states:
- "Development will only be permitted where it would not be damaging to the environment through air, land, noise or light pollution..."*
- 3.24 The supporting text in paragraph 4.2.90 states:
- "Exposure to high levels of noise can have a significant effect on human health. This policy deals with noise issues in general, whilst policy EN17 deals particularly with noise-generating equipment."*
- 3.25 Policy EN17 *Noise Generating Equipment* states:
- "Where noise generating equipment is proposed, the noise source specific level (plant noise level) should be at least 10dBA below the existing background sound level as measured at the nearest noise sensitive receptor."*
- 3.26 This requirement was referred to by the Environmental Health Department of RBC during the consultation undertaken as part of this assessment.

Impact Scale

- 3.27 The Institute of Environmental Management and Assessment (IEMA) produced *Guidelines for Environmental Noise Impact Assessment* in October 2014, and the guidance contained in that document has been taken into account here.
- 3.28 To determine the potential impact of changes in the sound environment, it is first necessary to determine an appropriate impact scale that refers to known indicators of human response to sound.
- 3.29 British Standard (BS) 8233: 2014 *Guidance on sound insulation and noise reduction for buildings* notes that:

“An increase or decrease in level of 10 dBA corresponds roughly to a doubling or halving of loudness.”

- 3.30 Loudness can be considered as analogous to volume; a 10dB increase in sound approximately twice as loud.

- 3.31 The IEMA Guidelines state:

“Measuring in decibels means that a 3dB increase is equivalent to a doubling of the sound energy, and a 10dB increase is a tenfold increase in energy. For broad band sounds which are very similar in all but magnitude, a change or difference in noise level of 1dB is just perceptible under laboratory conditions, 3dB is perceptible under most normal conditions, and a 10dB increase generally appears to be twice as loud. These broad principles may not apply where the change in noise level is due to the introduction of a noise with different frequency and/or temporal characteristics compared to sounds making up the existing noise climate. In which case, changes of less than 1dB may be perceptible under some circumstances.”

- 3.32 Guidance on the audibility of changes in road traffic noise was provided in a now-superseded version of the *Design Manual for Roads and Bridges*, Volume 11 *Environmental Assessment*, Section 3 *Environmental Assessment Techniques*, Part 7 *Noise and Vibration* (November 2011), which stated at paragraph 3.37:

“3.37 A change in road traffic noise of 1dB $L_{A10,18h}$ in the short term (e.g. when a project is opened) is the smallest that is considered perceptible. In the long term (typically 15 years after project opening), a 3dB $L_{A10,18h}$ change is considered perceptible. The magnitude of impact should, therefore, be considered different in the short term and long term.”

- 3.33 The current version of DMRB, LA111 *Noise and Vibration* (May 2020) has retained the short-term 1dB and long-term 3dB thresholds as distinguishing between a negligible impact and a minor adverse impact, although it no longer makes specific reference to the perception of changes in road traffic noise.

- 3.34 More general guidance can be found in the Welsh and Scottish planning guidance equivalents of PPG24. Technical Advice Note (Wales) 11, *Noise*, published in October 1997 and commonly referred to as TAN11, states:

“Measurements in dB(A) broadly agree with people’s assessment of loudness. A change of 3dB(A) is the minimum perceptible under normal conditions, and a change of 10dB(A) corresponds roughly to halving or doubling the loudness of a sound.”

- 3.35 The Scottish planning guidance, Planning Advice Note (PAN) 1/2011 *Planning and Noise*, provides similar guidance:

“Measurements in dB(A) broadly agree with people’s assessment of loudness. For noise of a similar character, a change of 3dB(A) is the minimum perceptible under normal conditions, and a change of 10dB(A) corresponds roughly to halving or doubling the loudness of a sound.”

- 3.36 PAN 1/2011 indicates that a 3dB change is the minimum perceptible change in noise level for “noise of a similar character”. Where a source of a different character is introduced, PAN 1/2011 implies that a change of less than 3dB would be perceptible.

- 3.37 It is important to note that a perceptible change in noise does not necessarily mean that annoyance will result.
- 3.38 Although Welsh and Scottish guidance are not directly relevant to the site, the physics and human perception of sound is not location-specific, so the guidance provided in these documents is considered valid to inform an impact assessment scale.
- 3.39 The impact scale adopted for this assessment is shown in Table 3.2.

Table 3.2: Impact scale for comparison of future noise against existing noise

Change in Noise Level dB(A)	Subjective Response	Description
0	Not noticeable	No Change
0.1 to 0.9	Unlikely to be noticeable	Negligible
1.0 to 2.9	Just noticeable but unlikely to be intrusive	Minor
3.0 to 9.9	Noticeable and potentially intrusive, particularly at higher end of scale	Moderate
10.0+	Noticeable and disruptive	Major

- 3.40 For the purposes of this assessment, changes of less than 3dB are considered unlikely to lead to an overall adverse effect i.e. are below the LOAEL, although they may be just audible. Changes of 3dB or more are considered to be at or above the LOAEL and are likely to be audible, while changes of 10dB or more are likely to be disturbing, and are considered to be at or above the SOAEL.

British Standard 4142

- 3.41 BS4142: 2014 + A1: 2019: *Methods for rating and assessing industrial and commercial sound* 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.
- 3.42 In a BS4142: 2014 + A1: 2019 assessment, the industrial or commercial sound is assessed outside a dwelling or premises used for residential purposes. The procedure 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.
- 3.43 The preferred method for determining the specific sound level is measurement. When measuring the specific sound level, the influence of other sound sources must be accounted for, and BS4142: 2014 + A1: 2019 states that this can be done by first measuring the ambient sound level, which includes contributions from both the source

under consideration and other sources in the area. Measurements should then be undertaken of the residual sound, which is the sound level where the specific source is suppressed to such a degree that it does not contribute to the measured sound level.

3.44 The residual sound can then be logarithmically subtracted from the ambient sound level to obtain the specific sound level. Where it is not possible to measure the residual sound level at the same location as the ambient level, for example if the source under consideration operates continuously, then an alternative location where the residual sound is comparable may be used.

3.45 Alternatively, where it is not possible to determine the specific sound by measurement alone, for example, because the difference between the ambient and residual sound level is too small, the specific sound level may be determined by a combination of measurement and calculation. The standard states:

“NOTE In some cases, measurements can be supplemented by calculations. Calculations are often more reliable than a single short-term measurement when long-term averages are to be determined and in other cases where it is impossible to carry out measurements because of high residual sound levels. In case of the latter, it is sometimes convenient to carry out the measurements closer to the source and then use a calculation method to estimate the specific sound level at the assessment locations(s).”

3.46 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, using subjective judgement. The standard also sets out objective methods for determining the presence of tones or impulsive elements, but notes that these should be used where the subjective method is not sufficient.

3.47 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.”

3.48 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.”

3.49 The standard also states that if a source has identifiable on/off conditions, a penalty may be applied for intermittency. The penalty for sources that have intermittent elements is stated as:

“If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.”

3.50 Where the specific sound features acoustic characteristics that are distinctive against the residual acoustic climate, but are not tonal, impulsive or intermittent in nature, a penalty of +3dB may be applied.

- 3.51 The background sound level is the L_{A90} of the residual sound, which is itself the sound remaining at the assessment location when the specific sound source being assessed is suppressed to such a degree that it does not contribute to the ambient sound.
- 3.52 The standard notes that the background sound level can include industrial and/or commercial sound in some circumstances:
- “Since the intention is to determine a background sound level in the absence of the specific sound that is under consideration, it is necessary to understand that the background sound level can in some circumstances legitimately include industrial and/or commercial sounds that are present as separate to the specific sound.”*
- 3.53 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.”*
- 3.54 The initial 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.*
- NOTE 2 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.”*
- 3.55 The standard states 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.”*
- 3.56 BS4142: 2014 + A1: 2019 does not indicate how the initial estimate of impact should be adjusted when background and rating levels are low. However, it is considered that in this situation, the absolute levels may suggest a more acceptable outcome than would otherwise be suggested by the difference between the values.
- 3.57 BS4142: 2014 + A1: 2019 does not define ‘low’ in the context of background sound levels nor rating levels. The note to the Scope of the 1997 version of BS4142 defined very low

background sound levels as being less than about 30dB L_{A90}, and low rating levels as being less than about 35dB L_{A,r}. It is considered that these definitions provide a reasonable reference point for the definition of ‘low’ in the context of the current version of the standard.

- 3.58 BS4142: 2014+A1: 2019 states that relevant contextual matters should be taken into account before reaching a final position on the assessment outcome. It is stated as important because:

“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.”

- 3.59 BS4142: 2014+A1: 2019 lists some of the contextual matters that might influence the assessment outcome:

“1) The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.

Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

2) The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/ or commercial nature is likely to be perceived and how people react to it.

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

3) The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:

- i) facade insulation treatment;*
- ii) ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and*

iii) *acoustic screening.*”

3.60 Other contextual matters that might be relevant, include:

- character of a particular neighbourhood;
- former uses at or close to a site;
- legitimacy of the industrial use, e.g. planning permissions or environmental permits;
- implementation of best practicable means for a given process or activity; or
- local convention or perceptions.

3.61 BS4142: 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.

World Health Organisation Guidelines

3.62 The World Health Organisation (WHO) *Guidelines for Community Noise* (1999) set out guidance on suitable internal and external maximum noise levels in and around residential properties. The WHO guidelines state:

“For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10-15 times per night.”

3.63 The internal target noise level of 45dB L_{AFmax} translates to an external target façade noise level of 60dB L_{AFmax} when a correction of 15dB is taken into account, which is the correction that the WHO guidance states is the effect of an open window.

3.64 The WHO published their *Environmental Noise Guidelines for the European Region* in 2018. The WHO states that the 2018 document supersedes the 1999 *Guidelines for Community Noise*; however, it advises that the indoor guideline values in the 1999 document, and any values in the 1999 document not covered by the 2018 document, such as industrial noise, remain valid.

British Standard 8233

3.65 The scope of British Standard (BS) 8233: 2014 *Guidance on sound insulation and noise reduction for buildings* is the provision of recommendations for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new or refurbished buildings undergoing a change of use rather than to assess the effect of changes in the external noise climate.

3.66 BS8233: 2014 suggests suitable internal noise levels within different types of buildings, including residential dwellings, as shown in Table 3.3.

Table 3.3: BS8233 recommended internal noise levels, dB

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

3.67 BS8233 contains the following relevant guidance in footnotes to the above information:

“Note 4: Regular individual noise events (for example, scheduled aircraft or passing trains) 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.

Note 5: If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.

Note 7: Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.”

3.68 Although Note 4 above refers to setting a guideline value for maximum noise levels, BS8233: 2014 does not provide any guidance on a suitable criterion.

3.69 Since BS8233: 2014 allows for a 5dB relaxation in the guideline values in Table 3.3 (Note 7 above), it is considered that internal noise levels up to 5dB above the guideline values in Table 3.3 are still acceptable.

ISO9613

3.70 The noise levels generated by the operation of the development have been calculated in accordance with the noise prediction framework set out in ISO9613-2 *Acoustics – Attenuation of sound during propagation outdoors – Part 2 General method of calculation*.

3.71 The noise calculations are based on individual noise sources acting as point sources, where the noise level reduces by 6dB for every doubling of distance.

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

3.73 The inherent uncertainty in ISO9613 is stated in the standard as being accurate to ± 1 dB for distances of up to 100 metres, or ± 3 dB for distances of between 100 metres and 1km, with an average height of propagation of up to 30 metres.

4 SOUND SURVEY

4.1 Baseline sound measurements have been undertaken to establish typical weekday and weekend sound levels in the area. The measurements were undertaken between 15:00 hours on Friday 22nd and 11:00 hours on Thursday 28th September 2017.

4.2 RBC confirmed it is acceptable to re-use this data in this assessment.

4.3 The survey methodology and results are set out below.

Survey Methodology

4.4 The baseline sound measurements were carried out using the equipment listed in Appendix C. The sound level meter was calibrated before the measurements using the listed acoustic calibrator and the calibration checked upon completion of the survey. No significant calibration drifts were found to have occurred. The sound level meter and acoustic calibrator had both been laboratory-calibrated to a traceable standard within the year preceding the survey.

4.5 The measurements were carried out at one position, as shown in Figure D.1 in Appendix D, and described as follows:

- Position 1: towards the south-west corner of the site, within Wickes' yard, adjacent to the residential properties on Moriston Close.

4.6 The microphone at Position 1 was set at a height of 5.6 metres above local ground level under free-field conditions, i.e. at least 3.5 metres from any reflecting surfaces, other than the ground.

4.7 This height was selected as the local ground was below the level of Moriston Close and other residential roads. A height of 5.6 metres meant that the microphone was not screened from the local properties by the topography of the site.

4.8 A weather station was installed with the sound level meter to measure the meteorological conditions present during the survey.

Survey Results

4.9 The weather during the survey was generally suitable for sound measurement, it being mainly dry with light winds of up to 5m/s. There were short periods of rain on the night of Friday 22nd, the evening of Sunday 24th, the early morning of Monday 25th and the evening of Wednesday 27th September 2017.

4.10 Winds were predominantly from a south-easterly direction with temperatures ranging from approximately 9 to 21°C.

4.11 The dominant sound source at Position 1 was distant traffic on local roads. Other sound sources included aircrafts overhead, yard activity including deliveries and other sounds associated with retail units as well as natural sounds such as birdsong.

- 4.12 The baseline sound survey results are summarised in Table 4.1 and set out in full in Appendix E. The results summarised in Table 4.1 have been averaged over the daytime (07:00 to 23:00 hours) and night-time (23:00 to 07:00 hours) periods.

Table 4.1: Summary of measured sound levels at Position 1, free-field dB

Date	Period	Duration (hours)	$L_{Aeq,T}$	$L_{A90}^{(1)}$	$L_{A10}^{(1)}$	L_{AFmax}
Friday 22 nd September 2017	Day	8 hours	45.7	40.3	46.6	47.8 to 68.5
	Night	8 hours	40.3	36.6	40.9	40.6 to 73.1
Saturday 23 rd September 2017	Day	16 hours	47.7	41.1	49.0	50.7 to 80.0
	Night	8 hours	41.5	38.2	41.8	43.2 to 66.0
Sunday 24 th September 2017	Day	16 hours	47.3	41.2	48.4	47.8 to 77.1
	Night	8 hours	50.2	40.3	45.3	39.1 to 69.0
Monday 25 th September 2017	Day	16 hours	47.2	41.0	47.9	49.4 to 80.3
	Night	8 hours	39.5	34.5	39.5	39.1 to 64.5
Tuesday 26 th September 2017	Day	16 hours	51.3	40.2	48.9	49.2 to 80.0
	Night	8 hours	42.1	36.7	42.2	43.5 to 64.3
Wednesday 27 th September 2017	Day	16 hours	47.9	42.4	49.2	51.2 to 77.7
	Night	8 hours	38.9	35.4	39.1	41.4 to 66.5
Thursday 28 th September 2017	Day	4 hours	49.9	40.4	49.8	53.5 to 76.2

Note: ⁽¹⁾ The L_{A90} and L_{A10} values presented were calculated from the arithmetic mean of the $L_{A90,15min}$ and $L_{A10,15min}$ measurements for each period.

- 4.13 British Standard 4142: 2014+A1: 2019 indicates that a representative background sound level should be adopted, which should not automatically be assumed to be the lowest or most common value. For this assessment, the distribution of the background sound levels in the measurement data, quantified using the L_{A90} noise index, has been analysed and representative values determined. The analysis is based on the arithmetic mean, the modal value, and the 25% cumulative percentage point, i.e. the value above which 75% of the data lies, of the values on the dataset.
- 4.14 Periods where there were wind speeds in excess of 5m/s or there was rainfall have been excluded from the analysis.
- 4.15 BS4142: 2014+A1: 2019 states that daytime is typically taken to be between 07:00 and 23:00 hours and night-time between 23:00 and 07:00 hours.
- 4.16 Separate representative background sound levels have been determined for both a weekday and weekend.
- 4.17 The representative background sound levels are shown in Table 4.2. The L_{A90} values have all been rounded to the nearest whole number, as required in BS4142: 2014+A1: 2019. The L_{A90} values shown are the overall ranges of 15 minute values that occurred for each period, and the representative value used in the assessment. The distributions of the background sound levels are shown graphically in Appendix E.

Table 4.2: Representative background sound levels, free-field dB

Day	Period	Background Sound Levels, L_{A90}	
		Range of Values	Representative Value
Weekday	Day	37 to 48	40
	Night	32 to 42	35
Weekend	Day	37 to 44	41
	Night	33 to 45	37

5 ASSESSMENT

Car Park Noise

- 5.1 The potential impact of increased car park activity associated with the proposed food store use has been assessed by considering the potential change in ambient sound level.
- 5.2 The traffic consultant for the project has provided the likely car movements for the proposed food store use, as well as car movements for the current non-food store use. The peak hourly car movements in each of the daytime and night-time periods for each of these scenarios are shown in Table 5.1.

Table 5.1: Peak hourly vehicle movements

Day	Period	Cars	
		Food Store	Non-food store
Weekday	Daytime (07:00-23:00)	143	94
	Night-time (23:00-07:00)	4	0
Weekend	Daytime (07:00-23:00)	250	156
	Night-time (23:00-07:00)	6	0

Note: In practice, the peak hourly car and HGV movements will not necessarily occur at the same; however for the purposes of this assessment, it is assumed that they will.

- 5.3 The potential changes in noise level have been calculated by logarithmically dividing the future food store values by the current non-food store values.
- 5.4 For the weekday daytime, the calculated change is an increase of +1.8dB and for the weekend daytime the calculated change is an increase of +2.1dB.
- 5.5 These changes are below +3dB, and are therefore considered unlikely to lead to an overall adverse effect.
- 5.6 For the night-time, there are no car movements associated with the current non-food store use, so no change can be calculated in noise terms.
- 5.7 However, the absolute sound levels due to the proposed night-time movements have been calculated using the prediction framework set out in ISO9613 as implemented by the noise modelling software CADNA/A. The topography on and around the site has been modelled using OS mapping and on-site observations. The fence that runs along the southern boundary of the site has been included in the model. The ground has been modelled as 100% acoustically hard and all buildings have been modelled as approximately 70% acoustically reflective.
- 5.8 Each car movement will give rise to noise levels similar to those set out in Table 5.2, which have been taken from similar but unrelated developments.

Table 5.2: Typical car source noise levels, free-field dB

Source	Distance (metres)	L _{AE}	L _{AFmax}
Car door slam	10	65	72
Car engine starting	10	62	66
Car pulling away	10	67	64
Car pass-by	10	70	63

5.9 The calculations are based on the night-time movements during the weekend, which, it is understood, will be slightly higher than those during the weekday; each of the six vehicle movements is assumed to give rise to the car noise levels set out in Table 5.2. The car parking activities have been modelled as acoustic point sources and an acoustic line source. The sources have been spread around all four parking zones, although it is considered unlikely in practice that there will be night-time car parking movements in Zone 4, which is closest to the receptors to the south and south-east.

5.10 The calculations have been undertaken at the following locations, as shown in Figure F.1 in Appendix F:

- 4 Moriston Close;
- 5 Moriston Close;
- 17 Moriston Close;
- 21 to 26 Moriston Close;
- 40 Strathy Close; and
- Craig House.

5.11 The noise predictions are free-field noise levels at the façade of the property closest to and facing the site. The predictions have been undertaken at 4 metres above ground level to represent the noise level at either the bedroom windows or simply an upper storey, except at Craig House, where a height of 6.8 metres above ground level has been used to represent the greater height of this property.

5.12 The calculated noise levels are shown in Table 5.3.

Table 5.3: Predicted noise levels, free-field dB

Property	Period	Predicted Noise Level, L _{Aeq,1hr}
4 Moriston Close	Night	17
5 Moriston Close	Night	20
17 Moriston Close	Night	20
21 to 26 Moriston Close	Night	17
40 Strathy Close	Night	28
Craig House	Night	31

5.13 It can be seen from Table 5.3 that at receptors on Moriston Close, the predicted sound levels are up to 20dB L_{Aeq,1hr}.

5.14 At 40 Strathy Close and Craig House, the predicted sound levels are 28 and 31dB L_{Aeq,1hr} respectively. Taking account of a reduction of 10dB for a façade with an open window, sound levels inside these properties are predicted to be below the 30dB L_{Aeq} guideline value in BS8233: 2014.

- 5.15 Night-time maximum noise levels from car door slams may exceed the 60dB criterion in the WHO's *Guidelines for Community Noise*, if car parking events occur in Zone 4, which is the closest parking area to the receptors to the south and south-east. However, the WHO guidelines state this value should not be exceeded more than 10 to 15 times per night. The proposed food-store use is only predicted to generated up to six night-time movements, and it is considered unlikely that all will be located in parking Zone 4.
- 5.16 It is also understood that there is a 24 hour gym located at the adjacent unit, which has existing night-time car movements associated with its operation. Up to 6 additional movements, all of which are understood to occur between 06:00 and 07:00 hours, are not considered significant when considering this existing level of activity at the retail park as a whole.
- 5.17 On the basis of the above, noise levels due to night-time car parking activities associated with the proposed food-store are also considered unlikely to lead to an adverse effect and no mitigation is considered necessary.

Plant Noise

- 5.18 The current plant items likely to installed at the food store operator have been provided by Acoustic Consultants Limited, and are shown in Table 5.4.

Table 5.4: Proposed Plant

Item	Number	Sound Power Level, dB(A)
Dry Cooler	2	64
VRF	1	69
VRF	2	70

Note: VRF = variable refrigerant flow cooling system

- 5.19 However, it is understood that these plant items are subject to change, so rather than assess the potential impact from plant that may not be installed, noise limits have been recommended. The limits, which are set in line with the guidance set out in BS4142: 2014+A1: 2019, are shown in Table 5.5. The background sound levels are the lower out of the weekday or weekend representative values set out in Table 4.2.

Table 5.5: Recommended noise limits for fixed plant, free-field dB

Receptor	Period	Background Sound Level, L_{A90}	Proposed Noise Limit, $L_{A,T}$
Any receptor	Day	40	40
	Night	35	35

Note: ⁽¹⁾ T is 1 hour for daytime and 15 minutes for night-time.

- 5.20 Note that the limits suggested in Table 5.5 are rating levels and therefore any design should take into account the acoustic characteristics of the plant. The limits are deemed to apply to the total plant noise emission levels from the whole development, so individual plant items may need to be designed to a lower limit to take into account the cumulative effects of noise.
- 5.21 It is noted that RBC has a Local Plan policy, Policy EN17, that requires noise from fixed plant to achieve a limit set 10dB(A) below the background sound level. Where it is

required that fixed plant meet this policy, the plant should be designed to achieve noise limits 10dB lower than those set out in Table 5.5.

- 5.22 Providing the fixed plant is designed to achieve the limits set out in Table 5.5, no further mitigation is considered necessary.

6 CONCLUSION

- 6.1 Resound Acoustics Limited has been appointed by Threadneedle UK Property Authorised Investment Fund to undertake a noise assessment for a proposed development at Reading Retail Park, Reading. Threadneedle UK Property Authorised Investment Fund is seeking to submit a planning application for a new food store.
- 6.2 This assessment considers the likely noise emissions from plant and car parking noise from the proposed development.
- 6.3 The potential impact of HGV servicing is set out in a noise assessment produced by Acoustic Consultants Limited titled *Noise Impact Assessment* (reference 9360/BL Rev B, dated 13th December 2021); this noise report should be read in conjunction with the Acoustic Consultants Limited noise assessment.
- 6.4 The assessment has shown that noise from increased car parking activity associated with the proposed food store is unlikely to lead to an adverse effect at receptors. Noise limits are recommended for fixed plant.
- 6.5 On the basis of the information set out in this report, it is considered that noise emissions from car parking or fixed plant do not pose a material constraint to the proposed development.

Appendices

Appendix A – Introduction to Noise and Glossary of Terminology

Noise is defined as unwanted sound. The human ear is able to respond to sound in the frequency range 18Hz (deep bass) to 18,000Hz (high treble) and over the audible range of 0dB (the threshold of perception) to 140dB (the onset of pain). The ear does not respond equally to different frequencies of the same magnitude, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting (filtering) mechanism is used. This reduces the importance of lower and higher frequencies, approximating the response of the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. Noise can be perceived to be louder or more noticeable if the source of the noise is observed; e.g. roads, trains, factories, building sites etc. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source. Various noise indices have been derived to describe the fluctuation of noise levels that vary over time. Usually, these noise indices relate to specific types of noise, and as such different noise indices are used to describe road traffic noise, background noise, construction noise, etc.

The weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement and the levels are denoted as dB(A) or L_{Aeq} , L_{A10} , etc, according to the parameter being measured.

Noise is measured on the decibel scale, which is logarithmic rather than linear. As a result of this, a 3dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3dB(A) is generally regarded as the minimum difference needed to perceive a change. Table A.1 sets out examples of noise levels typically experienced during everyday activities. Table A.2 sets out an explanation of the terminology used in this report.

Table A.1: Typical sound levels found in the environment

Sound Level	Location
0 to 10dB(A)	Threshold of hearing
10 to 20dB(A)	Broadcasting studio
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside a factory or noisy pub
100 to 110dB(A)	Burglar Alarm at 1m
110 to 130dB(A)	Pneumatic drill at 1m away
140dB(A)	Threshold of Pain

Table A.2: Terminology relating to noise

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of $20\mu\text{Pa}$ (20×10^{-6} Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10} (s_1/s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is $20\mu\text{Pa}$.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
L_w	The L_w , or sound power level, is a measure of the total noise energy of a source.
$L_{Aeq,T}$	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 during the 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.
$L_{90,T}$ or Background Noise Level	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	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.
Free-field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5 metres
Façade	At a distance of 1 metre in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS EN 61672.

Appendix B: Site Plans

Figure B.1: Site location plan

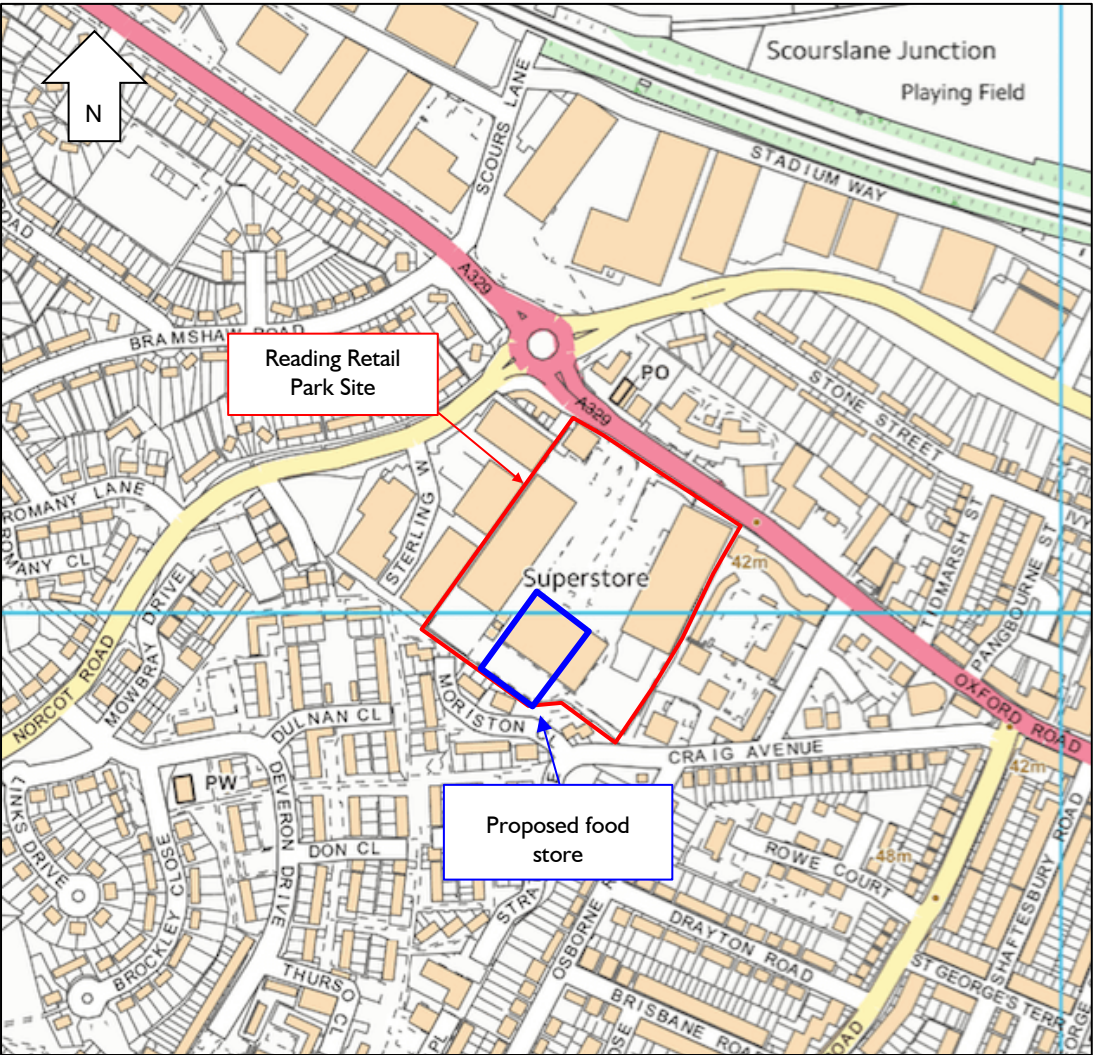
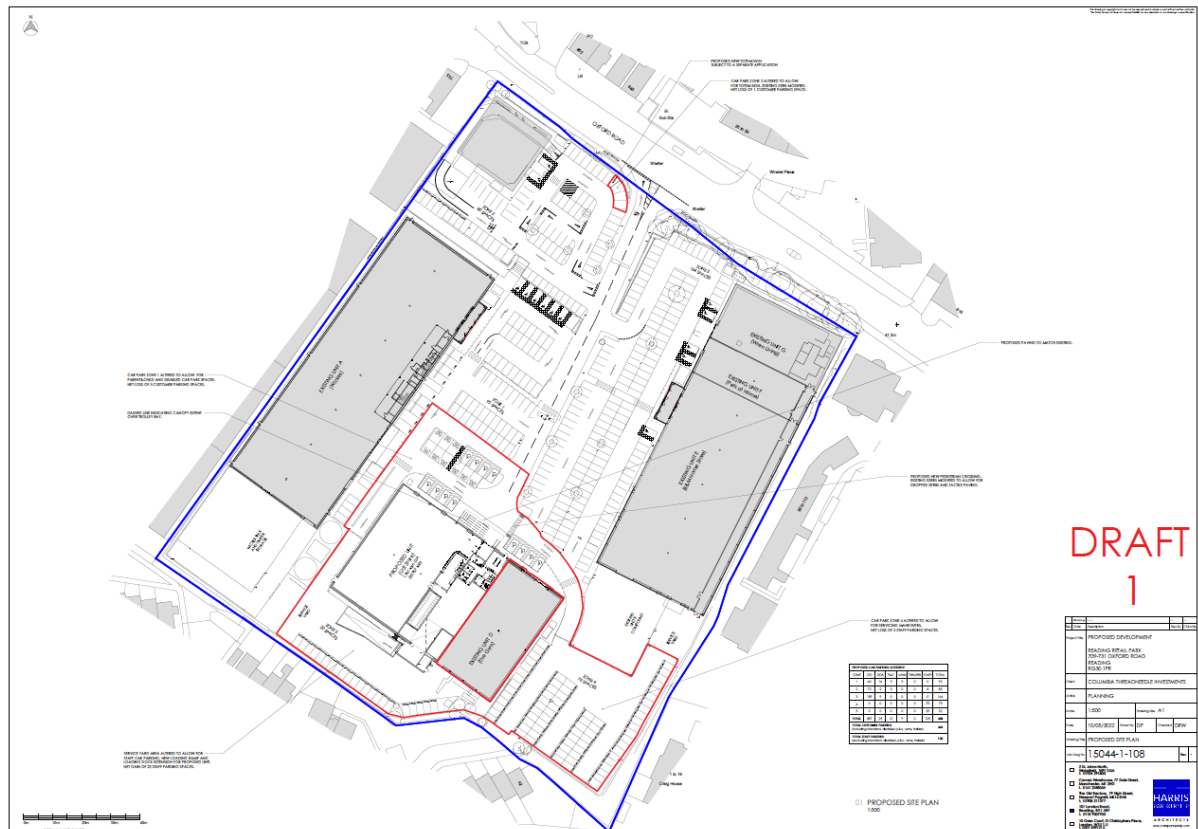


Figure B.2: Proposed site layout plan

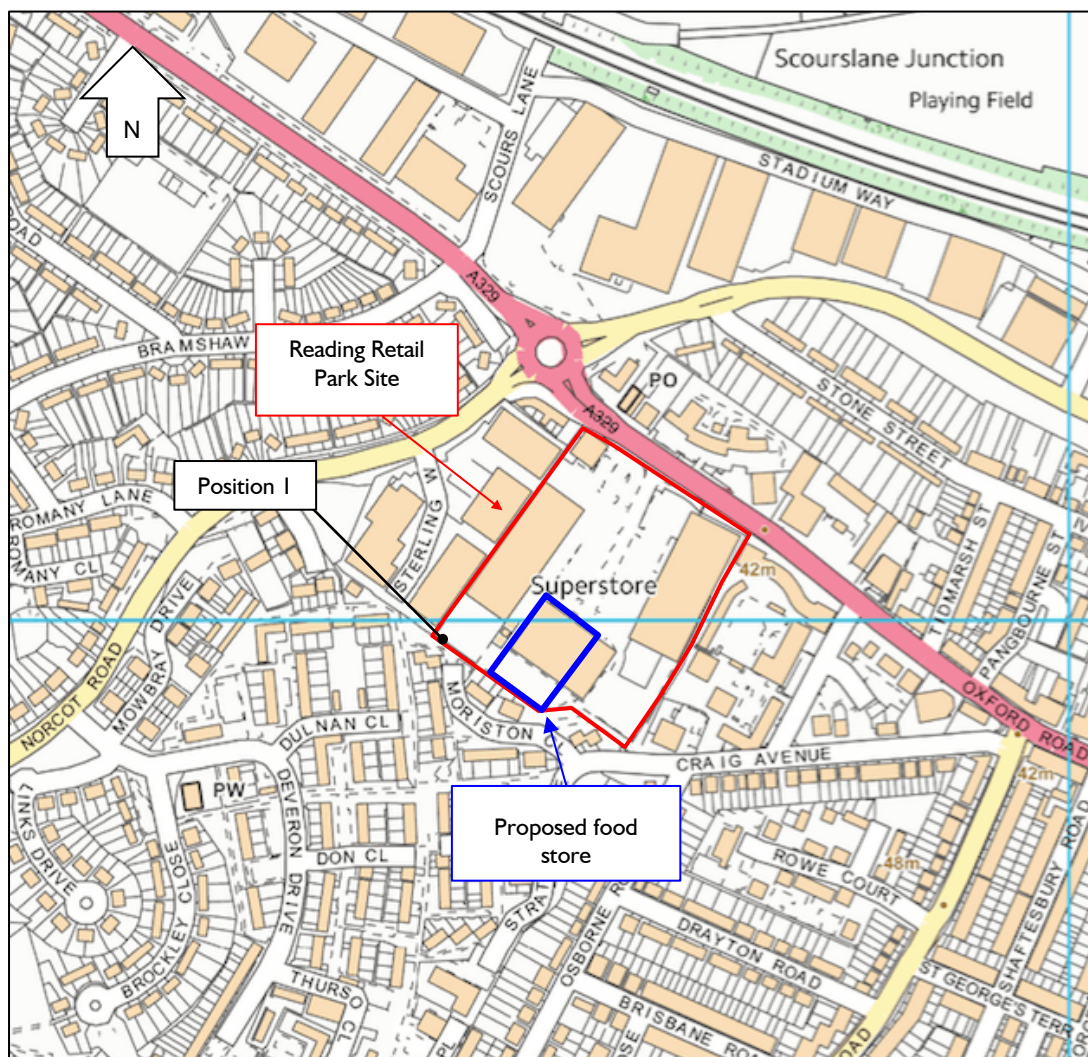


Appendix C – Sound Monitoring Equipment**Table C.1: Sound monitoring equipment**

Position	Equipment	Serial Number	Calibration Date
I	01dB Cube type I sound level meter	10694	03/05/2017
	01dB PRE22 pre-amplifier	11118	
	GRAS 40CD microphone	224223	
	01dB Cal21 acoustic calibrator	35054818	28/03/2017

Appendix D – Sound Survey Measurement Locations

Figure D.1: Sound survey measurement locations



Appendix E – Baseline Sound Survey Results

Table E.1: Sound levels measured at Position 1, free-field dB

Date	Start Time	L _{Aeq,T}	L _{A90}	L _{A10}	L _{AFmax}
Friday, 22 September 17	15:00	48.8	41.6	49.7	66.4
	15:15	44.3	40.5	46.9	53.8
	15:30	42.7	39.8	44.9	53.2
	15:45	49.4	40.4	48.8	63.0
	16:00	49.3	39.7	49.0	68.0
	16:15	43.5	39.6	45.5	54.2
	16:30	45.9	40.1	48.3	60.8
	16:45	48.3	40.7	51.4	64.6
	17:00	43.9	39.5	46.4	54.1
	17:15	47.3	40.6	51.2	61.0
	17:30	47.1	40.2	49.8	63.9
	17:45	49.2	40.2	53.5	63.6
	18:00	42.5	39.9	44.2	52.2
	18:15	47.9	41.4	50.5	64.0
	18:30	47.3	40.4	49.2	66.3
	18:45	44.2	40.1	46.8	53.5
	19:00	47.7	41.2	50.0	61.4
	19:15	48.2	40.2	50.4	68.5
	19:30	45.7	40.3	48.7	57.0
	19:45	43.8	40.1	44.9	55.8
	20:00	42.0	40.1	43.7	50.1
	20:15	42.6	40.1	44.9	50.9
	20:30	41.4	40.3	42.1	51.3
	20:45	43.9	40.6	45.3	59.5
	21:00	44.0	40.7	44.6	66.5
	21:15	42.2	40.7	43.4	50.3
	21:30	41.6	40.0	42.7	52.4
	21:45	42.1	40.3	43.4	56.1
	22:00	41.6	39.9	42.7	49.8
	22:15	41.0	39.8	41.8	47.8
	22:30	42.6	39.3	44.0	54.1
	22:45	40.9	39.7	41.8	49.5
	23:00	42.7	39.3	44.2	58.4
	23:15	41.2	37.7	42.9	56.7
	23:30	39.6	37.9	41.1	49.2
	23:45	40.0	37.6	42.2	47.6
Saturday, 23 September 17	00:00	41.7	38.3	44.9	51.9
	00:15	38.5	37.6	39.1	40.9
	00:30	39.1	37.6	40.2	47.8
	00:45	38.6	36.7	39.9	50.2
	01:00	37.1	35.9	38.5	50.3
	01:15	37.1	35.9	38.0	42.1
	01:30	36.6	35.3	37.4	49.8

APPENDIX E

Date	Start Time	L _{Aeq,T}	L _{A90}	L _{A10}	L _{AFmax}
	01:45	36.7	35.1	38.0	48.7
	02:00	36.0	35.0	36.6	49.4
	02:15	36.0	34.8	37.2	40.8
	02:30	35.7	34.4	37.1	46.4
	02:45	36.8	34.6	38.1	50.3
	03:00	37.4	34.9	39.1	49.4
	03:15	36.3	35.3	37.1	40.6
	03:30	36.7	34.7	38.2	50.8
	03:45	36.9	35.2	38.4	44.5
	04:00	44.1	35.6	44.6	64.3
	04:15	39.1	35.1	39.1	55.2
	04:30	40.4	35.6	42.5	55.0
	04:45	38.1	35.6	40.1	53.0
	05:00	38.5	36.0	40.8	50.8
	05:15	38.4	36.5	39.5	50.7
	05:30	43.0	37.4	46.7	55.0
	05:45	41.9	38.6	44.7	53.5
	06:00	41.2	38.1	43.0	52.8
	06:15	42.6	38.6	45.8	56.5
	06:30	43.3	38.8	46.3	54.4
	06:45	46.7	40.1	46.4	73.1
	07:00	45.6	40.5	48.3	57.4
	07:15	43.9	40.9	46.5	53.9
	07:30	44.2	41.0	46.7	51.8
	07:45	49.2	40.5	51.4	66.6
	08:00	52.0	40.4	55.9	65.4
	08:15	51.4	41.9	55.2	64.8
	08:30	46.4	42.6	49.8	57.3
	08:45	44.9	43.2	46.3	55.9
	09:00	47.4	42.1	49.8	65.5
	09:15	46.1	41.9	48.7	61.6
	09:30	45.6	42.1	48.0	55.8
	09:45	45.0	41.2	45.4	72.3
	10:00	48.5	41.1	51.2	63.0
	10:15	50.2	42.6	53.4	71.6
	10:30	50.3	40.8	50.5	73.5
	10:45	49.3	40.4	48.9	67.5
	11:00	51.7	40.4	53.5	80.0
	11:15	47.9	40.3	51.4	61.3
	11:30	50.6	41.0	52.1	70.2
	11:45	49.3	39.7	49.1	67.5
	12:00	46.0	40.3	49.1	63.3
	12:15	46.6	40.4	48.1	67.4
	12:30	48.5	40.7	52.1	65.8
	12:45	48.3	39.9	51.7	63.2
	13:00	46.4	40.1	49.0	63.7

APPENDIX E

Date	Start Time	L _{Aeq,T}	L _{A90}	L _{A10}	L _{AFmax}
	13:15	50.0	41.3	52.7	70.9
	13:30	50.0	41.5	53.3	67.6
	13:45	51.2	41.0	51.8	77.1
	14:00	46.0	40.3	49.6	60.1
	14:15	47.0	40.2	49.2	60.0
	14:30	48.2	40.7	51.3	64.9
	14:45	47.2	40.9	50.9	60.3
	15:00	47.0	40.3	50.0	64.7
	15:15	48.1	40.0	50.8	62.8
	15:30	45.5	40.6	48.2	63.6
	15:45	45.9	39.9	49.0	61.0
	16:00	47.8	39.7	49.4	62.9
	16:15	49.4	41.2	51.9	69.1
	16:30	46.1	41.2	49.2	55.7
	16:45	47.2	41.1	49.4	60.5
	17:00	43.6	40.5	45.3	63.2
	17:15	44.2	40.4	46.3	58.6
	17:30	45.3	41.5	47.0	58.7
	17:45	48.6	41.4	49.4	69.0
	18:00	52.8	41.7	55.6	69.2
	18:15	50.1	40.5	52.6	71.0
	18:30	49.9	41.6	53.0	65.2
	18:45	46.8	41.6	46.9	67.5
	19:00	44.9	40.7	45.6	70.1
	19:15	47.6	41.4	47.4	64.5
	19:30	42.8	40.6	43.6	59.6
	19:45	48.0	41.6	49.3	71.2
	20:00	43.6	42.0	45.0	52.8
	20:15	44.2	41.9	46.1	57.9
	20:30	44.5	41.4	47.3	54.4
	20:45	43.9	41.4	45.4	56.2
	21:00	43.0	40.9	44.3	52.1
	21:15	44.4	41.6	46.2	53.6
	21:30	43.1	41.5	44.5	51.4
	21:45	48.6	41.4	50.9	68.9
	22:00	43.8	41.8	45.8	50.7
	22:15	43.1	41.6	44.3	50.7
	22:30	43.0	41.5	44.2	51.4
	22:45	42.4	41.0	43.4	51.0
	23:00	42.8	40.9	44.5	48.3
	23:15	41.6	40.3	42.5	46.2
	23:30	42.0	40.2	43.5	50.1
	23:45	42.5	40.6	44.2	49.4
Sunday, 24 September 17	00:00	41.4	40.0	42.5	47.8
	00:15	40.7	39.3	41.9	48.1
	00:30	41.2	39.3	42.4	46.3

APPENDIX E

Date	Start Time	L _{Aeq,T}	L _{A90}	L _{A10}	L _{AFmax}
	00:45	40.2	38.6	41.1	45.7
	01:00	40.5	38.7	40.7	66.0
	01:15	40.4	38.6	41.1	57.4
	01:30	39.5	38.1	40.4	47.8
	01:45	39.3	37.9	40.5	47.2
	02:00	38.9	37.8	39.7	48.2
	02:15	38.7	37.6	39.7	46.0
	02:30	38.6	37.0	39.7	47.5
	02:45	38.5	36.5	39.8	50.2
	03:00	38.3	36.7	39.1	49.5
	03:15	38.4	37.0	39.8	43.2
	03:30	37.9	36.5	39.1	48.0
	03:45	38.2	36.6	39.3	47.0
	04:00	38.6	37.1	39.8	47.8
	04:15	37.5	36.1	38.6	45.1
	04:30	38.4	36.5	40.2	45.8
	04:45	39.8	36.5	40.1	56.2
	05:00	37.8	36.2	38.9	48.1
	05:15	38.4	37.0	39.4	43.2
	05:30	38.7	37.0	39.9	49.3
	05:45	41.6	37.7	43.5	53.6
	06:00	42.1	37.9	45.7	53.4
	06:15	48.0	39.4	50.2	65.4
	06:30	47.0	40.5	50.3	63.9
	06:45	46.9	41.4	48.8	60.4
	07:00	48.1	41.0	49.0	64.7
	07:15	46.7	41.3	46.0	66.4
	07:30	45.0	41.9	47.3	52.3
	07:45	46.9	41.6	46.4	66.6
	08:00	49.3	41.5	50.6	68.1
	08:15	44.8	42.0	46.5	55.4
	08:30	45.2	42.3	47.3	54.4
	08:45	44.4	42.1	46.4	53.5
	09:00	44.5	41.6	46.7	56.1
	09:15	48.1	42.0	51.4	63.5
	09:30	45.5	40.5	49.0	56.6
	09:45	44.3	39.9	47.3	58.7
	10:00	46.2	41.2	48.5	60.8
	10:15	48.1	42.3	51.8	60.8
	10:30	48.2	41.8	51.3	60.9
	10:45	49.5	43.7	53.2	62.1
	11:00	49.1	42.5	52.4	65.9
	11:15	48.3	43.3	50.4	70.8
	11:30	50.1	43.3	54.2	65.1
	11:45	49.8	42.4	53.7	60.6
	12:00	47.2	43.0	49.0	64.0

APPENDIX E

Date	Start Time	L _{Aeq,T}	L _{A90}	L _{A10}	L _{AFmax}
	12:15	47.8	42.2	50.2	65.9
	12:30	47.5	43.2	50.3	58.9
	12:45	47.9	42.3	50.0	62.0
	13:00	46.3	43.4	48.0	60.0
	13:15	50.8	43.0	51.0	68.7
	13:30	46.3	43.1	49.0	55.7
	13:45	46.9	42.4	47.7	62.6
	14:00	45.5	42.5	47.1	65.9
	14:15	51.2	42.8	55.6	66.7
	14:30	49.9	43.0	52.9	67.6
	14:45	46.8	43.4	47.9	61.0
	15:00	47.3	42.9	49.4	59.0
	15:15	48.8	43.3	51.9	60.4
	15:30	48.0	44.0	49.8	70.1
	15:45	52.8	42.0	54.0	77.1
	16:00	45.9	42.3	47.6	66.3
	16:15	46.6	41.9	48.5	63.7
	16:30	49.8	42.1	52.6	68.3
	16:45	47.7	41.3	50.2	60.3
	17:00	47.4	41.3	47.4	64.5
	17:15	48.4	41.6	48.2	65.2
	17:30	45.9	42.1	48.1	62.4
	17:45	50.9	40.7	55.6	64.2
	18:00	46.7	41.5	47.9	60.0
	18:15	44.8	40.5	47.1	54.2
	18:30	45.2	40.6	48.3	58.9
	18:45	42.8	38.8	44.4	59.8
	19:00	51.6	38.8	56.9	67.1
	19:15	44.5	38.4	43.9	59.8
	19:30	42.9	38.6	45.3	53.5
	19:45	48.4	39.3	48.7	63.9
	20:00	44.7	38.4	46.4	57.9
	20:15	43.2	38.5	46.4	55.4
	20:30	41.9	38.3	42.9	61.6
	20:45	39.9	38.4	40.9	50.2
	21:00	41.4	38.2	42.7	53.1
	21:15	41.3	38.1	41.6	57.0
	21:30	39.8	37.0	42.3	51.4
	21:45	41.5	37.0	42.6	57.7
	22:00	41.7	39.7	43.0	52.1
	22:15	41.6	39.3	43.4	47.8
	22:30	41.5	38.4	44.3	48.4
	22:45	42.7	38.9	44.9	53.9
	23:00	40.5	36.7	42.1	53.7
	23:15	39.3	36.2	40.5	49.8
	23:30	54.2	36.7	56.3	69.0

APPENDIX E

Date	Start Time	L _{Aeq,T}	L _{A90}	L _{A10}	L _{AFmax}
Monday, 25 September 17	23:45	43.0	36.1	46.4	55.2
	00:00	43.6	34.4	46.8	57.6
	00:15	35.6	33.7	36.4	44.8
	00:30	36.5	33.9	37.6	50.5
	00:45	38.3	36.0	39.4	51.7
	01:00	37.6	35.6	38.8	47.3
	01:15	37.4	35.8	38.6	46.1
	01:30	38.3	34.9	41.7	49.4
	01:45	36.8	34.8	38.2	52.4
	02:00	35.0	34.0	35.7	51.6
	02:15	34.8	33.5	36.2	41.5
	02:30	34.9	33.6	35.7	53.1
	02:45	34.9	33.9	35.5	52.2
	03:00	34.7	33.3	35.4	46.8
	03:15	34.2	32.9	35.2	39.1
	03:30	34.5	32.6	36.6	50.3
	03:45	46.5	34.3	51.1	54.7
	04:00	49.9	47.9	51.5	53.3
	04:15	55.9	51.3	59.0	62.0
	04:30	57.7	55.3	59.0	61.0
	04:45	55.9	54.5	56.8	58.9
	05:00	57.5	53.6	59.5	61.3
	05:15	54.0	52.5	55.1	56.9
	05:30	53.5	50.7	55.3	58.6
	05:45	51.4	50.1	52.2	61.9
	06:00	49.9	48.2	51.4	54.2
	06:15	49.5	45.1	51.3	56.4
	06:30	46.0	43.3	47.0	59.1
	06:45	46.9	44.6	48.7	53.4
	07:00	45.7	43.8	47.2	52.2
	07:15	49.6	43.9	47.7	73.2
	07:30	47.7	45.6	49.2	54.7
	07:45	47.9	45.5	49.9	58.0
	08:00	46.9	45.0	48.5	58.1
	08:15	46.5	43.9	48.9	55.9
	08:30	45.3	43.3	46.8	55.6
	08:45	47.5	44.0	49.2	61.4
	09:00	47.8	45.2	49.5	56.9
	09:15	48.1	43.6	51.3	57.5
	09:30	54.7	41.5	55.4	80.3
	09:45	45.2	41.2	47.1	57.0
	10:00	46.0	42.9	48.2	58.7
	10:15	48.3	43.0	50.7	59.8
	10:30	49.0	44.1	51.8	64.9
	10:45	51.0	44.5	53.8	65.3
	11:00	49.6	45.2	52.4	61.8

APPENDIX E

Date	Start Time	L _{Aeq,T}	L _{A90}	L _{A10}	L _{AFmax}
	11:15	51.1	43.1	51.8	71.1
	11:30	48.2	41.1	51.0	65.1
	11:45	46.6	41.6	49.2	59.6
	12:00	45.0	42.1	47.3	56.7
	12:15	42.8	40.2	44.5	51.0
	12:30	45.6	41.1	48.0	57.9
	12:45	49.5	40.4	48.0	64.9
	13:00	48.6	40.9	51.6	66.7
	13:15	46.5	39.5	49.6	60.4
	13:30	45.4	38.3	49.3	54.9
	13:45	42.9	38.5	45.3	64.8
	14:00	46.4	39.4	47.6	67.5
	14:15	46.9	41.2	49.8	61.5
	14:30	42.6	40.0	44.4	52.5
	14:45	45.5	41.9	47.5	58.8
	15:00	46.0	42.8	48.5	53.3
	15:15	48.1	44.4	50.9	60.6
	15:30	54.0	44.4	54.4	73.3
	15:45	48.2	42.8	50.4	62.7
	16:00	44.4	40.3	46.2	65.5
	16:15	46.6	39.7	49.4	63.3
	16:30	45.6	39.7	48.7	60.8
	16:45	48.4	38.4	51.8	66.6
	17:00	43.5	37.1	46.5	59.0
	17:15	47.0	37.4	49.6	61.3
	17:30	44.1	37.0	46.0	66.0
	17:45	52.5	38.6	48.1	71.0
	18:00	43.5	38.8	46.4	56.5
	18:15	46.0	40.2	48.2	59.9
	18:30	47.3	41.5	50.4	61.7
	18:45	43.3	39.5	45.8	55.4
	19:00	47.8	40.1	49.5	66.4
	19:15	44.1	40.3	45.3	58.1
	19:30	43.2	39.9	45.3	57.6
	19:45	44.6	40.2	46.7	57.0
	20:00	43.0	40.2	45.0	54.0
	20:15	42.2	39.9	44.2	52.9
	20:30	42.4	39.3	44.9	51.4
	20:45	41.6	38.7	43.4	49.7
	21:00	40.0	37.7	41.7	49.4
	21:15	42.1	37.8	44.8	54.7
	21:30	39.6	37.7	40.8	54.4
	21:45	42.8	38.6	46.4	53.9
	22:00	40.9	39.0	42.5	50.1
	22:15	42.7	38.2	45.4	54.5
	22:30	39.9	37.4	41.8	52.9

APPENDIX E

Date	Start Time	L _{Aeq,T}	L _{A90}	L _{A10}	L _{AFmax}
	22:45	41.2	37.9	43.2	53.5
	23:00	41.4	37.5	42.9	54.8
	23:15	39.3	37.1	40.0	50.3
	23:30	40.3	36.7	41.8	58.9
	23:45	40.8	35.4	42.9	56.5
Tuesday, 26 September 17	00:00	37.3	34.8	37.9	53.1
	00:15	35.6	33.3	36.8	49.7
	00:30	36.2	33.1	38.0	47.8
	00:45	36.1	32.5	37.6	51.3
	01:00	36.2	33.3	38.0	51.9
	01:15	39.6	33.1	41.5	54.0
	01:30	37.4	33.2	39.9	49.2
	01:45	36.3	33.5	37.4	49.4
	02:00	36.3	33.3	36.5	52.4
	02:15	34.0	32.9	35.1	41.6
	02:30	35.3	33.1	37.2	52.1
	02:45	33.6	32.6	34.0	50.9
	03:00	33.5	32.4	33.9	48.4
	03:15	34.5	32.8	35.9	39.1
	03:30	35.5	32.8	37.2	49.4
	03:45	33.9	32.5	34.3	48.9
	04:00	34.2	32.8	35.1	48.5
	04:15	34.9	33.0	36.6	42.2
	04:30	36.3	33.4	36.9	48.5
	04:45	38.0	34.1	39.2	50.3
	05:00	42.8	35.2	44.5	59.0
	05:15	44.3	35.3	44.2	58.6
	05:30	40.1	35.9	40.5	64.5
	05:45	42.5	36.5	45.2	55.3
	06:00	43.2	37.1	47.4	58.3
	06:15	46.0	37.8	49.2	60.4
	06:30	41.7	38.5	43.9	51.9
	06:45	41.0	38.1	42.7	50.1
	07:00	48.9	38.8	47.8	70.7
	07:15	46.2	38.8	49.5	62.0
	07:30	48.1	40.2	51.6	68.3
	07:45	48.1	40.7	49.8	64.8
	08:00	46.2	40.9	47.0	63.9
	08:15	46.5	41.2	49.4	61.7
	08:30	43.6	39.9	45.6	55.2
	08:45	48.6	40.0	50.5	65.9
	09:00	53.5	42.3	57.5	65.4
	09:15	52.8	41.7	57.3	64.5
	09:30	47.7	40.0	50.0	66.9
	09:45	64.1	40.3	54.5	80.0
	10:00	64.3	47.6	69.0	78.0

APPENDIX E

Date	Start Time	L _{Aeq,T}	L _{A90}	L _{A10}	L _{AFmax}
	10:15	49.2	43.7	52.0	59.7
	10:30	47.5	41.0	49.2	64.2
	10:45	44.9	40.8	48.1	56.8
	11:00	47.5	42.1	49.9	63.7
	11:15	48.7	43.6	51.5	65.3
	11:30	51.0	43.4	53.8	66.8
	11:45	53.1	41.7	48.2	74.9
	12:00	47.6	40.4	50.0	68.9
	12:15	51.0	41.0	53.4	67.8
	12:30	47.8	42.4	51.1	61.9
	12:45	44.3	40.0	46.7	56.4
	13:00	43.9	39.1	46.8	58.8
	13:15	45.5	39.7	47.9	62.2
	13:30	51.9	39.2	54.4	70.1
	13:45	46.9	39.7	47.4	69.8
	14:00	48.9	40.0	51.7	69.2
	14:15	45.3	38.5	48.1	59.2
	14:30	44.8	37.6	46.5	63.8
	14:45	42.4	38.2	45.7	53.3
	15:00	44.5	38.4	47.4	64.1
	15:15	42.6	39.4	44.6	57.2
	15:30	43.0	39.6	45.3	55.6
	15:45	47.5	40.1	46.4	65.8
	16:00	45.0	40.8	48.1	57.9
	16:15	44.8	39.8	46.6	60.8
	16:30	47.3	38.5	50.3	67.2
	16:45	42.3	38.0	44.4	57.8
	17:00	47.7	39.4	50.0	66.7
	17:15	45.5	38.9	49.6	58.7
	17:30	45.6	38.3	49.6	58.4
	17:45	46.5	39.5	50.1	61.1
	18:00	43.7	39.2	46.4	57.2
	18:15	43.4	39.9	45.7	65.5
	18:30	44.2	40.7	46.4	59.2
	18:45	44.5	39.9	46.2	57.3
	19:00	49.1	40.7	51.8	64.3
	19:15	50.6	41.9	51.7	68.5
	19:30	44.7	40.9	47.4	56.2
	19:45	45.1	41.1	47.5	60.4
	20:00	45.9	41.2	48.1	57.9
	20:15	48.8	41.5	49.1	73.7
	20:30	43.8	40.2	46.0	55.9
	20:45	49.5	40.4	49.8	66.4
	21:00	43.9	40.7	46.8	50.8
	21:15	43.6	40.1	45.9	57.0
	21:30	42.4	39.6	44.4	56.6

APPENDIX E

Date	Start Time	L _{Aeq,T}	L _{A90}	L _{A10}	L _{AFmax}
	21:45	41.1	38.7	42.5	49.2
	22:00	41.9	38.3	43.9	61.1
	22:15	44.0	38.5	46.0	61.9
	22:30	44.4	37.8	43.3	58.8
	22:45	42.2	38.4	45.2	52.2
	23:00	42.1	37.8	43.2	54.7
	23:15	40.4	38.0	42.0	47.4
	23:30	45.6	36.0	47.9	59.6
	23:45	37.4	35.6	38.5	52.4
Wednesday, 27 September 17	00:00	41.5	37.9	42.9	52.3
	00:15	40.6	36.5	43.0	58.2
	00:30	37.9	35.9	38.8	51.5
	00:45	39.9	36.2	42.4	51.9
	01:00	38.2	36.1	39.7	49.1
	01:15	39.3	35.7	40.9	52.1
	01:30	41.0	36.3	44.4	46.5
	01:45	39.4	34.8	40.1	52.5
	02:00	37.5	35.4	38.7	47.3
	02:15	37.3	35.4	39.2	43.5
	02:30	37.2	35.0	38.0	53.0
	02:45	38.2	35.7	40.1	47.8
	03:00	37.5	35.1	38.7	46.4
	03:15	37.6	35.8	39.2	45.5
	03:30	39.0	36.0	40.6	51.6
	03:45	39.6	35.4	42.1	52.3
	04:00	41.3	34.3	39.6	56.0
	04:15	37.2	34.3	39.6	57.1
	04:30	39.0	35.3	42.0	49.4
	04:45	36.4	33.9	38.1	47.4
	05:00	38.7	36.5	40.2	50.0
	05:15	38.7	36.0	40.4	48.6
	05:30	41.8	37.2	43.1	53.7
	05:45	45.7	39.5	48.8	61.2
	06:00	45.6	40.2	49.5	60.8
	06:15	50.8	41.4	53.0	64.3
	06:30	46.2	42.4	47.9	58.8
	06:45	44.7	42.1	46.9	54.8
	07:00	47.8	42.9	49.0	61.3
	07:15	45.6	42.8	47.4	57.9
	07:30	46.1	42.0	47.9	60.1
	07:45	44.6	42.1	46.5	58.6
	08:00	46.1	42.7	48.1	58.8
	08:15	46.0	42.1	48.0	59.8
	08:30	45.2	41.7	47.1	59.9
	08:45	44.2	41.8	46.0	55.1
	09:00	44.9	42.0	47.1	62.6

APPENDIX E

Date	Start Time	L _{Aeq,T}	L _{A90}	L _{A10}	L _{AFmax}
	09:15	44.9	41.0	47.5	56.6
	09:30	43.0	39.3	46.0	55.0
	09:45	47.3	41.0	50.3	65.4
	10:00	45.1	40.8	47.7	58.5
	10:15	48.8	40.8	51.5	64.7
	10:30	50.9	41.5	51.7	70.9
	10:45	48.5	42.8	52.0	58.1
	11:00	47.5	41.2	50.3	65.2
	11:15	48.2	39.8	49.9	63.1
	11:30	42.5	39.5	44.7	65.3
	11:45	45.3	40.4	48.2	66.9
	12:00	44.5	40.1	46.0	57.7
	12:15	48.4	40.8	52.2	66.2
	12:30	46.6	43.4	48.5	65.9
	12:45	48.2	42.3	50.0	67.9
	13:00	49.0	41.8	49.9	65.4
	13:15	46.2	42.1	48.1	64.0
	13:30	44.4	41.7	46.3	57.7
	13:45	48.0	41.9	48.6	74.9
	14:00	50.4	41.3	52.0	67.3
	14:15	45.9	41.0	49.2	60.6
	14:30	46.7	41.7	48.7	66.2
	14:45	45.7	41.5	48.3	60.2
	15:00	47.5	42.2	50.0	61.4
	15:15	46.4	41.9	48.3	62.9
	15:30	46.2	41.6	47.6	63.7
	15:45	45.4	41.6	46.9	58.5
	16:00	44.7	41.6	47.0	54.7
	16:15	46.4	41.1	47.8	77.7
	16:30	46.2	41.3	48.2	58.6
	16:45	46.6	42.0	48.4	64.9
	17:00	46.2	41.8	49.7	61.0
	17:15	46.4	42.0	49.6	58.4
	17:30	47.1	41.4	50.3	59.6
	17:45	50.5	45.1	53.6	59.9
	18:00	49.0	43.3	52.0	60.5
	18:15	53.5	49.8	55.5	58.6
	18:30	49.0	45.1	51.9	61.4
	18:45	52.3	44.9	55.4	68.9
	19:00	52.8	47.9	56.0	64.2
	19:15	51.4	48.5	53.2	60.8
	19:30	49.1	46.6	51.2	62.3
	19:45	53.6	46.5	54.4	69.2
	20:00	49.0	46.4	50.9	57.8
	20:15	46.8	41.9	48.9	56.6
	20:30	49.2	43.4	52.4	57.7

APPENDIX E

Date	Start Time	L _{Aeq,T}	L _{A90}	L _{A10}	L _{AFmax}
	20:45	51.3	46.7	54.4	57.4
	21:00	46.6	42.9	49.7	54.7
	21:15	43.5	41.5	44.5	52.9
	21:30	44.4	42.3	46.0	52.7
	21:45	43.3	41.3	44.7	57.3
	22:00	49.2	44.2	53.3	62.5
	22:15	45.6	41.1	48.2	59.4
	22:30	41.5	39.8	42.8	51.2
	22:45	39.7	38.2	40.7	53.5
	23:00	39.7	38.4	40.7	52.9
	23:15	39.9	38.4	40.8	49.6
	23:30	39.7	37.6	41.0	49.4
	23:45	38.2	36.5	39.4	48.9
Thursday, 28 September 17	00:00	38.2	36.2	39.5	49.3
	00:15	40.9	36.8	43.9	50.4
	00:30	39.4	37.1	41.1	51.6
	00:45	37.1	35.5	38.1	48.7
	01:00	36.8	35.5	37.9	45.1
	01:15	37.0	35.2	38.1	52.0
	01:30	37.1	35.3	38.3	49.5
	01:45	37.5	35.1	39.3	48.3
	02:00	35.6	34.3	36.6	42.2
	02:15	35.9	34.2	37.0	44.8
	02:30	36.0	34.4	37.1	51.0
	02:45	35.0	33.7	35.8	51.3
	03:00	43.3	33.9	47.3	53.8
	03:15	36.8	35.3	37.8	48.9
	03:30	37.4	35.1	38.8	48.1
	03:45	36.4	34.3	37.2	52.1
	04:00	35.1	34.0	36.3	41.4
	04:15	35.6	33.4	37.0	44.3
	04:30	34.3	32.9	35.6	46.0
	04:45	35.3	33.5	37.0	43.4
	05:00	35.3	34.1	36.3	46.7
	05:15	36.9	34.1	37.9	53.7
	05:30	40.7	34.4	39.2	56.0
	05:45	38.1	34.5	38.4	57.1
	06:00	40.3	34.8	39.1	60.3
	06:15	40.9	36.7	42.0	59.1
	06:30	45.6	37.7	44.0	66.5
	06:45	40.1	38.3	41.7	53.1
	07:00	43.5	39.7	45.0	60.8
	07:15	42.1	40.0	43.3	56.8
	07:30	44.5	40.3	47.7	59.3
	07:45	48.1	40.7	49.5	63.8
	08:00	44.3	41.3	46.0	57.4

APPENDIX E

Date	Start Time	L _{Aeq,T}	L _{A90}	L _{A10}	L _{AFmax}
	08:15	53.1	42.7	56.7	66.6
	08:30	54.0	42.5	57.7	68.0
	08:45	49.8	41.4	50.5	67.1
	09:00	50.1	41.3	52.9	69.3
	09:15	53.8	42.7	57.4	76.2
	09:30	43.8	39.8	47.0	53.5
	09:45	43.0	39.4	44.5	59.1
	10:00	42.0	37.6	44.6	59.7
	10:15	43.8	37.5	47.3	56.5
	10:30	55.6	40.1	56.5	75.3
	10:45	46.9	39.0	50.5	64.3

Note: All measurements were 15 minutes in duration

Figure E.1: Weekday Daytime L_{A90} distribution, free-field dB

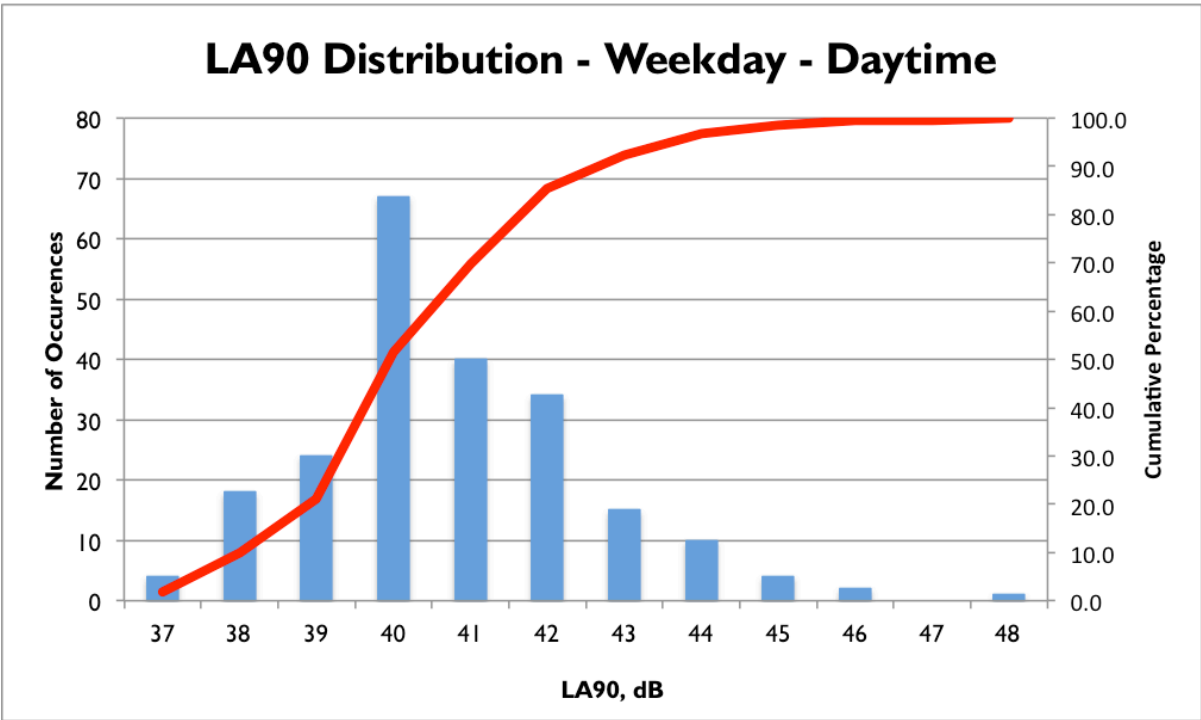


Figure E.2: Weekday Night-time L_{A90} distribution, free-field dB

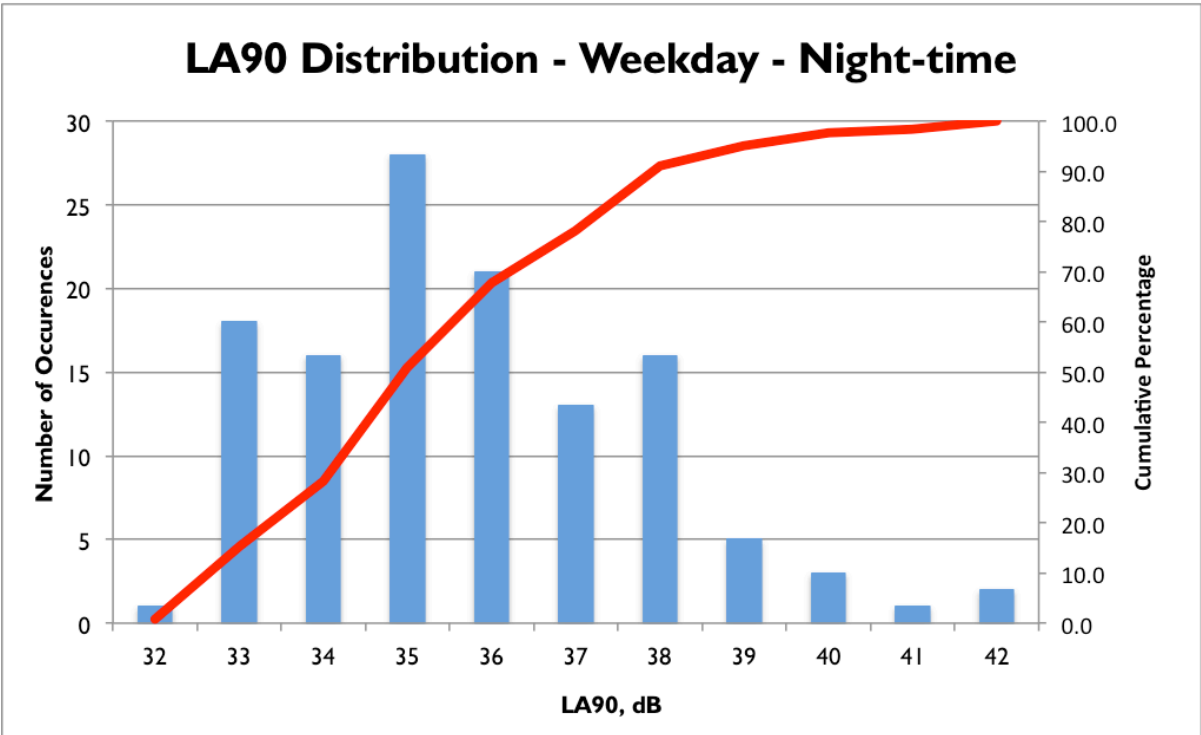


Figure E.3: Weekend Daytime L_{A90} distribution, free-field dB

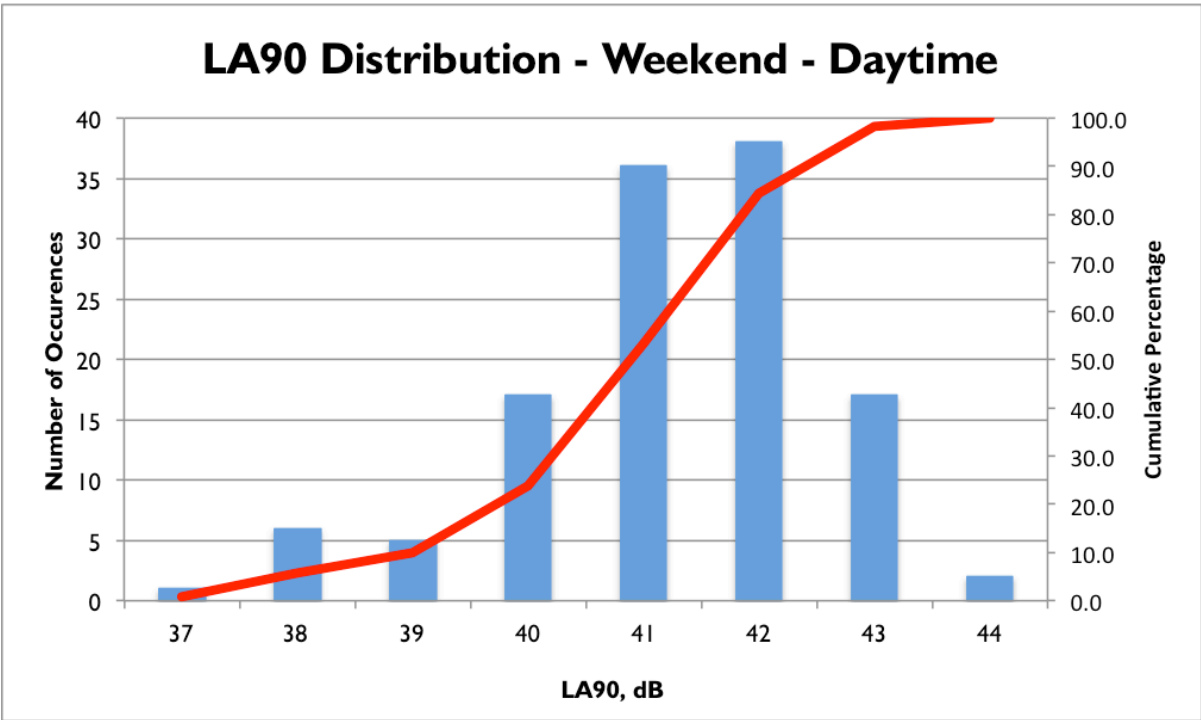
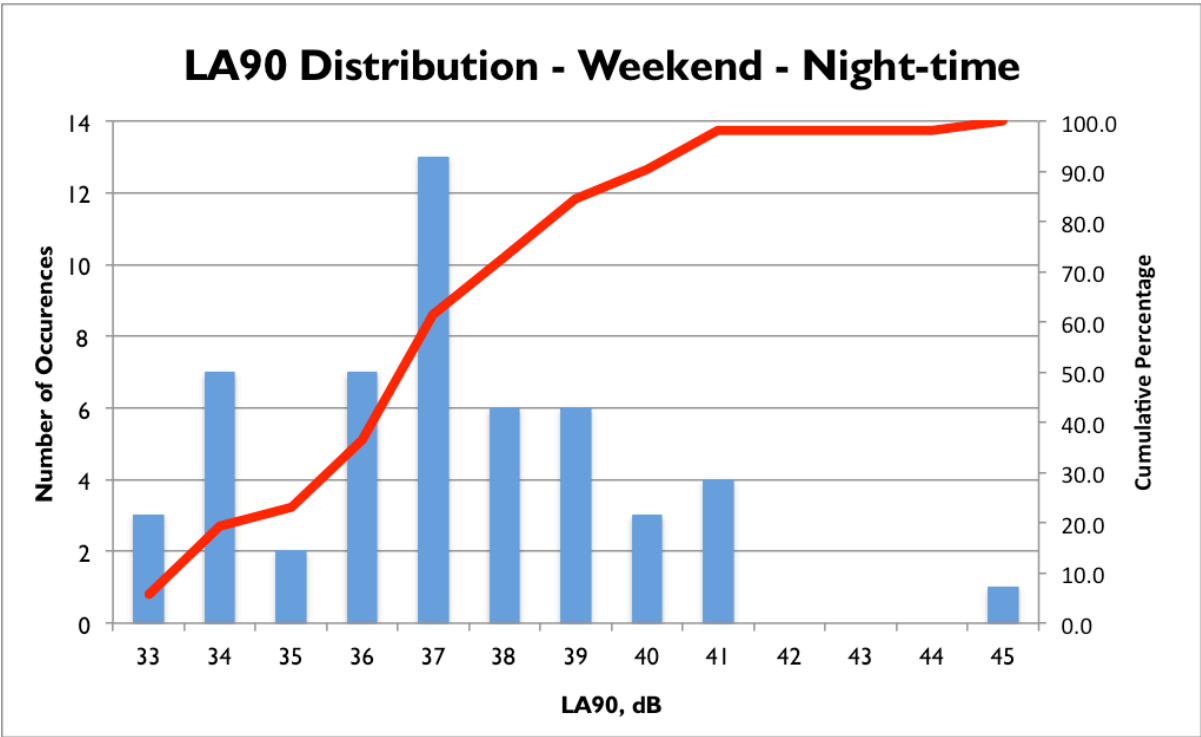
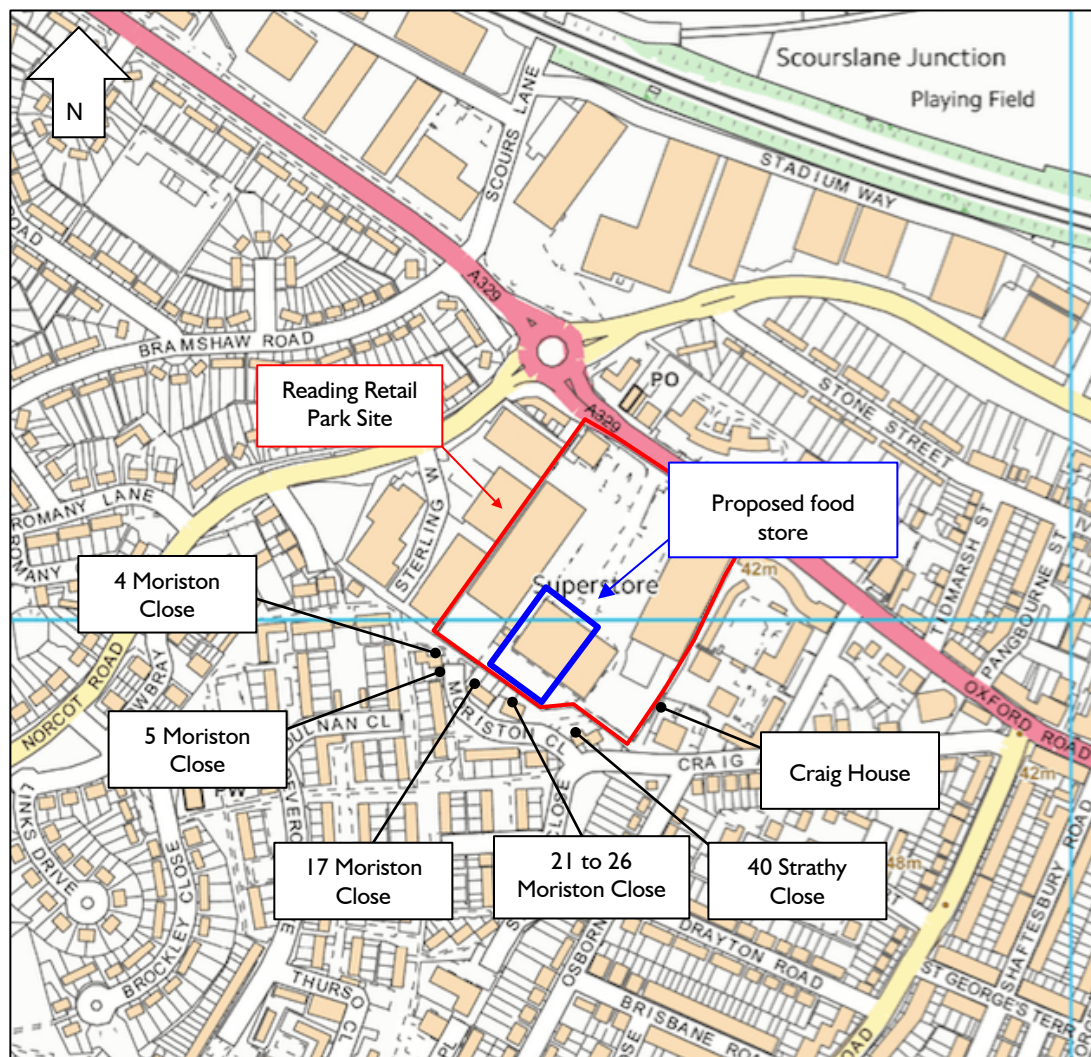


Figure E.4: Weekend Night-time L_{A90} distribution, free-field dB



Appendix F – Noise Assessment Figures

Figure F.1: Noise assessment locations





Resound Acoustics Limited, Elizabeth Court, Church Street, Stratford-upon-Avon, Warwickshire CV37 6HB
Telephone: (01789) 387979
www.resoundacoustics.co.uk

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