ACOUSTIC CONSULTANTS LTD

Noise Impact Assessment

Reading Retail Park
Reading

Reference: 9360/BL

Document Control				
Version:	**Revision Description:**	**Date:**	**Author:**	**Reviewed by:**
1.0	First Issue	26/11/2021	Blake Lucas MIOA	Daniel Oldaker MIOA
A	Amending typos	30/11/2021	Blake Lucas MIOA	Daniel Oldaker MIOA
B	Amending typos	13/12/2021	Blake Lucas MIOA	Daniel Oldaker MIOA
C	Client comments	18/11/2022	Blake Lucas MIOA	Daniel Oldaker MIOA

The report has been prepared in good faith, with all reasonable skill and care, based on information provided or available at the time of its preparation and within the scope of work agreement with the Client. We disclaim any responsibility to the Client and others in respect of any matters outside the scope of the above. The report is provided for the sole use of the named Client and is confidential to them and their professional advisors. No responsibility is accepted to other parties.

The report limits itself to addressing solely on the noise, or acoustic, or vibration aspects as included in this report. We provide advice only in relation to noise, vibration and acoustics. It is recommended that appropriate expert advice is sought on all the ramifications (e.g. CDM, structural, condensation, fire, legal, etc.) associated with any proposals in this report or as advised and concerning the appointment. It should be noted that noise predictions are based on the current information as we understand it and, on the performances noted in this report. Any modification to these parameters can alter the predicted level. All predictions are in any event subject to a degree of tolerance of normally plus or minus three decibels. If this tolerance is not acceptable, then it would be necessary to consider further measures.

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1. Introduction

Acoustic Consultants Limited to undertake a noise impact assessment for the proposed food store at Reading Retail Park, Reading.

This report provides a noise assessment of the delivery operation on the nearby sensitive receivers around the site.

The noise impact assessment has been undertaken in accordance with the guidance in the National Planning Policy Framework (NPPF), Noise Policy Statement for England (NPSE), National Planning Practice Guidance (NPPG) and British Standard 4142:2014+A1:2019 (BS4142).

The author of this report is a Member of the Institute of Acoustics (MIOA) with over 14 years of experience within the field of noise and acoustics.

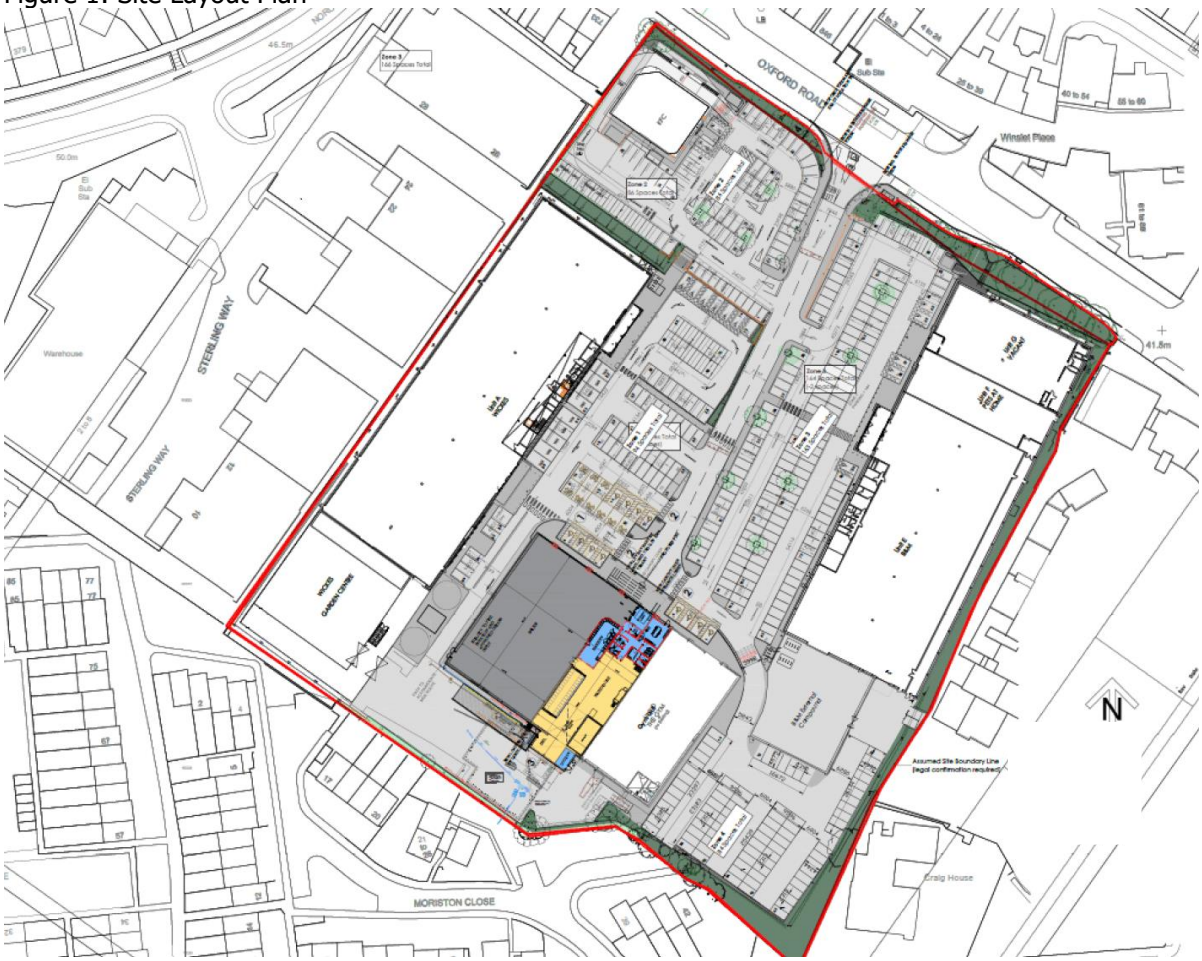
2. The Site & Proposals

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.

The retail park currently comprises three large commercial buildings and a drive-thru fast food restaurant, with associated car parking and service yard areas. The currently permitted servicing hours at the site are 09:00 to 17:00 hours Monday to Friday.

The noise-sensitive receptors closest to the site are residential properties to the south on Craig Avenue and Moriston Close. The site location is provided below:

Figure 1: Site Layout Plan



3. Planning and Noise

3.1. National Planning Policy Framework

The National Planning Policy Framework (NPPF) was published in March 2012 and revised in July 2021. Section 15 entitled 'Conserving and enhancing the natural environment' addresses noise as a requirement of planning. Paragraph 174 states:

"174. 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; and f) remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate."

Paragraph 185 states:

"185. 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; and

c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation. "

The document does not prescribe any assessment methodology or criteria to assess the adverse effect of noise, and refers you to the NPSE.

3.2. Noise Policy Statement for England

The NPPF refers to the Noise Policy Statement for England (NPSE). This was published in March 2010 and aims to provide clarity regarding current policies and practices to enable noise management decisions to be made within the wider context, at the most appropriate level, in a cost-effective manner and in a timely fashion and applies to all forms of noise including environmental noise, neighbour noise and neighbourhood noise.

The NPSE sets out the long-term vision of Government noise policy. This long-term vision is supported by three noise policy aims which are as follows:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

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

The NPSE introduces the concept of "Significant adverse" and "Adverse" impacts of noise which relate to the noise policy aims. These are applied as follows:

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.

SOAEL – Significant Observed Adverse Effect Level - This is the level above which significant adverse effects on health and quality of life occur. With regard to where there is potential for noise impact it states the following in relation to the second noise policy aim:

"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 NPSE does not provide any assessment criteria for the noted effect levels and each case must be considered on its own merits. The NPSE does, however, emphasise that in dealing with noise, Local Planning Authorities are required to take a balanced approach in considering the benefits of development against any adverse effects which arise. Paragraph 2.18 of the NPSE is particularly relevant in this respect and states:

"There is a need to integrate consideration of the economic and social benefits of the activity or policy under examination with proper consideration of the adverse environmental effects, including the impact of noise on health and quality of life. This should avoid noise being treated in isolation in any particular situation, i.e. not focusing solely on the noise impact without taking into account other related factors."

The planning need is outside the scope of noise and acoustics and will need to be addressed by others.

3.3. National Planning Practice Guidance, Noise

The National Planning Practice Guidance (NPPG) on noise, referred to here, is based on the current version (July 2019) as provided on the Planning Guidance Website. It states that *"Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment."*

The document provides generic guidance on how to determine the impact of noise and what factors could be a concern. It includes the option types to mitigate any adverse effects of noise stating that there are four broad types of mitigation. These are engineering, layout, using planning conditions or obligations and noise insulation. Paragraph 5 of the NPPG provides a table identifying the effect level and examples of effect relating to the impact effect levels provided in the NPSE. The table is duplicated on the following page.

Table 1: NPPG Noise – Perception of Effect Levels

Response	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 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

The table does not provide any objective assessment which equates to the noted effect levels.

The NPPG identifies that where noise is audible it is not necessarily intrusive. The effect and impact on people is based primarily on the level of noise.

The Noise Policy Statement for England (NPSE) states that noise levels above the Lowest Observed Adverse Effect Level are acceptable in planning where reduced to a minimum when taken into account against all other planning considerations.

Section 4 of this report identifies guidance which is considered to provide noise criteria equivalent to effect levels below the Lowest Observed Adverse Effect Level. This is where the perception of noise is "not noticeable" or "noticeable but not intrusive" as indicated in Table 1 above.

3.4. Local Planning Policies

Reading Borough Council (RBC) adopted the Reading Borough Local Plan in November 2019. Policy EN16 is relevant to this delivery assessment:

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…"

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."

4. Assessment Criteria

For commercial noise, the most relevant guidance is provided within British Standard 4142:2014+A1:2019. The methods described in the British Standard use outdoor sound levels to assess the likely effects of sound upon people who might be inside or outside a dwelling or other premises used for residential purposes.

The initial estimate principle is that of establishing the 'difference' between the 'rating level' and the 'background sound level'. The 'rating level' is the 'specific sound level' of the source over a period of one hour during the day (07:00 to 23:00 hours) and over a period of 15 minutes during the night (23:00 to 07:00 hours). Clause 9 entitled 'Rating Level' states:

"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level."

An acoustic character correction should be added to the 'specific sound level' if it exhibits any tonality, impulsivity, other specific characteristics and/or intermittency at the assessment location. The value of the character correction varies, dependent on the prominence of the character of the sound source at the assessment location. In Clause 11 of the Standard, entitled 'Assessment of the Impacts', it states:

"Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level (see Clause 8) from the rating level (see Clause 9), and consider the following.

- *Typically, the greater this difference, the greater the magnitude of the impact.*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
- *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."*

Based on the initial assessment outcomes of BS4142, and depending on context, it is our opinion that the NOEL, LOAEL and SOAEL levels stated in the Noise Policy Statement for England would generally fall within the following categories when considered in conjunction with the effect levels of the NPPG Noise.

Table 2: BS4142 Difference in Relation to Effect Levels

BS4142 Assessment Difference	Corresponding Effect Level*	Action*
≤-10 dB	No Observed Effect	No specific measures required
-9.9 dB to 0 dB	No Observed Adverse Effect	No specific measures required
	Lowest Observed Adverse Effect Level	
0.1 dB to 5 dB	Observed Adverse Effect	Mitigate and reduce to a minimum
	Significant Observed Adverse Effect Level	
5.1 dB to 10 dB	Significant Observed Adverse Effect	Avoid
≥10.1 dB	Unacceptable Adverse Effect	Prevent

* BS4142 states that "where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration". Therefore, the assessment levels and effect levels above are not definitive and can be modified due to context.

It should be noted that the numerical outcome only represents the initial estimate of impact, as stated in the first paragraph of Clause 11, and that contextual matters should be considered before determining what the potential impact is. This paragraph states:

> *The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context.*
>
> *Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level (see Clause 8) from the rating level (see Clause 9).*
>
> *NOTE 1 More than one assessment might be appropriate.*

The second part of Clause 11 sets out three contextual matters that should be taken into account once the initial numerical estimate has been determined. It is important to note that the three listed is not exhaustive and all pertinent factors should be considered.

5. Baseline Noise Monitoring

A baseline noise survey was completed by Resound Acoustics. they The measurements were undertaken between 15:00 hours on Friday 22nd and 11:00 hours on Thursday 28th September 2017 as part of other applications on the development site. The following summary is taken directly from the Resound Acoustics report Report Reference: RA00710 – Rep 1, dated 5th May 2021.

5.1. Monitoring Procedure

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 Mortison 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.

5.2. Survey Results

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.

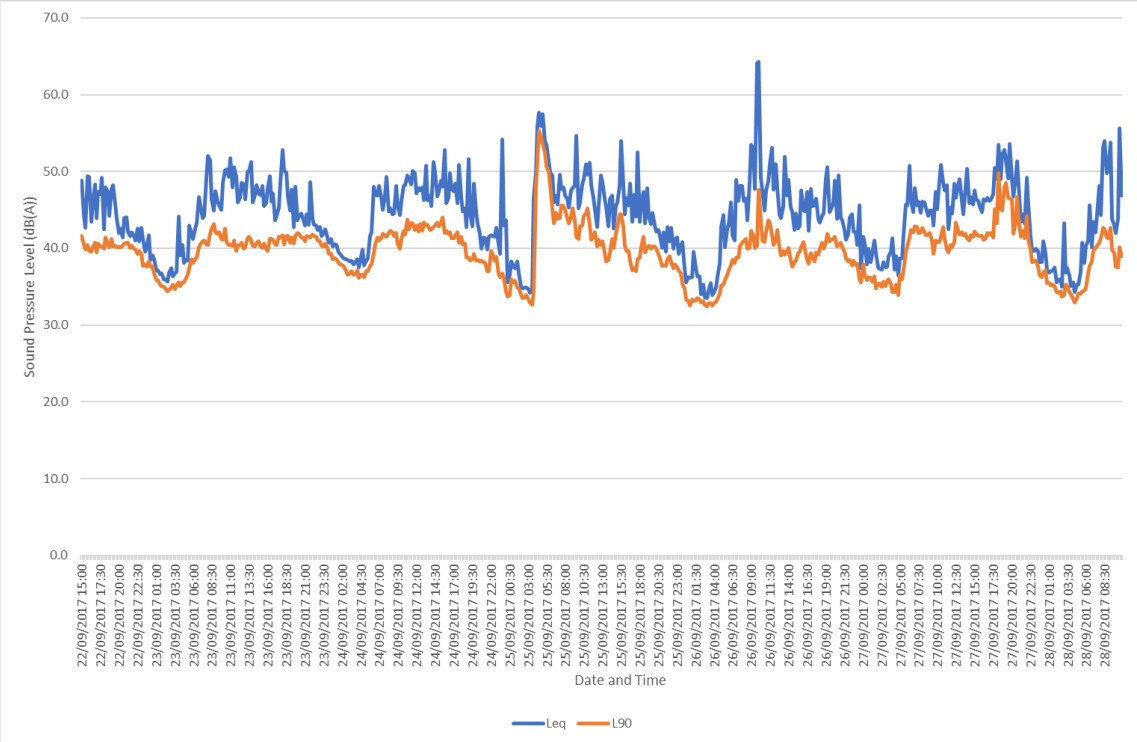
Table 4.1: Summary of measured sound levels at Position 1, free-field dB

Date	Period	Duration (hours)	$L_{Aeq,T}$	L_{A90} (1)	L_{A10} (1)	L_{AFmax}
Friday 22nd 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 23rd 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 24th 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 25th 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 26th 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 27th 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 28th 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.

A chart indicating the variation in noise levels is provided below, this has been generated directly from the Resound data, which they supplied to us:

Chart 1 – Variation in Noise Levels



5.3. Noise Levels over Extension of Hours

The currently permitted servicing hours at the site are 09:00 to 17:00 hours Monday to Friday. The client will be looking at extending these as far as feasible during the daytime hours only.

The following table provides the data analysis of the residual level ($L_{Aeq15min}$) and background sound level ($L_{A90(15min)}$) between 07:00-09:00 and 17:00-23:00 Monday to Friday, Saturday 07:00-23:00 and Sunday 07:00-23:00. We have discounted the data where periods of poor weather affected the results.

Table 3: Range in Noise Levels

Date and Time	$L_{Aeq(15min)}$		$L_{A90\ (15min)}$	
	Range	**Typical**	**Range**	**Modal**
Monday to Friday (07:00-09:00 & 17:00-23:00)	40-54	44	37-46	40
Saturday (07:00-23:00)	42-53	46	40-41	41
Sunday (07:00-23:00)	40-53	48	37-44	42

6. Delivery Noise Modelling

6.1. Summary of Delivery Operations

The vehicle will access the site from via the access road. All deliveries are to be via the delivery bay to the southern part of the site. The unloading of goods has the potential to affect the residential receivers around the site. We understand that the deliveries are contained to an articulated vehicle which includes a refrigerated section with condensing unit. The vehicle arrives on site and reverses up to the loading area. The engine is then turned off and the goods are moved from the trailer by tail-lift at the rear of the vehicle. The goods are mostly on pallets and an electric pallet truck is used. The operation takes about one hour. In most stores there are 2-3 deliveries a day.

6.2. Delivery Noise Monitoring

Acoustic Consultants Limited have measured the delivery operation from food stores over a number of years, at a number of different sites. We have found that the noise level of a delivery operation does not vary significantly from site to site as the process and site conditions are consistent. The measured noise levels of a typical delivery operation are as follows; these are free-field levels at a distance of 10 metres. The measured levels include reflections off the store building.

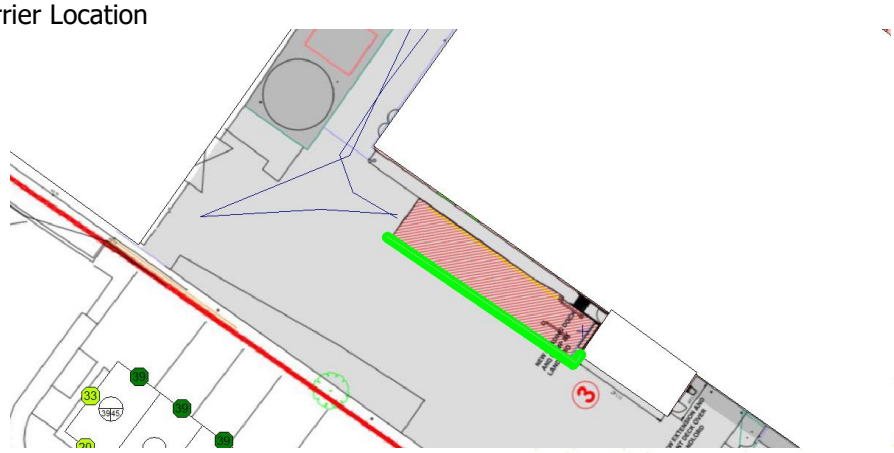
Table 4: Typical Delivery Operation Noise Emission

Duration, T (min)	$L_{Aeq(T)}$ (dB)	Activity at 10m
5	61	HGV Arrive
60	58	HGV unloading
2	63	HGV Depart

6.3. Delivery Noise Control Measures

To control delivery noise it is advised a 3m high barrier (mass at least 10 Kg/m^2) is installed along the length of the delivery bay. The barrier should be sealed with no gaps and is as shown here:

Figure 2: Barrier Location



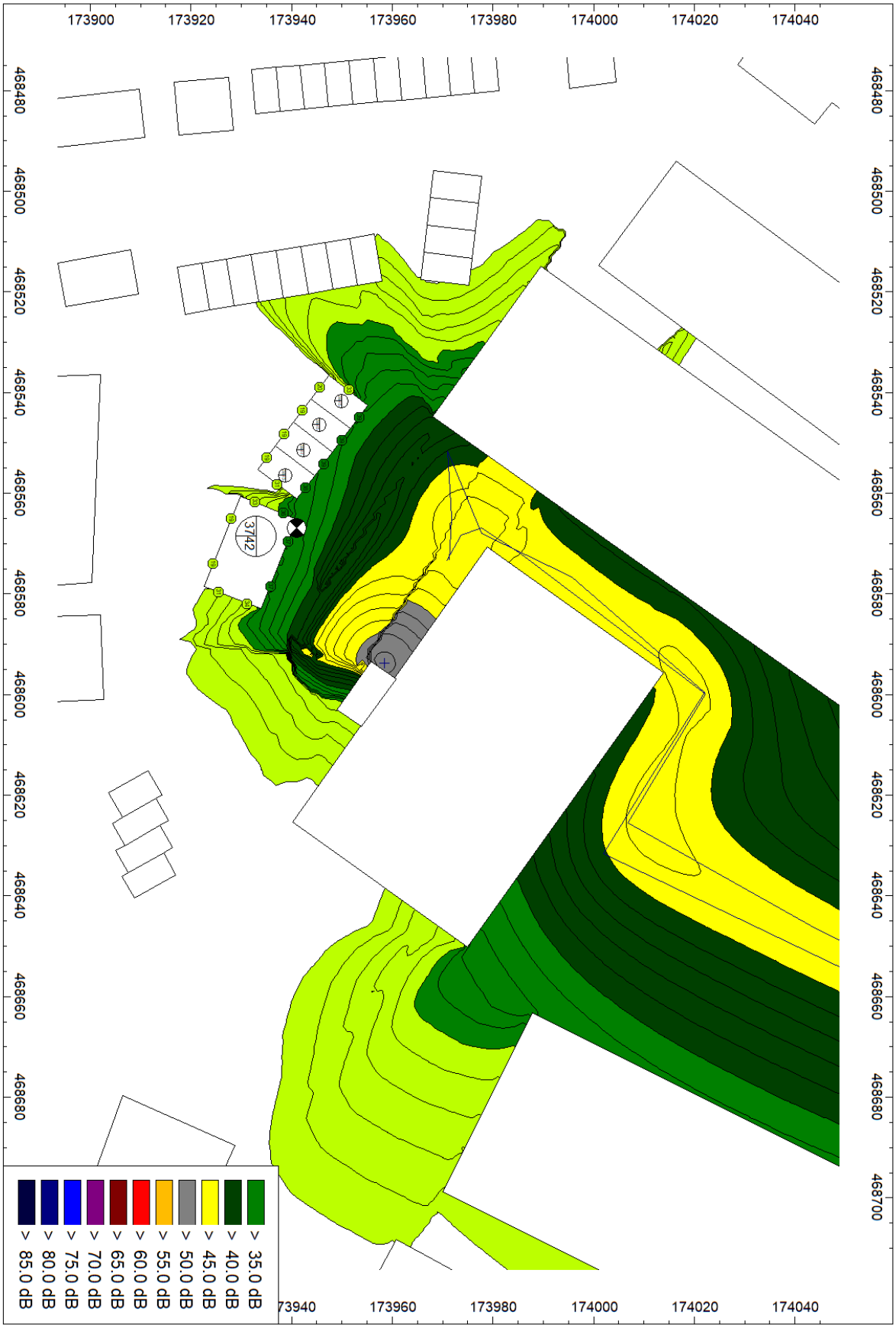
6.4. Noise Modelling

Noise emission predictions have been carried out for delivery noise. The delivery operation has been modelled in the noise modelling software Cadna:A by DataKustik. The parameters within the Cadna:A model are as follows and are considered reasonable assumptions:

- The store height and surrounding building are estimated using Google Maps
- The predicted noise map level is at a height of 1.5 metres
- The order of reflections is 3, and all buildings are considered reflective.
- The ground across the site and surrounding area is considered hard and reflective.
- The topography of the site is assumed to be flat. The dwellings are elvated over the site by approx. 6m.
- The predictions are based on the measured delivery noise emission levels noted above.
- The building evaluation levels shown at the façade of the NSR are the worst-case levels per façade.
- The assessment considers the worst-case 60-minute period (as required for a BS4142:2014 assessment). This assumes the arrival of the delivery vehicle, the unloading process and the departure of the vehicle within the 1-hour assessment period.

The following noise map display the predictions of noise propagation across the site due to the delivery operations.

Figure 3: Noise map of delivery activity ($L_{Aeq,T}$, 11m above retail site height, 4m at façade of dwelling)



7. Delivery Noise Assessment

7.1. Background Sound Level

The background sound levels are as noted in Table 3 above.

7.2. Specific Sound Level

The predicted specific sound level of the delivery operation (including vehicle movements and unloading) is as follows:

Table 5: Predicted Specific Sound Level, $L_{Aeq,T}$ (worst case receiver)

Location	Parameter	Daytime $L_{Aeq,1hour}$ dB
21-26 Morriston Close	Arrival/Departure	34
	Unloading	30
17 Morriston Close	Arrival/Departure	39
	Unloading	31

7.3. Character Corrections

Character corrections should be applied to the specific sound level if the noise source is expected to exhibit tonality, intermittency, impulsivity, or any other sound characteristic at the noise-sensitive receiver. The character corrections are as noted in Appendix 2.

7.4. British Standard 4142:2014 Initial Estimate

Therefore, the British Standard 4142:2014 initial estimate of impact is as follows at the worst case receivers.

The character corrections are applied to the cumulative specific sound level, this assumes all the delivery unloading and vehicle movements all occurring in the same one hour assessment period. It should be noted this is not always the case and most cases the arrival/departure will occur in a separate hour period, and therefore the cumulative rating level will on occasion be lower than noted below.

Table 6: Initial Estimate of Impact at 21-26 Morriston Close

Activity	Parameter	Monday to Friday	Saturday	Sunday
-	Background Level, $L_{A90,T}$	40 dB	41 dB	42 dB
Unloading	Specific Sound Level, $L_{Aeq,T}$	35 dB	35 dB	35 dB
	Character Correction	2 dB	1 dB	0
Arrival/departure	Specific Sound Level, $L_{Aeq,T}$	33 dB	33 dB	33 dB
Cumulative	Rating Sound Level, L_{Ar}	39 dB	38 dB	37 dB
Cumulative	Excess over background	-1 dB	-3 dB	-5 dB

Table 7: Initial Estimate of Impact at 17 Morriston Close

Activity	Parameter	Monday to Friday	Saturday	Sunday
-	Background Level, $L_{A90,T}$	40 dB	41 dB	42 dB
Unloading	Specific Sound Level, $L_{Aeq,T}$	31 dB	31 dB	31 dB
	Character Correction	0 dB	1 dB	0 dB
Arrival/departure	Specific Sound Level, $L_{Aeq,T}$	39 dB	39 dB	39 dB
Cumulative	Rating Sound Level, L_{Ar}	40 dB	40 dB	40 dB
Cumulative	Excess over background	0 dB	-1 dB	-2 dB

This indicates the proposed extension of hours would be of a low impact. In all instances, BS4142 states that the context of the site must be considered.

7.5. Context of Site

With regard to context British Standard 4142 states: "*where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration"*

7.5.1. Absolute Levels

> *"Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following. 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."*

With regard to 'absolute levels', the most relevant guidance is British Standard 8233:2014. Section 7.7.2 Table 4 of the British Standard provides internal ambient noise levels for dwellings from noise sources 'without a specific character' and are based on existing guidelines issued by the World Health Organisation in 1999. We would advise the rating level is considered to allow for the character of the source.

The guideline states that noise levels should not exceed 35 dB $L_{Aeq(16hr)}$ within living rooms during the daytime. The internal level is approximately 15 dB quieter than the external free-field level (as stated by the BS8233:2014 and WHO 1999) allowing for the attenuation of a partially open window. Therefore, based on the predicted rating levels noted above, the internal absolute levels are as follows.

Table 8: Comparison with British Standard 8233:2014 at Worst Case Receiver

Location	Predicted External Level $L_{Ar(T)}$ dB	Open Window Correction dB(A)	Predicted Internal Level $L_{Ar(T)}$ dB	Within Criteria
21-26 Morriston Close	39	-15	24	YES
17 Morriston Close	40	-15	25	YES

As can be seen from the table above, the internal rating sound levels are comfortably below the British Standard 8233:2014 criteria for daytime rooms.

7.5.2. Residual Noise

We should also consider the residual noise climate. British Standard 4142:2014 also states:

> *"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."*

We have compared the residual noise climate, i.e. the ambient sound at the assessment location when the specific sound source (deliveries) is suppressed to such a degree that it does not contribute to the ambient sound. This is summarised below:

Table 9: Comparison with Residual Noise Climate

Date and Time	$L_{Aeq(15min)}$		$L_{Ar(1hr)}$	
	Range	**Typical**	**21-26 Morriston Close**	**17 Morriston Close**
Monday to Friday (07:00-09:00 & 17:00-23:00)	40-54	44	39	40
Saturday (07:00-23:00)	42-53	46		
Sunday (07:00-23:00)	40-53	48		

As can be seen, the rating sound level (with character) is -1 dB to 0 dB lower than the lowest 15 minute residual sound. We would consider the noise source could be audible but it will not result in an incongruous sound by comparison to the baseline residual climate.

7.6. Summary of Assessment

Based on the above assessment, we would consider the noise impact of the proposed unloading and vehicle movements associated with deliveries to the food store to fall below the Lowest Observed Adverse Effect Level of the NPPG and NPSE over the extension of hours.

As such, the proposed extension of hours between 07:00-23:00 Monday-Sunday including Bank Holidays will be acceptable in terms of planning at the existing dwellings.

8. Summary & Conclusions

Acoustic Consultants Limited to undertake a noise impact assessment for the proposed food store at Reading Retail Park, Reading.

This report provides a noise assessment of the delivery operation on the nearby sensitive receivers around the site.

The noise impact assessment has been undertaken in accordance with the guidance in the National Planning Policy Framework (NPPF), Noise Policy Statement for England (NPSE), National Planning Practice Guidance (NPPG) and British Standard 4142:2014+A1:2019 (BS4142).

A Cadna:A computer noise model was built for the proposed delivery operation and the predicted levels compared to background noise level over the proposed extension of hours.

Mitigation has been provided in the form of daytime deliveries only and a barrier to the delivery bay.

A BS4142 assessment was undertaken which showed that with the mitigation there is no adverse impact when comparing the noise from deliveries over the proposed extension of delivery hours.

As such, it could be considered that the noise impact of the proposed deliveries to the food store over the proposed extension of hours falls within the Significant Observed Adverse Effect Level of the NPPG and NPSE and is acceptable in terms of planning at the existing dwellings.

9. Appendix 1 – Glossary of Acoustic Terminology

A-weighted sound pressure pA – value of overall sound pressure, measured in pascals (Pa), after the electrical signal derived from a microphone has been passed through an A-weighting network.

A-weighted sound pressure level, L_{pA} - quantity of A-weighted sound pressure given by the following formula in decibels (dBA)

$L_{pA} = 10 \log_{10} (p_A/p_0)^2$

where:

p_A is the A-weighted sound pressure in pascals (Pa);
p_0 is the reference sound pressure (20 µPa)

Background sound level, $L_{A90,T}$– A-weighted sound pressure level that is exceeded by the residual sound assessment location for 90% of a given time interval, T, measured using weighting F and quoted to the nearest whole number of decibels

Break-in - noise transmission into a structure from outside.

Decibel (dB) – The decibel is the unit used to quantify sound pressure levels. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro-Pascals to 100 Pascals). Therefore, a logarithmic scale is used to describe sound pressure levels and also sound intensity and power levels. The logarithms are taken to base 10. Hence an increase of 10 dB in sound pressure level is equivalent to an increase by a factor of 10 in the sound pressure level (measured in Pascals). Subjectively, this increase would correspond to a doubling of the perceived loudness of sound.

Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$ – value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, T = t2 – t1, has the same mean-squared sound pressure as a sound that varies with time, and is given by the following equation:

$$L_{AeqT} = 10\lg_{10}\left\{(1/T)\int_{t_1}^{t_2}[p_A(t)^2/p_0^2]dt\right\} \quad (1)$$

where:

p_0 is the reference sound pressure (20 µPa); and

$p_A(t)$ is the instantaneous A-weighted sound pressure (Pa) at time t

NOTE The equivalent continuous A-weighted sound pressure level is quoted to the nearest whole number of decibels.

Facade level – sound pressure level 1 m in front of the façade. Facade level measurements of L_{pA} are typically 1 dB to 3 dB higher than corresponding free-field measurements because of the reflection from the facade.

Free-field level – sound pressure level away from reflecting surfaces. Measurements made 1.2 m to 1.5 m above the ground and at least 3.5 m away from other reflecting surfaces are usually regarded as free-field. To minimize the effect of reflections the measuring position has to be at least 3.5 m to the side of the reflecting surface (i.e. not 3.5 m from the reflecting surface in the direction of the source).

Octave and Third Octave Bands – The human ear is sensitive to sound over a range of frequencies between approximately 20 Hz to 20 kHz and is generally more sensitive to medium and high frequencies than to low frequencies within the range. There are many methods of describing the frequency content of a noise. The most common methods split the frequency range into defined bands, in which the mid-frequency is used as the band descriptor and in the case of octave bands is double that of the band lower. For example, two adjacent octave bands are 250 Hz and 500 Hz. Third octave bands provide a fine resolution by dividing each octave band into three bands. For example, third octave bands would be 160 Hz, 250 Hz, 315 Hz for the same 250 Hz octave band.

Sound pressure level – Sound pressure level is stated on many of the charts. It is the amplitude of the acoustic pressure fluctuations in a sound wave, fundamentally measured in Pascals (Pa), typically from 20 micro-Pascals to 100 Pascals, but commonly simplified onto the decibel scale.

Sound reduction index, R – laboratory measure of the sound insulating properties of a material or building element in a stated frequency band.

Specific sound level, $L_s = L_{Aeq,Tr}$ – equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r.

Structure-borne noise – audible noise caused by the vibration of elements of a structure, the source of which is within a building or structure with common elements.

Rating level, $L_{Ar,Tr}$ – Specific sound level plus any adjustment for the characteristic features of the sound.

Reverberation Time, T – The reverberation time is defined as the time taken for a noise level in an enclosed space to decay by 60 dB from a steady level once the noise source has stopped. It is measured in seconds. Often a 60 dB decay cannot be measured so the reverberation time is measured over a lesser range and corrected back to the time for a 60 dB drop assuming a constant decay rate. Common parameters are T20 (time taken for a 20 dB decay multiplied by three) and T30 (time taken for a 30 dB decay multiplied by two).

Vibration Dose Value, VDV – measure of the total vibration experienced over a specified period of time.

Estimated Vibration Dose Value, eVDV – estimation of the total vibration experienced over a specified period of time. This is usually based on the number of events and shortened measurement data.

Weighted sound reduction index, R_w – Single-number quantity which characterizes the airborne sound insulating properties of a material or building element over a range of frequencies. The weighted sound reduction index is used to characterize the insulation of a material or product that has been measured in a laboratory (see BS EN ISO 717-1).

10. Appendix 2 – BS4142:2014 Character Corrections

10.1. Impulsivity Calculation

As follows below is summarised the impulsivity calculation to the worst-case receiver during the day and night, based on the methodology of Annex E in British Standard 4142:2014. Impulsivity of a delivery with dock is due to the unloading process. This is related to the maximum noise levels.

Figure 4: Emission of maximum noise events from unloading operation (L_{AFmax})

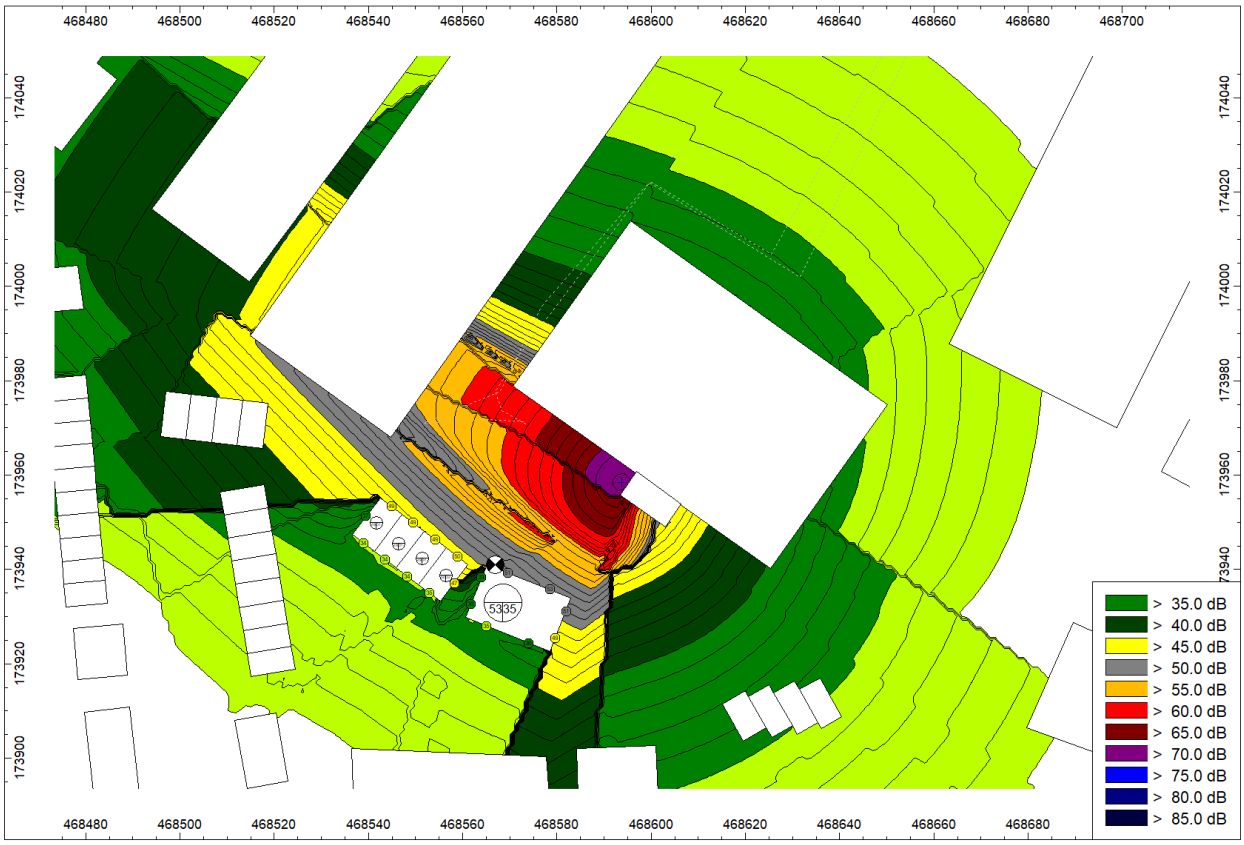


Figure 5: Determination of impulsivity correction for unloading operation at 21-26 Morriston Close

	Monday to Friday	Saturday	Sunday
Predicted LAFmax at NSR	53	53	53
Residual at NSR	44	46	48
Predicted Prominence P = 3Log(onset rate) + 2Log(level change)			
Onset Rate at NSR = (LAFmax - Residual)/Onset time	30	23	17
Level Change at NSR = LAFmax - Residual	9	7	5
Prominance	6	6	5
BS4142:2014+A1:2019 Impulsivity correction	**2**	**1**	**0**

Figure 6: Determination of impulsivity correction for unloading operation at 21-26 Morriston Close

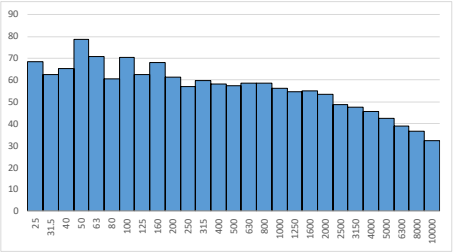
	Monday to Friday	Saturday	Sunday
Predicted LAFmax at NSR	49	53	49
Residual at NSR	44	46	48
Predicted Prominence P = 3Log(onset rate) + 2Log(level change)			
Onset Rate at NSR = (LAFmax - Residual)/Onset time	17	23	3
Level Change at NSR = LAFmax - Residual	5	7	1
Prominance	5	6	2
BS4142:2014+A1:2019 Impulsivity correction	**0**	**1**	**0**

10.2. Tonality

We do not consider a character correction is necessary for tonality. The BS4142 tonality calculation is below for the Diesel Fridge 10m at a RDC. The fridges would be the source of any significant tone from a refrigerated HGV. As can be seen there is no tonality present, and a character correction is not required.

Figure 7: Tonality Calculation

	Frequency (Hz)																										
	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
LZeq (dB)	68.3	62.5	65.2	78.5	70.6	60.4	70.5	62.5	68.1	61.4	57	59.9	58.3	57.3	58.7	58.6	56.3	54.6	54.9	53.4	48.8	47.4	45.4	42.4	39.1	36.4	32.2
Tonality?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



It should be noted on most deliveries the Diesel fridges do not normally operate when a HGV arrives as the ambient temperature of the trailer is sufficiently cooled at the RDC and on transport to the store.

10.3. Intermittency

We do not consider a character correction is necessary for intermittency as the delivery process is constant in nature.

10.4. Other Sound Characteristics

We do not consider a character correction is necessary for other sound characteristics.

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