

RESIDENTIAL DEVELOPMENT LAND SOUTH OF WHITE HORSE BUSINESS PARK, NORTH BRADLEY

Noise Impact Assessment

Prepared for: Castlewood Properties Ventures Ltd.

Client Ref: 115110

SLR Ref: 410.V11511.00001
Version No: 3
June 2023



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1.0 Introduction

SLR Consulting Ltd. (SLR) has been commissioned by Castlewood Properties Ventures Ltd. to undertake a noise impact assessment to support an outline planning application (reference 20/03641/OUT) for a proposed residential development of circa 70 dwellings (the 'Proposed Development') on land south of White Horse Business Park, North Bradley, Trowbridge (the 'Site').

This document has followed pre-application guidance with Wiltshire Council, with advice relating to the noise assessment as follows:

"The noise assessment should assess road traffic noise as well as any commercial/industrial noise from the businesses nearby. There has in the past been valid complaints about noise from elevated air handling plant on industrial units on the White Horse Business Park impacting on properties on Woodmarsh. The problem was resolved but these proposed dwellings are closer to the business park. Evidence must be provided to show noise from the business park will not have an adverse impact at residential dwellings."

Following the submission of an earlier revision of this report, a planning consultation response (reference WK/202010891) has been received from the Environmental Protection Team. The outcomes and conclusions are discussed later within this report.

This report has been prepared to assess the impact of environmental noises on the proposal, relevant to overarching national and local policy requirements relating to noise impacts and new residential development. This noise assessment has been completed with reference to:

- ProPG: Planning & Noise – *Professional Practice Guidance on Planning & Noise, New Residential Development* (2017).

Whilst reasonable effort has been made to make this report easily understandable, it is technical in nature. To assist the reader, a glossary of acoustic terminology has been included in **Appendix 01**.

2.0 Site Description

2.1 Development Site

The Site is located within North Bradley, Trowbridge, largely comprising residential, commercial and greenfield land uses, at the approximate National Grid Reference (NGR): x385900, y155500. The Site is bounded by:

- Green space and White Horse Business Park to the north.
- White Horse Business Park to the east, with green space located further afield.
- Residential properties to the south, with green space located further afield.
- Residential properties to the west.

The proposed Site boundary has been illustrated by the red line in Figure 2-1.

Figure 2-1
Site Location



2.2 Proposed Use of Site

The planning application seeks outline approval for a residential development comprising up to 70 dwellings as well as vehicular access from the A363 Bradley Road.

The proposed Planning Layout can be seen on the drawing provided in **Appendix 02**.

3.0 Scope and Guidance

3.1 Scope

SLR consulted with an Environmental Health Officer at Wiltshire Council in January 2021. The following methodology was agreed:

- This assessment will be completed with reference to the following relevant guidance document, which provide recommended external and internal noise level limits for new dwellings:
 - British Standard BS 8233:2014, *Guidance on sound insulation and noise reduction for buildings*;
 - ProPG: Planning & Noise – *Professional Practice Guidance on Planning & Noise, New Residential Development*; and
 - The ‘Agent of Change’ Principle from the National Planning Policy Framework.
- Road traffic is anticipated to be the dominant noise source at the site; however, it was also recognised at the time of writing that, due to the nationwide lockdown due to COVID-19, road traffic levels may be atypical at this time.
- Traffic count data for Woodmarsh and the A363 Bradley Road (available from the DfT Traffic Counts website) will therefore be used to predict noise levels across the proposed site using CadnaA noise modelling software. CadnaA uses the principal methodology set out in the Calculation of Road Traffic Noise 1988 to determine the $L_{A10,T}$ sound level. To allow the BS 8233:2014 assessment to be undertaken, the $L_{A10,18hr}$ noise levels will be converted to $L_{Aeq,T}$ using formulae as recommended within ‘*Method for Converting the UK Road Traffic Noise Index $L_{A1018hr}$ to the EU Noise Indices for Road Noise Mapping*’ (Defra 2006).
- Attended short term noise survey will be undertaken at northern and southern boundaries to establish L_{Amax} levels from road traffic.
- Calculated daytime $L_{Aeq,16hr}$ and night-time $L_{Aeq,8hr}$ and L_{Amax} sound levels will be assessed with reference to recommended internal and external criteria for new dwellings contained within BS 8233:2014 and ProPG. Further to this, Wiltshire Council advised that the desirable sound level of $L_{Aeq,T}$ 50 dB should be achieved within external amenity space.
- If assessment indicates that sound levels exceed the recommended criteria, then mitigation measures to achieve the recommended internal and external (amenity space) criteria will be identified and included within this noise assessment report.
- To determine the level of assessment required, a walkover of the site and surrounding commercial areas/buildings will be undertaken during the daytime and night-time to identify noise sources and determine whether they are audible at the proposed site. Survey and assessment would then be undertaken if necessary, with reference to BS 4142:2014 + A1:2019. If observations indicate that nearby commercial use is unlikely to lead to adverse impact, then in accordance with the ‘Agent of Change’ Principle (defined in the National Planning Policy Framework), the new development should not result in ‘*unreasonable restrictions*’ being placed on existing businesses and any proposed new development should include ‘*suitable mitigation*’. Recommendations to mitigate future noise by site design would be identified for inclusion in the masterplan as necessary.

3.2 Planning Consultation Response

The Environmental Protection team provided a planning consultation response (WK/202010891)¹ following amended plans submitted including a noise impact assessment report.

Regarding the commercial noise it was found that noise from the commercial uses was not audible at the site with the EHO stating *“have no evidence to contradict these findings at this time but will endeavour to visit the area at night to listen for myself.”*

Comments relating to the road traffic noise assessment included:

“For an edge of town/village location like this would expect the developer to aim for the sound levels recommended in BS8233 and by the World Health Organisation (WHO) to be achieved with windows open. An open window can provide between 10 and 15dB attenuation.”

Continuing on regarding open windows, comments received also say:

“It is recommended that the layout is revised and/or further boundary treatments are included so that 35dB $L_{Aeq16hrs}$ can be achieved in living rooms with windows open across the site.”

The consultation response is concluded by saying:

“Based on the evidence submitted regarding noise at this time I would have to recommend refusal. It is not acceptable for the whole development to have to have windows closed the majority of the time for suitable internal noise levels to be achieved.”

After reviewing the planning consultation response SLR and Vicky Brown, the EHO providing the comments discussed the next steps via a Teams call on 22 September 2022. During the call, regarding open windows, attention was drawn to NOTE 5 of ProPG Internal Noise Level Guidelines, for ease this note is replicated below.

“NOTE 5 Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the “open” position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7.”

This updated assessment seeks to address the issues raised following the consultation response.

Prior to the assessment the following sections summarise the policy, guidance documents, and standards that will be referred to in this Report.

3.3 Local Policy

The Wiltshire Core Strategy Development Plan Document was formally adopted on 20 January 2015. The plan provides a positive and flexible overarching planning policy framework for Wiltshire for the period up to 2026.

“Core Policy 51: Landscape

Development should protect, conserve and where possible enhance landscape character and must not have a harmful impact upon landscape character, while any negative impacts must be mitigated as far as possible through sensitive design and landscape measures.

[...]

¹ Dated 30th March 2021

In particular, proposals will need to demonstrate that the following aspects of landscape character have been conserved and where possible enhanced through sensitive design, landscape mitigation and enhancement measures:

[...]

vii. Tranquillity and the need to protect against intrusion from light pollution, noise, and motion.

[...]”

“Core Policy 57: Ensuring high quality design and place shaping

A high standard of design is required in all new developments

[...]

Applications for new development must be accompanied by appropriate information to demonstrate how the proposal will make a positive contribution to the character of Wiltshire through:

[...]

vii. having regard to the compatibility of adjoining buildings and uses, the impact on the amenities of existing occupants, and ensuring that appropriate levels of amenity are achievable within the development itself, including the consideration of privacy, overshadowing, vibration, and pollution (e.g. light intrusion, noise, smoke, fumes, effluent, waste or litter)

[...]”

3.4 National Planning Policy Framework

The National Planning Policy Framework (NPPF) was introduced by The Department for Communities and Local Government in March 2012, with the latest revision dated July 2021.

The NPPF defines the Government’s planning policies for England and sets out the framework, within which local authorities must prepare their local and neighbourhood plans, reflecting the needs and priorities of their communities. The Government’s stated purpose in producing the NPPF was to streamline policy, so the planning process is less restrictive, to give a more easily understood framework for delivering sustainable development.

Under the heading of conserving and enhancing the natural environment and Paragraph 174 e), one aim of the NPPF is *“preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of... noise pollution...”*.

Paragraph 185 requires planning policies and decision to ensure that new development is appropriate for its location. It stipulates a need to account for the likely effects of pollution on health and other matters, requiring the planning process to *“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”*.

The NPPF acknowledges that there is a host of existing sources of national and international guidance which can be used, in conjunction with the Framework, to inform the production of Local Plans and decision making.

3.4.1 Agent of Change Principle

The *Agent of Change* principle has been defined in recent revisions of the NPPF to explain that new development should not result in unreasonable restrictions being placed on existing and established businesses. The onus for mitigation for any new development has been required to lie with the developer, rather than the business.

Paragraph 187 of the NPPF has been noted to state:

“Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing

businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."

This principle has been deemed necessary to follow for the proposed residential development near to existing commercial sources. The guidance has provided that residential development should be suitably mitigated against commercial uses, to support the coexistence of noise-sensitive and noise-generating uses.

3.5 Noise Policy Statement for England

The *Noise Policy Statement for England* (NPSE) was published in March 2010. It sets out the long-term vision of government noise policy, which is fundamentally to: *"Promote good health and good quality of life through the effective management and control of noise within the context of Government policy on sustainable development"*. The vision is supported by three key aims:

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and reduce to a minimum, other adverse impacts on health; and
- Where possible, contribute to the improvement of health and quality of life.

The NPSE should apply to all forms of noise including environmental noise, neighbour noise and neighbourhood noise but does not apply to noise in the workplace. The NPSE has adopted the following concepts, to help consider whether noise is likely to have *"significant adverse"* or *"adverse"* effects on health and quality of life:

SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.

LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.

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.

"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... (Defra, 2010)."

3.6 National Planning Practice Guidance

Revised *Planning Practice Guidance* was released in March 2014 to support the NPPF and last updated in July 2019. The Guidance stipulates that Local Planning Authorities' plan making and decision making should 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.

The guidance has also provided the following noise exposure hierarchy table *"when noise could be a concern"*.

Table 3-1
Planning Practice Guidance Noise Exposure Hierarchy Table

Response	Example of Outcomes	Increasing Effect Level	Action
NOEL – No observed effect level			
Not present	No effect	NOEL	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 or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
LOAEL – Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, 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 sleep disturbance. Affects acoustic character of the area and creates a perceived change in quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
SOAEL – Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour and/or attitude, 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 and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

3.7 ProPG: Planning & Noise (2017)

ProPG: *Planning & Noise – Professional Practice Guidance on Planning & Noise, New Residential Development* was developed by a working group consisting of representatives from the Association of Noise Consultants (ANC), Institute of Acoustics (IOA), Chartered Institute of Environmental Health (CIEH) and practitioners from a planning and local authority background.

This guidance was made effective in May 2017 to provide a recommended approach to the management of noise within the planning system in England. It has drawn upon legislation, guidance and standards available at the time of publication to reflect the Noise Policy Statement for England (NPSE), the National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG-Noise) and other authoritative sources of guidance.

ProPG has been noted to advocate two sequential stages covering an 'initial noise risk assessment' at Stage 1 then a 'full assessment' at Stage 2 considering four key elements.

- Element 1 – Good acoustic design process.
- Element 2 – Internal noise level guidelines.
- Element 3 – External amenity area noise assessment.
- Element 4 – Assessment of other relevant issues.

The scope of ProPG considers new residential development that will be predominantly exposed to airborne noise from transportation sources. In cases where the site is exposed to noise of an industrial and/or commercial nature, this shall be considered at Stage 1 of the ProPG approach.

ProPG has provided a summary of internal noise level guidelines as part of Stage 2 assessment requirements. These guidelines values have been derived from British Standard BS 8233:2014 *Guidance on Sound Insulation and Noise Reduction for Buildings* and *The World Health Organisation Guidelines for Community Noise (1999)*.

Table 3-2
ProPG Internal Ambient Noise Levels, dB

Activity	Location	07:00 to 23:00 dB L _{Aeq} , 16 h	23:00 to 07:00 dB L _{Aeq} , 8 h
Resting	Living room	35	-
Dining	Dining room/area	40	-
Sleeping (daytime resting)	Bedroom	35	30 45 dB L _{Amax} (F) *
* Not normally exceeded more than 10 times per night.			

3.7.1 Acoustics Ventilation and Overheating Guide (2020)

The AVO Guide has been published for application by practitioners when following Stage 2 Element 1 of good acoustic design within ProPG. This extended guidance document has aimed to assist designers to adopt an integrated approach to the acoustic design within the context of the ventilation and thermal comfort requirements.

It has been acknowledged from the AVO guide that there is a need to address how the ventilation strategy and overheating mitigation impacts of the impacts on the acoustic conditions and whether a more-informed strategy is required in the mitigation of overheating.

3.8 BS 4142:2014 +A1:2019

The British Standard BS 4142:2014 +A1:2019 *Methods for Rating and Assessing Industrial and Commercial Sound* (BS 4142) notably describes methods for rating and assessing sound of an industrial or commercial nature. It has been referenced where required in policy and guidance documents to assess the potential impact of sound of an industrial and/or commercial nature, at existing and proposed noise-sensitive receptor locations within the context of the existing sound environment.

Certain acoustic features can increase the significance of impact from a comparison of the specific sound level to the background sound level where these features are likely to affect perception and response. Where such

features are present at the assessment location, a character correction (or penalty) to the specific sound level is made to obtain the rating level. This can be approached from subjective, objective and reference methods.

- **Tonality:** A correction of 0 dB to + 6 dB for sound ranging from not tonal to prominently tonal.
- **Impulsivity:** A correction of up to + 9 dB can be applied for sound that is impulsive.
- **Intermittency:** A penalty of + 3 dB can be applied if on/off conditions are readily distinctive within the reference time interval over the period of the greatest amount of on-time.
- **Other characteristics:** A penalty of + 3 dB can be applied in the absence of all other defined characteristics, where the specific sound contains a distinctive feature in the residual acoustic environment.
- The rating sound level is equal to the specific sound level if there are no acoustic features present or expected to be present.

The significance of sound depends upon both the margin by which the rating level exceeds the background sound level and the context in which the sound occurs. An initial estimate of the impact of the specific sound is made by subtracting the measured background sound level from the rating level.

- Typically, the greater the difference, the greater the magnitude of the impact;
- A difference of around + 10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around + 5 dB is likely to be an indication of an adverse impact, depending on the context; and
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. It is an indication that the specific sound source has a low impact, depending on the context.

BS 4142 has stipulated that context is important when assessing the impact of sound of a commercial and/or industrial nature. Amongst a range of advocated considerations, this can include mitigation, residual sound levels, location and absolute sound levels in the consideration of context.

The scope of BS 4142 recognises that human response to sound can be subjective as affected by many factors, both acoustic and non-acoustic. The significance of its impact can depend on various factors such as the exceedance to the background level, its absolute level, time of day and change in environment, as well as local attitudes to the source of sound and character of the neighbourhood.

4.0 Environmental Survey Summary

Road traffic is anticipated to be the dominant noise source at the site, however, it was also recognised at the time of undertaking the survey, due to the nationwide lockdown from to COVID-19, road traffic levels may be atypical at this time.

To determine L_{AFmax} sound levels at the Site, a short-term noise survey was undertaken on Friday 23rd April 2021. L_{AFmax} sound levels were measured at the following locations:

- Location 1 – at the western site boundary with Woodmarsh; and
- Location 2 – at the northern site boundary with Bradley Road.

4.1 Equipment

Sound pressure level measurements were carried out using the following equipment listed in Table 4-1, confirming to Class 1 acoustic accuracy for sound level meters and matched calibrators.

The sound level meter was calibrated before the measurements using the handheld acoustic calibrator and the calibration was checked upon completion of the survey. No significant drift was observed with calibration offsets of ≤ 0.2 dB. The calibration chain of equipment has been maintained as at least traceable to National Standards, no greater than one year for sound calibrators and two years for sound level meters.

Table 4-1
Sound Monitoring Equipment

Location	Description	Serial No.
Locations 1 and 2	Cirrus CR:171C Type 1 Sound Level Meter	G061698
	Cirrus CR:515 Acoustic Calibrator	59336

4.2 Locations

At each survey location, the sound level meter microphone was placed 1.5 m above local ground level in free-field conditions, i.e. at least 3.5 m from the nearest vertical reflecting surface. The above-listed monitoring locations have been highlighted on Figure 4-1 below.

Figure 4-1
Monitoring Locations



4.3 Weather

Weather conditions were conducive for noise monitoring, being dry with wind speeds below 5 m/s during the survey period.

4.4 Soundscape and Context

Observations on the prevailing acoustic climate were made during site walkover during the daytime site visit to undertake the short-term survey. During site walkover, the surveyor noted that the dominant noise source at all locations was road traffic, with other sources including birdsong, high altitude aircraft and mowing from nearby playing fields.

A site visit was also undertaken during the night-time period of the 22nd April 2021, from approximately 23:00 to 00:00, to observe whether sound from nearby commercial/industrial premises (business parks to the north and north-east) was audible at the nearest site boundary locations. It was considered that, due to reduced traffic flows, this time period would be appropriate to undertake a critical listening exercise, with minimal influence of road traffic.

The surveyor noted that sound from distant road traffic dominated along the northern boundary, and that any commercial sound was imperceptible.

4.5 Baseline Survey Results

A full survey results time history graph has been provided within **Appendix 03** of this report. Summaries for the purposes of assessment have been presented within Table 4-2.

Table 4-2
Derived Free-Field L_{AFmax} Sound Levels, dB

Measurement Details			$L_{Amax(F)}$ *	
Location	Period	Time	Range	10 th Highest
1	Day	10:56 - 11:33	72 - 87	82
2	Day	10:17 - 10:48	83 - 88	86

In order to present a robust assessment, the daytime L_{Amax} levels will be used as representative of night-time levels given that transportation noise is the likely cause of the maximum levels.

5.0 Agent of Change Assessment

In accordance with the 'Agent of Change' Principle the new development should not result in 'unreasonable restrictions' being placed on existing businesses and any proposed new development should include 'suitable mitigation'.

As detailed above, on-site observations were that sound from road traffic sources was dominant at the site, and that nearby sound from commercial use was imperceptible. It is therefore considered that a detailed BS 4142:2014 + A1:2019 assessment is not required.

The detail in this section has been formulated further to relevant observations in Section 4.4, that commercial operations were not witnessed to be readily audible, influential and/or discernible at any location across the Site. Such observation has not excluded the reality that minor commercial activities would occur. However no obvious commercial activity, such as plant, have been deemed influential for further assessment.

It is considered that a detailed BS 4142:2014 + A1:2019 assessment is not required. It is therefore considered that the proposed development would not result in 'unreasonable restrictions' being placed on existing businesses, and that no further, more detailed assessment is required.

Notwithstanding this, in accordance with the 'Agent of Change' Principle (defined within the National Planning Policy Framework), the new development should not result in 'unreasonable restrictions' being placed on existing businesses, and any proposed new development should include 'suitable mitigation'. Example mitigation measures are included within ProPG and include:

- Maximising the spatial separation of noise source(s) and receptor(s).
 - This has been followed by locating the dwellings at least 150 m from both commercial premises to the north and north east. The dwellings are also positioned approximately 50 m away from the nearest side of the A363 Bradley Road and approximately 100 m from Woodmarsh
- Investigating the necessity and feasibility of reducing existing noise levels and relocating existing sources.
- Using existing topography and existing structures (that are likely to last the expected life of the noise-sensitive scheme) to screen the Proposed Development site from significant sources of noise.
- Incorporating noise barriers as part of the scheme to screen the Proposed Development site from significant sources of noise.
- Using the layout of the scheme to reduce noise propagation across the site.
 - A design element which has been utilised with a dwelling and garage combination being used around the development providing screening and noise protection to the properties within the middle of the development.
- Using the orientation of buildings to reduce the noise exposure of noise sensitive rooms.
- Using the building envelope to mitigate noise to acceptable levels.
 - All the dwellings closest to the A363 and Woodmarsh have been orientated so that the dwelling itself acts as a barrier to the rear gardens.

6.0 ProPG Assessment

The assessment method of ProPG has been applied to the development to understand the risks and design requirements to mitigate the proposal from environmental noise sources.

6.1 Road Traffic Noise Model

A model of the development building has been provided to review the extent of road traffic noise exposure, following the Calculation of Road Traffic Noise (CRTN, 1988) and using CadnaA. Model inputs include Woodmarsh and Bradley Road, traffic flow data, the proposed layout and topographical data.

The following road links have been included within the model:

- Woodmarsh: $L_{Aeq,T}$ sound levels have been predicted using traffic flow data. Night-time L_{Amax} sound levels have been calculated using noise survey data; and
- A363 Bradley Road: $L_{Aeq,T}$ sound levels have been predicted using traffic flow data. Night-time L_{Amax} sound levels have been calculated using noise survey data.

For assessment purposes, the modelled $L_{A10,18hr}$ sound levels have been converted to $L_{Aeq,T}$ (the equivalent continuous sound level) using the formulae presented in Table 6-1, as recommended in the 'Method for Converting the UK Road Traffic Noise Index $L_{A10,18hr}$ to the EU Noise Indices for Road Noise Mapping' (2006).

Table 6-1
 $L_{A10,18hr}$ Conversion Calculations

Time period	Non-motorway conversion	Motorway conversion
07:00 – 21:00	$L_{day} = 0.95 \times L_{A10,18hr} + 1.44$	$L_{day} = 0.98 \times L_{A10,18hr} + 0.09$
21:00 – 23:00	$L_{evening} = 0.97 \times L_{A10,18hr} - 2.87$	$L_{evening} = 0.89 \times L_{A10,18hr} + 5.08$
23:00 – 07:00	$L_{night} = 0.90 \times L_{A10,18hr} - 3.77$	$L_{night} = 0.87 \times L_{A10,18hr} + 4.24$
07:00 – 23:00	$L_{Aeq,16hr} = 10 \log_{10} ((12 \times (10^{L_{day}/10}) + 4 \times (10^{L_{evening}/10})) / 16)$	

For this assessment, the non-motorway conversion calculations have been applied. 18-hour Annual Average Weekly Traffic (AAWT) traffic data (in accordance with procedures contained within the CRTN) inputs to the noise model are shown in Table 6-2 below. To provide a robust scenario, 'With development' traffic flows provided by the Transport consultant for the project have been included.

Table 6-2
Traffic Data

Road	18hr AAWT Future Year with Development	% HGV	Speed Km/hr ²	Road Type
Woodmarsh	16698	4%	50kph	Impervious bituminous
Bradley Road (west of site access)	15766	2%	50kph	
Bradley Road (east of site access)	14007	2%	50kph	

The spread of environmental noise levels shown as the highest per façade from the development are presented in Figure 6-1 and Figure 6-2.

Figure 6-1
Prediction of Daytime Road Traffic Noise Levels – Highest Value Per Façade – dB L_{Aeq,T}



² Average traffic speed data should be used but in its absence these road speed limits have been assumed. The road speed has then been determined with reference to the Traffic Speed Table in CRTN.

Figure 6-2
Prediction of Night-time Road Traffic Noise Levels – Highest Value Per Façade – dB LAeq, T



It has been highlighted in Figure 6-1 and Figure 6-2 that greatest road traffic noise levels would be seen along the north and north western façades of the development. The impact of this source has posed slightly greater concern at night when compared to those established during the day (as illustrated through the orange areas in Figure 6-2).

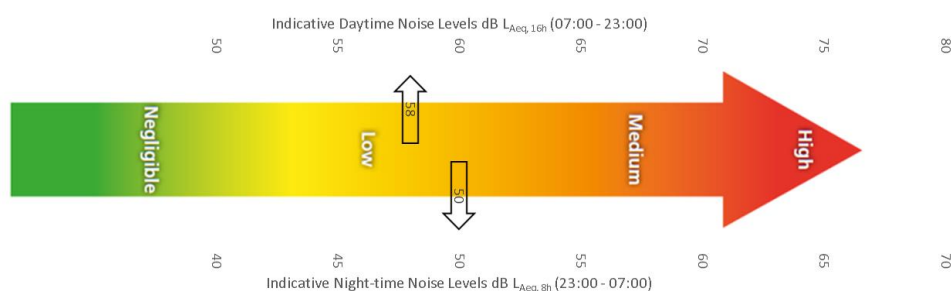
6.2 Stage 1 – Initial Risk Assessment

The environmental survey provided in Section 4.0 of this report, in addition to the modelling of road traffic across the site in Figure 6-1 and Figure 6-2, has described the following period sound pressure levels that have been used for an Initial Site Risk assessment according to Stage 1 of ProPG.

Table 6-3
Summary Assessment of External Noise Levels, dB

Location	Period	Hours	Indicative Noise Level
Northern boundary	Daytime	07:00 – 23:00	58 dB LAeq, 16 h
	Night-Time	23:00 – 07:00	50 dB LAeq, 8 h 73 dB LAmax(F)
Centre of development	Daytime	07:00 – 23:00	45 dB LAeq, 16 h
	Night-Time	23:00 – 07:00	38 dB LAeq, 8 h 62 dB LAmax(F)

Figure 6-3
ProPG Indicative Risk Assessment



The dominant sound source across the site was noted from transportation sources. Commercial activities have not been observed and are not considered dominant in the case of the adjacent business park.

The Initial Site Noise Risk Assessment has been categorised in the worst-case of ‘medium risk’ on future occupants of the new noise sensitive development. Where a medium noise risk has been noted, the pre-planning application advice stated in ProPG has been provided as follows:

“As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS [Acoustic Design Statement] which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development.”

Generally, across the site the Initial Site Noise Risk Assessment would be of ‘low risk’ on future occupants of the new noise sensitive development. Where a low noise risk has been noted, the pre-planning application advice stated in ProPG has been provided as follows:

“At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.”

6.3 Stage 2 – Full Assessment

6.3.1 Good Acoustic Design Process

ProPG has stated it is imperative for acoustic design to be considered at an early stage of the development control process, as to avoid unreasonable acoustic conditions and prevent those which are unacceptable.

The proposed development land has been notably fixed within its urban setting, where it has not been considered possible to move proposed receptors away from the incident noise source, or visa-versa. Given the dominant source as road traffic providing the range of sound levels across the developing land space, there has been considered minimal acoustic benefit in moving residential rooms of the proposal.

The plan layouts of each dwelling type have not been reviewed in this assessment. It has been acknowledged that 'good acoustic design' generally requires facing less-sensitive rooms (i.e. kitchens and bathrooms) towards the dominant incident noise sources.

A review of application plans has provided the orientation of the building with a rear amenity space, using the intervening residential building as a physical barrier between transportation noise source and external area.

It has been understood that the dwellings are to be formed by traditional brick construction along with an insulated and warm roof. The sound insulation of these components has been deemed less consequential to resulting internal ambient noise levels, where the acoustic performance of glazing and ventilation elements will typically remain as dictating.

6.3.2 Internal Noise Level Guidelines

ProPG has provided a summary of internal noise level guidelines as part of Stage 2 assessment that have been replicated in Table 3-2 of this assessment. The method adopted to achieve suitable internal noise level guidelines has been based upon information contained within the recent ANC publication, The AVO Guide. This has provided an approach as to how the competing aspects of thermal and acoustic comfort can be managed and has been written to reflect the requirements of ProPG and overarching planning requirements.

Given the initial and worst-case site risk assessment as medium risk, it has been considered commensurate to judge suitable façade components in terms of glazing and ventilation components.

The range of whole dwelling ventilation strategies for development has been taken from The Building Regulations 2010 Approved Document F (2013, as amended) Means of Ventilation (ADF). An outline appraisal for suitability has been provided using Table B2 of the AVO Guide.

Table 6-4
Outline Appraisal of Different Ventilation Strategies – North and North West Boundary

Ventilation strategy according to ADF	Typical windows and vent	Higher acoustic performance windows and vent
System 1: Intermittent extract fans	✗	✓
System 2: Passive stack ventilation	✗	✓
System 3: Continuous mechanical extract (MEV)	✓	✓
System 4: Continuous mechanical supply and extract with heat recovery (MVHR)	✓	✓

Table 6-5
Outline Appraisal of Different Ventilation Strategies – All Other Elevations

Ventilation strategy according to ADF	Typical windows and vent	Higher acoustic performance windows and vent
System 1: Intermittent extract fans	✓	✓
System 2: Passive stack ventilation	✓	✓
System 3: Continuous mechanical extract (MEV)	✓	✓
System 4: Continuous mechanical supply and extract with heat recovery (MVHR)	✓	✓

It should be read from Table 6-4 that the means to appraise noise levels along the northern and north western boundary at the site would require any System (1 to 4) ventilation scheme with higher performance windows for a System 1 or 2 approach. For the remaining elevations, any System (1 to 4) with typical windows would be appropriate.

It should be considered as part of good acoustic design that minimising the quantity of penetrations through a building façade should be favoured in high noise level areas. Therefore, where suitable, a System 3 ventilation strategy has been outwardly considered more favourable than System 1 or 2 design. Furthermore, if using a System 4 MVHR approach, the ventilation routes should face away from the incident noise source as far as possible, to reduce noise travelling into the habitable room via the ductwork. Where this is not possible the intake and exhaust ducts should incorporate appropriate attenuation to control intrusive noise to meet the criteria in Table 3-2.

The following specifications have been based on calculations to the detailed method in section G2.1 of BS 8233 (equivalent to the method in BS EN 12354-3).

An adaptation term has been provided for all specifications following the method ISO 717-1:2020. This has included a comparison between the normalised, A-weighted sound spectrum for day and night against the adaptation curves for C_{tr} .

Table 6-6
Minimum Specifications for Windows and Ventilators

Building Element and Location	Specification	Metric	Typical Configuration
Site Specification (All other façades)	≥ 31	dB $R_w + C_{tr}$	Double glazing 4-14-6 standard glass types
	≥ 27	dB $D_{ne, w} + C_{tr}$	Acoustic window trickle vent as rated*
*Only one ventilator accounted per habitable room, assuming System 3 approach. If more than one ventilator is used as per System 1 or System 2 then the specification will increase by a factor $10 \times \log_{10}(n)$, where n = ventilator quantity.			

6.3.3 Overheating Risk

The AVO Guide has been published for application by practitioners when following Stage 2 Element 1 of good acoustic design within ProPG. This extended guidance document has aimed to assist designers to adopt an integrated approach to the acoustic design within the context of the ventilation and thermal comfort requirements.

It has been acknowledged from the AVO guide that there is a need to address how the ventilation strategy and overheating mitigation impacts the acoustic conditions and whether a more-informed strategy is required in the mitigation of overheating.

The advice in this section has so far considered the internal ambient noise level with closed windows under Building Regulations ventilation conditions. The AVO guide has informed that acoustic assessments should also be formed for the overheating ventilation condition, which in the first instance has been considered with open windows.

A simplistic insertion loss of 13 dB has been initially considered from external free field to internal reverberant levels through an open window. It has been acknowledged that acoustic losses for a fully open window may be much less and in the region of 4 – 9 dB depending on the Risk Location. The following summary of Table 6-7 has been provided as an initial consideration of the worst-affected façades with both closed and open windows. This follows the Simplified Method for a Moderate Risk Location as per Section 4 of the following Guide .

The advice in this section has considered the internal ambient noise level with closed windows under Building Regulations ventilation conditions. The AVO guide has informed that acoustic assessments should also be formed for the overheating ventilation condition, which in the first instance has been considered with open windows.

With an advocated and simplistic insertion loss of 13 dB from external to internal areas through an open window, the following summary has been provided for the worst-affected façade with both closed and open windows.

Table 6-7
Estimated IANLs from Different Ventilation Conditions

Level 1 Risk Assessment following the AVO Guide			Internal Ambient Noise Levels (IANLs)		
Location	Windows	Condition	Day dB $L_{Aeq, 16h}$	Night dB $L_{Aeq, 8h}$	Max dB $L_{Amax(F)}$
North	Windows closed and ventilators open	Building ventilation	27	19	42
	Windows partially open	Overheating ventilation	45	37	60

Level 1 Risk Assessment following the AVO Guide			Internal Ambient Noise Levels (IANLs)		
Location	Windows	Condition	Day dB L _{Aeq, 16h}	Night dB L _{Aeq, 8h}	Max dB L _{Amax(F)}
	Windows fully open		49	41	64
Mid-point	Windows closed and ventilators open	Building ventilation	14	< 10	31
	Windows partially open	Overheating ventilation	32	25	49
	Windows fully open		36	29	53

In case of closed windows, building ventilation conditions have been shown to provide suitable internal ambient noise levels following ProPG and AVO, given that predicted values in Table 6-7 do not exceed those in Table 3-2.

In the case of partially open windows, the above listed sound levels in the majority of the site have been noted to meet recent noise levels requirements of Building Regulations Approved Document O: Overheating³ of ≤ 40 dB L_{Aeq,T} and 55 dB L_{Amax(F)} at night (23:00 – 07:00) in all areas of the Site. The slight exceedance is seen at the northern façade dwellings meeting the night-time max criteria.

For fully open windows, internal ambient noise levels could remain in compliance, except again for the dwellings nearest to the A363 Bradley Road where external noise levels are highest. For the perimeter plots along the north boundary, opening windows fully in the direction of the A363 has been viewed to present an unsuitable overheating design strategy due to external noise ingress. This exceedance has been limited to northern facing bedrooms along the perimeter, where an external free field to internal reverberant level difference of at least 14 dB would provide compliance. Notwithstanding, these plots would remain able to fully open front facing windows as to allow cross-ventilation during an overheating condition given that incident environmental noise would be expectedly less on front facing façades.

Table B-5 of the AVO Guide has indicated that passive ventilation approaches could remain possible to adopt for the entire development, with passive attenuated ventilation commensurate for housing facing the A363 Bradley Road, if providing at least 14 dB attenuation from external to internal areas. Attenuated louvres, vents, or plenum windows have defined possible design solutions to overcome external noise ingress during an overheating condition in these areas. A recent opinion paper⁴ has highlighted successful applications of such passive attenuated approaches in residential design.

Note the presumption of suitability for natural or passive ventilation (where identified) should also be read and considered in conjunction with any Air Quality assessment. Should this be considered an issue due to poor air quality, this issue may take precedence and alternative, filtered and tempered mechanical ventilation such as MVHR may need to be considered by the developer despite acoustic suitability for passive ventilation methods. The Air Quality assessment should also therefore be consulted on suitability of passive ventilation proposals suggested.

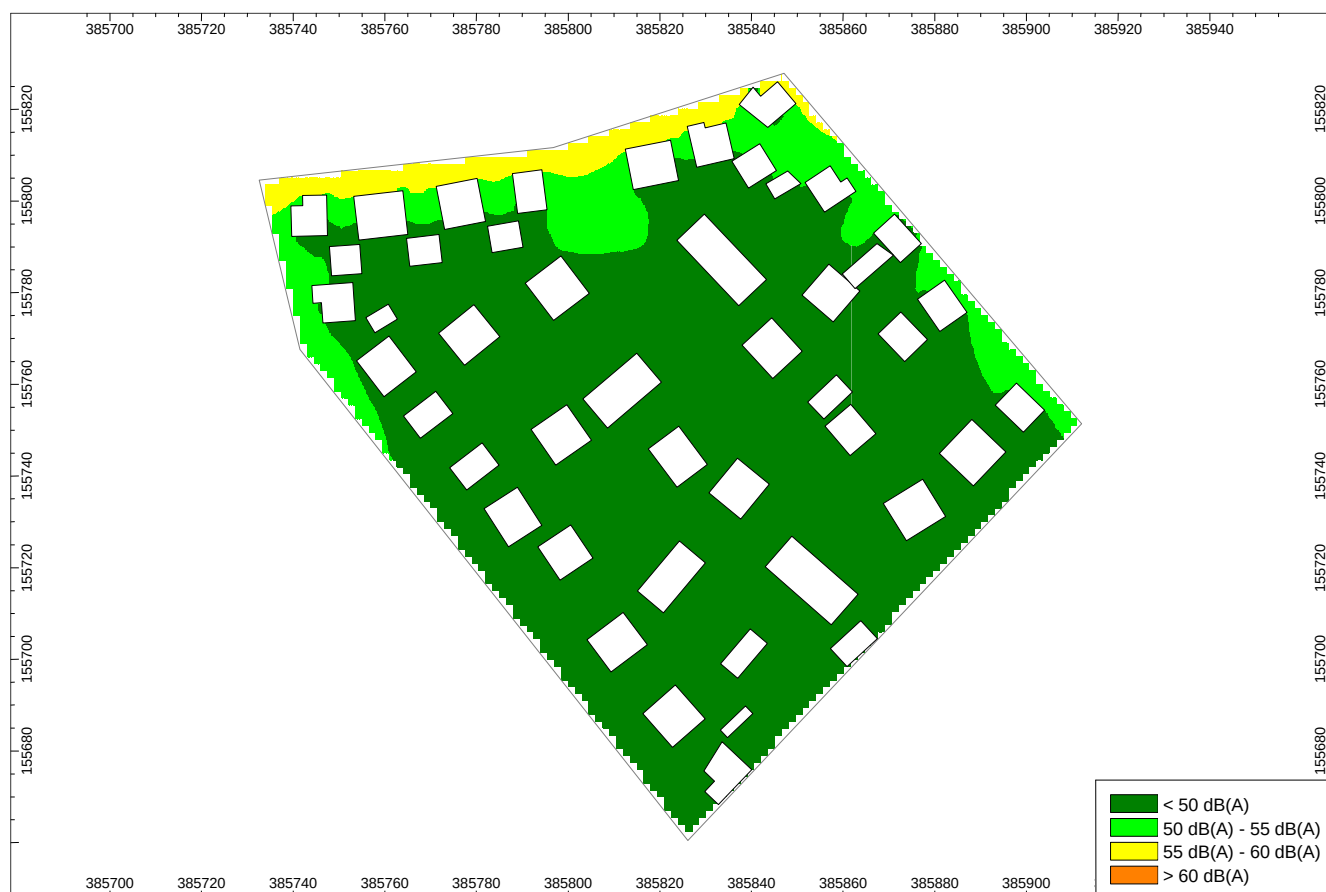
³ The Building Regulations 2010 Require O1: Overheating mitigation, 2021 Edition. As applicable to a building notice or full planning application submitted after 15th June 2022.

⁴ Conlan, N and Harvie-Clark, J. Methods of controlling noise levels and overheating in residential buildings. Presented at 24th international congress on sound and vibration (ICSV24), July 2017.

6.3.4 External Noise Level Guidelines

An amenity area has been proposed at the rear of the dwellings. Modelling of the development in Figure 6-4 below has provided that useful screening loss will occur from the development buildings as to provide them within ProPG guidance of 50-55 dB $L_{Aeq, 16h}$ to provide suitably protected, quiet and tranquil outdoor space within this development.

Figure 6-4
External Amenity Areas – Daytime dB $L_{Aeq, 16h}$



7.0 Conclusion

SLR Consulting Ltd. has been commissioned by Castlewood Properties Ventures Ltd. to undertake a noise impact assessment to support an outline planning application for a proposed residential development on land south of White Horse Business Park, North Bradley, Trowbridge.

Commercial noise and activity from the business parks to the north have not been readily observed at the development site.

Stage 1 assessment in accordance with ProPG has provided that the site is influenced by road traffic noise, being most significant on aspects facing north and northwest. The initial site noise risk assessment has been categorised at low to medium risk on the future occupants of the new noise sensitive development.

Stage 2 assessment in accordance with ProPG has reviewed a good acoustic design process, internal ambient noise levels, external amenity areas and other matters. Commensurate design specifications have been established considering current industry guidance. It has been realised that suitable internal and external amenity standards can be achieved by the scheme.

On the basis that design guidance within this report has been adopted, it follows that any significant adverse noise impacts will be avoided in the finished development as to accord with overarching national and local planning requirements for new residential development.

A recommendation is made to the decision maker to grant the proposed residential development and where necessary to include a condition to ensure a commensurate scheme of noise control as outlined within this report.

APPENDIX 01

Glossary of Terminology

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

Table 01-01
Sound Levels Commonly Found in the Environment

Sound Level	Location
0 dB(A)	Threshold of hearing
20 to 30 dB(A)	Quiet bedroom at night
30 to 40 dB(A)	Living room during the day
40 to 50 dB(A)	Typical office
50 to 60 dB(A)	Inside a car
60 to 70 dB(A)	Typical high street
70 to 90 dB(A)	Inside factory
100 to 110 dB(A)	Burglar alarm at 1 m away
110 to 130 dB(A)	Jet aircraft on take off
140 dB(A)	Threshold of Pain

Acoustic Terminology

dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (of 20 μ Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq, T}$	$L_{Aeq, T}$ is defined as the notional steady sound level which, over a stated period T, would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.
$L_{A10, T}$ & L_{A90}	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time and as such can be

regarded as the 'average maximum level'. Similarly, L_{90} is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L_{10} index to describe traffic noise.

$L_{Amax(F)}$

$L_{Amax(F)}$ is the maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, 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.

APPENDIX 02

Drawings



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Beds		%
1	8	11
2	27	39
3	29	41
4	6	9
	70	

CLIENT
Castlewood Properties Limited

PROJECT
Land off the A363 White Horse Business Park

DRAWING
Sketch Proving Layout - Mix

PROJECT NUMBER
CASR3002

DRAWING NUMBER 4101 **CHECKED BY** CD

REVISION D **STATUS** Draft

DATE 15/05/2023 **SCALE** 1:2000 @ A3

emapsite™

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APPENDIX 03

Survey Results

Figure 03-01 Location 1

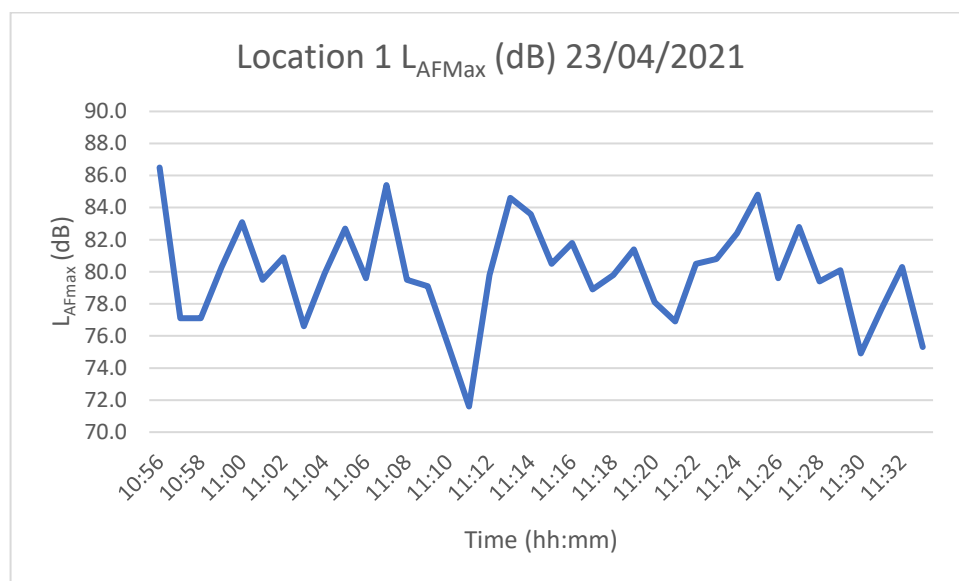
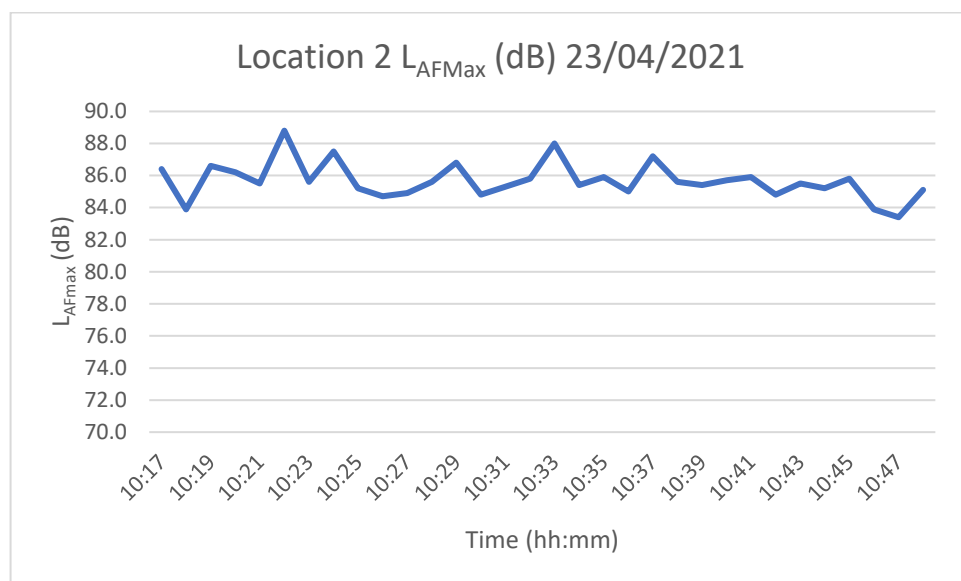


Figure 03-02 Location 2



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