BRISLINGTON MEADOWS BRISLINGTON MEADOWS BRISLINGTON MEADOWS BRISLINGTON

# Noise Impact Assessment

Homes England

Report for:

# CampbellReith

Brislington Meadows, Bristol

*Noise Assessment*

**Status: Final** **Date: 21.03.2022**

| | |
|---|---|
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# CONTENTS



# LIST OF TABLES




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# LIST OF FIGURES



# LIST OF APPENDICES




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# 1. INTRODUCTION

## 1.1. Background

ACCON UK Limited (ACCON) has been commissioned by CampbellReith on behalf of Homes England to carry out a noise assessment to support an outline planning application (all matters reserved apart from access) for residential development at Brislington Meadows, Bristol.

**The 'proposed development' comprises development of up to 260 dwellings with pedestrian, cycle and vehicular access, cycle and car parking, public open space and associated infrastructure. All matters except access are reserved.**

The Applicant is committed to delivering affordable housing in line with policy requirements and will deliver a 10% net gain in biodiversity through on-site and off-site measures.

A series of Parameter Plans have been prepared which define the proposed extents of development across the Site. An Illustrative Masterplan has also been prepared which shows one way in which the development could come forward within the parameters identified.

## 1.2. Site Description

The proposed development site is located within the administrative boundary of Bristol City Council (BCC).

The Site is located in Brislington in the southeast of Bristol within the administrative boundary of Bristol City Council and the Ward of Brislington East.

The Site comprises an irregular shaped parcel of land (9.6 hectares) known as Brislington Meadows, as shown on Drawing: 7456_037 (Site Location Plan).

To the northeast, the Site is bound by Broomhill Road and residential properties in Condover Road. To the north the Site is bound by residential dwellings on Belroyal Avenue and an associated rear access lane, Broomhill Junior School and Mama Bear's Day Nursery, and residences accessed off Allison Road. To the east the site is bound by Bonville Road and the protected employment area comprising the Bonville Trading Estate. To the west of the site is School Road and allotments. To the south lie Victory Park and paddocks which comprise protected open space and a Site of Nature Conservation Interest.

The Site currently comprises open fields crossed by two public rights of way and a network of informal trodden paths. The Site is not subject to specific environmental or landscape designations and has an allocation for housing development in the Council's Local Plan.

The Site is characterised by a steeply sloping topography from the northern boundary down to the southern boundary, with the gradient reducing towards the east. There are overhead electricity cables and a pylon on the lower slopes towards the southern boundary of the Site. A telecommunications mast towards the northeast of the Site will be relocated following the grant of planning consent for the proposed development.

The Site is well located to make use of existing services and facilities. Broomhill Infant School, Broomhill Junior School and Mama Bear's Day Nursery are all located adjacent to the Site's


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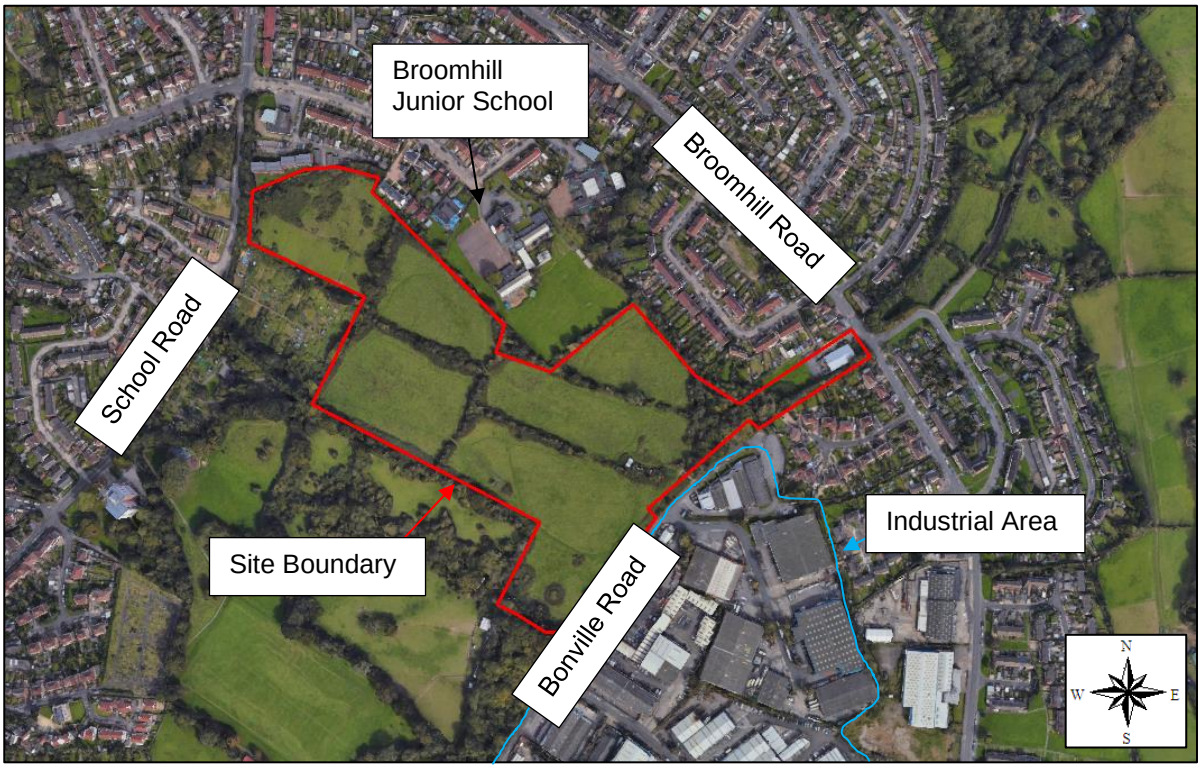
northern boundary. Broomhill local centre, including a small convenience store, public house, salons and takeaway shops, is located approximately 200m north of the Site.

There is no public vehicular access into the Site at present. There are two public rights of way across the Site, one running east-west along the southern boundary connecting Bonville Road and School Road, and one north-south between Belroyal Avenue and Bonville Road. In addition, a network of informal trodden paths crosses the Site. The Applicant is in the process of formalising public access rights and the proposed development will accommodate pedestrian and cycle access across and within the Site.

The Site has a direct informal connection to Victory Park to the south. Eastwood Farm Local Nature Reserve is located approximately 150m north of the Site on the northern side of Broomhill Road. Nightingale Valley Park is located approximately 600m west of the Site off Allison Road.

A site location plan is provided in **Figure 1.1**.

**Figure 1.1: Site Location Plan**




The noise assessment is required to determine the impact of existing sources of noise on the proposed residential development. Appropriate recommendations for noise mitigation are provided, where required.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# 2. THE NATURE, MEASUREMENT AND EFFECT OF NOISE

Noise is often defined as sound that is undesired by the recipient. Whilst it is impossible to measure nuisance caused by noise directly, it is possible to characterise the loudness of that noise. 'Loudness' is related to both sound pressure and frequency, both of which can be measured. The human ear is sensitive to a wide range of sound levels. The sound pressure level of the threshold of pain is over a million times that of the quietest audible sound. In order to reduce the relative magnitudes of the numbers involved, a logarithmic scale of decibels (dB) is normally used, based on a reference level of the lowest audible sound.

The response of the human ear is not constant over all frequencies. It is therefore usual to weight the measured frequencies to approximate the human response. The resulting 'A' weighted decibel, dB (A), has been shown to correlate closely to the subjective human response.

When related to changes in noise, a change of ten decibels, for example, from 60 dB(A) to 70 dB(A), would represent a doubling in 'loudness'. Similarly, a decrease in noise, for example, from 70 dB(A) to 60 dB(A), would represent a halving in 'loudness'. A change of 3 dB(A) is generally considered to be just perceptible[1]. **Table 2.1** details typical noise levels.

**Table 2.1: Typical Noise Levels**

| Approximate Noise Level (dB(A)) | Example |
|---|---|
| 0 | Limit of hearing |
| 30 | Rural area at night |
| 40 | Library |
| 50 | Quiet office |
| 60 | Normal conversation at 1 m |
| 70 | In car noise without radio |
| 80 | Household vacuum cleaner at 1 m |
| 100 | Pneumatic drill at 1 m |
| 120 | Threshold of pain |

A glossary of acoustic terminology is provided in **Appendix 1**.

[1] Institute of Environmental Management and Assessment (2014). Guidelines for environmental noise impact assessment.


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# 3. NOISE ASSESSMENT CRITERIA

## 3.1. National Planning Policy Framework

The revised National Planning Policy Framework (NPPF as amended in July 2021) supersedes the 2012, 2018 and 2019 versions of the NPPF. The purpose of the planning system is to contribute to the achievement of sustainable development. There are three dimensions to sustainable development: economic, social and environmental. The environmental role is to contribute to protecting and enhancing our natural, built and historic environment; and as part of this, make effective use of land, help to improve biodiversity, use natural resources prudently, minimise waste and pollution, and mitigate to adapt to climate change including moving to a low carbon economy.

One of the core planning principles is to contribute to conserving and enhancing the natural environment and reducing pollution. Allocations of land for development should prefer land of lesser value, where consistent with other policies in the Framework. The planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability.

Paragraph 185 of the NPPF states:

"*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 (see Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food and Rural Affairs, 2010));*

*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."*

Additionally, Paragraph 187 states:

"*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.*"


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## 3.2. Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) aims to "*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*".

Based on concepts from toxicology, it introduces three 'Effect Levels' relevant to the assessment of noise. These are:

- NOEL: No Observed Effect Level: This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise;
- LOAEL: Lowest Observed Adverse Effect Level: This is the level above which adverse effects on health and quality of life can be detected; and
- SOAEL: Significant Observed Adverse Effect Level: This is the level above which significant adverse effects on health and quality of life occur.

## 3.3. Planning Practice Guidance

The Planning Practice Guidance for Noise (PPG-N) was published in March 2014 and most recently updated in July 2019. The PPG-N suggests that the most appropriate and cost-effective solutions to potential noise issues are best identified when good acoustic design is considered early in the planning process.

The PPG-N provides the following advice on how to determine the noise impact on development:

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

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

*In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation. As noise is a complex technical issue, it may be appropriate to seek experienced specialist assistance when applying this policy.*" (Paragraph 003 Reference ID 30-003-20190722)

The document goes on to acknowledge the levels of noise exposure at which an effect may occur as provided in the NPSE and introduces a fourth effect level:


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- UAE: Unacceptable Adverse Effect: Extensive and regular changes in behaviour and/or an inability to mitigate the effect of noise lead to psychological stress or physical effects.

Where residential development is proposed in the vicinity of existing businesses, community facilities or other activities that produce noise, the PPG-N advises that the applicant (or 'agent of change') will need to clearly identify the effects of the existing businesses that may cause a nuisance (including noise) and clearly define the mitigation measures being proposed to address any potential significant adverse effects that are identified. The agent of change needs to not only consider the current activities of the business, but the permitted activities too, even if they are not occurring at the time of the application being made. The PPG-N acknowledges that "*It can be helpful for developers to provide information to prospective purchasers or occupants about mitigation measures that have been put in place, to raise awareness and reduce the risk of post-purchase/occupancy complaints.*" (Paragraph 009 Reference ID 30-009-20190722).

It is important to understand that as the PPG-N does not specifically provide any advice with respect to noise levels/limits for different sources of noise, it is appropriate to consider other sources of advice and guidance documents when considering whether new developments would be sensitive to the prevailing acoustic environment and the PPG-N signposts a number of appropriate guidance documents.

## 3.4. Bristol City Council

### 3.4.1. Bristol Development Framework Core Strategy (Adopted June 2011)

The Bristol Development Framework Core Strategy (June 2011) Policy BCS23 *Pollution* states:

*"Development should be sited and designed in a way as to avoid adversely impacting upon:*

- *Environmental amenity or biodiversity of the surrounding area by reason of fumes, dust, noise, vibration, smell light or other form of air, land, water pollution, or creating exposure to contaminated land.*
- *The quality of underground or surface water bodies.*

*In locating and designing development, account should also be taken of:*

- *The impact of existing sources of noise or other pollution on the new development; and*
- *The impact of the new development on the viability of existing uses by reason of its sensitivity to noise or other pollution.*

*Water quality and associated habitat of surface watercourses should be preserved or enhanced."*


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### 3.4.2. Site Allocation and Development Management Policies Local Plan (Adopted July 2014)

The primary policy on noise is Policy DM35 which states:

*"Noise-Sensitive Development*

*Noise-sensitive development in locations likely to be affected by existing sources of noise such as busy roads, railway lines, aerodromes, industrial/commercial developments, waste, recycling and energy plant and sporting, recreation and leisure facilities, will be expected to provide an appropriate scheme of mitigation to ensure adequate levels of amenity for future occupiers of the proposed development.*

*In assessing such a scheme of mitigation, account will be taken of:*

*i. The location, design and layout of the proposed development; and*

*ii. Measures to reduce noise within the development to acceptable levels, including external areas where possible; and*

*iii. The need to maintain adequate levels of natural light and ventilation to habitable areas of the development.*

*In areas of existing noise, proposals for noise-sensitive development should be accompanied by an assessment of environmental noise and an appropriate scheme of mitigation measures.*

*Development will not be permitted if mitigation cannot be provided to an appropriate standard with an acceptable design."*

### 3.4.3. Bristol Local Plan Review: Draft Policies and Development Allocations (March 2019)

Draft Policy HW1: Pollution Control and Water Quality expands upon the Development Management Policy DM35 and introduces commentary on the Agent of Change principle:

"*In areas of existing noise or other types of pollution, new development sensitive to the effects of that pollution should include measures to mitigate the impact of the existing pollution on future occupiers.*

*New development sensitive to pollution will not be permitted where the presence of that sensitive development could threaten the ongoing viability of existing uses that are considered desirable for reasons of economic or wider social need, such as music venues and industrial uses, through the imposition of undue operational constraints.*"

Although the content of HW1 is noted, no weight is applied to such draft policies at present given draft nature of the Plan.


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## 3.5. Noise Guidance

### 3.5.1. Professional Practice Guidance on Planning and Noise: New Residential Development

The Professional Practice Guidance (ProPG) on Planning and Noise for New Residential Development was published in May 2017 and was produced to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England.

The recommended approach detailed in the ProPG includes a framework to enable situations where noise is not an issue to be clearly determined, and to help identify the extent of risk at noisier sites. The recommended approach provides opportunities to incorporate effective design interventions that will enable residential development to proceed in areas that might otherwise have been considered unsuitable.

The ProPG provides advice for Local Planning Authorities and developers, and their respective professional advisers. It aims to complement Government planning and noise policy and guidance. In particular, it strives to:

- Advocate full consideration of the acoustic environment from the earliest possible stage of the development control process;
- Encourage the process of good acoustic design in and around new residential developments;
- Outline what should be taken into account in deciding planning applications for new noise-sensitive developments;
- Improve understanding of how to determine the extent of potential noise impact and effect; and
- Assist the delivery of sustainable development.

The two sequential stages of the recommended approach are:

- Stage 1: an initial noise risk assessment of the proposed development site; and
- Stage 2: a systematic consideration of four key elements.

The four key elements to be undertaken in parallel during Stage 2 of the recommended approach are:

- Element 1: demonstrating a “Good Acoustic Design Process”;
- Element 2: observing internal “Noise Level Guidelines”;
- Element 3: undertaking an “External Amenity Noise Assessment”; and
- Element 4: consideration of “Other Relevant Issues”.


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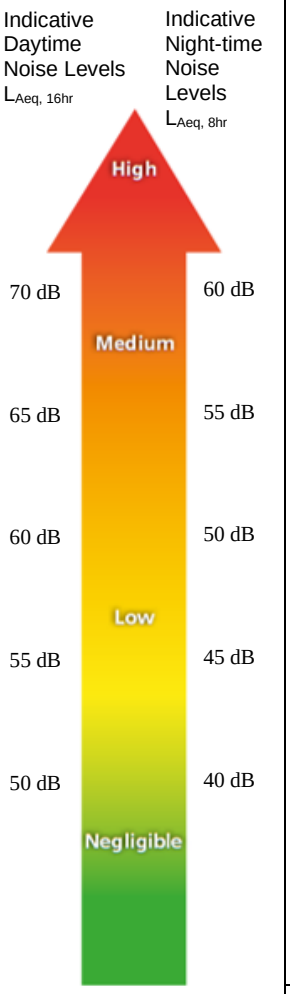
**Figure 3.1** below identifies the guidance given in the ProPG when undertaking the risk assessment stage for a site.

**Figure 3.1: Phase 1 – Noise Risk Assessment**

| Noise Risk Assessment | Potential Effect Without Noise Mitigation | Pre-Planning Application Advice |
|---|---|---|
|  | Increasing risk of adverse effect | High noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice.<br><br>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 which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrates that a significant adverse noise impact will be avoided in the finished development.<br><br>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. |
| | No adverse effect | These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds. |

Notes:

1. Indicative noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures.
2. Indicative noise levels are the combined free-field noise levels from all sources of transport noise and may also include industrial/commercial noise where this is present but is "not dominant".
3. $L_{Aeq, 16hr}$ is for daytime 0700 - 2300, $L_{Aeq, 8hr}$ is for night-time 2300 - 0700.
4. An indication that there may be more than 10 noise events at night (2300 - 0700) with $L_{AFmax}$ > 60 dB means the site should not be regarded as negligible risk.


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**Table 3.1** below identifies the internal noise level criteria provided in the ProPG.

**Table 3.1: ProPG Noise Levels**

| Activity | Location | 0700-2300 Hours | 2300-0700 Hours |
|---|---|---|---|
| Resting | Living room | 35 dB $L_{Aeq,16hr}$ | - |
| Dining | Dining room/area | 40 dB $L_{Aeq,16hr}$ | - |
| Sleeping (daytime resting) | Bedroom | 35 dB $L_{Aeq,16hr}$ | 30 dB $L_{Aeq,8hr}$<br>45 dB $L_{AFmax}$ Note 4 |

Notes:

1. The Table provides recommended internal $L_{Aeq}$ target levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Ground-borne noise is assessed separately and is not included as part of these targets, as human response to ground-borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.
2. The internal $L_{Aeq}$ target levels shown in the Table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the internal $L_{Aeq}$ target levels recommended in the Table.
3. These internal $L_{Aeq}$ target levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.
4. Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{AFmax}$, depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{AFmax}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events (see Appendix A).
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.
6. Attention is drawn to the requirements of the Building Regulations.
7. Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal $L_{Aeq}$ target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal $L_{Aeq}$ levels start to exceed the internal $L_{Aeq}$ target levels by more than 5 dB, the more that most people are likely to regard them as "unreasonable". Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal $L_{Aeq}$ levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing "unacceptable" noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form (**see Section 3.D**).


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### 3.5.2. British Standard BS 8233:2014

BS 8233 *Guidance on sound insulation and noise reduction for buildings* has a number of design criteria for intrusive external noise without a specific character. The guidelines are designed to achieve reasonable resting/sleeping conditions in bedrooms and good listening conditions in other rooms. The most appropriate noise levels (Table 4 of the BS) for the residential environment are reproduced in **Table 3.2**.

**Table 3.2: Indoor Ambient Noise Levels for Dwellings**

| Activity | Location | Daytime 0700 hrs to 2300 hrs | Night-time 2300 hrs to 0700 hrs |
|---|---|---|---|
| Resting | Living room | 35 dB $L_{Aeq,16hr}$ | - |
| Dining | Dining room/area | 40 dB $L_{Aeq,16hr}$ | - |
| Sleeping (daytime resting) | Bedroom | 35 dB $L_{Aeq,16hr}$ | 30 dB $L_{Aeq,8hr}$ |

Although there are no limits set for external noise levels in BS 8233 the following guidance is provided at paragraph 7.7.3.2:

"*For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.*"

### 3.5.3. World Health Organization Guidelines for Community Noise (1999)

The World Health Organization (WHO) has developed the *Guidelines for Community Noise* (CNG) designed to minimise the adverse effects of noise. The guidelines relevant to residential noise exposure are detailed in **Table 3.3**. For each specific environment, the stated noise levels are the maximum noise levels to avoid the health effect noted.


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**Table 3.3: WHO Community Noise Guideline Values**

| Specific Environment | Critical Health Effect(s) | Period Noise Level | Maximum Noise Level |
|---|---|---|---|
| Outdoor Living Area | Serious annoyance, daytime and evening | 55 dB $L_{Aeq,16hr}$ | - |
| | Moderate annoyance, daytime and evening | 50 dB $L_{Aeq,16hr}$ | - |
| Dwelling, Indoors | Speech intelligibility and moderate annoyance, daytime and evening | 35 dB $L_{Aeq,16hr}$ | |
| Inside bedrooms | Sleep disturbance, night-time | 30 dB $L_{Aeq,8hr}$ | 45 dB $L_{AFmax}$ |
| Outside bedrooms | Sleep disturbance with window open | 45 dB $L_{Aeq,8hr}$ | 60 dB $L_{AFmax}$ |

The WHO guidelines state, with respect to the $L_{Amax}$ threshold, that "*for a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB $L_{Amax}$ more than 10-15 times per night (Vallet and Vernet 1991)*". Therefore, ACCON consider that it is appropriate to assess against the tenth highest $L_{AFmax}$ level during the night-time period as opposed to the highest level in order to represent typical $L_{AFmax}$ levels and provide a realistic compromise between protection from sleep disturbance and achievable mitigation.

### 3.5.4. World Health Organization Environmental Noise Guidelines for the European Region

The World Health Organization (WHO) issued the *Environmental Noise Guidelines for the European Region* (ENG) in October 2018. The guidelines state that the main intended purpose is to "*provide recommendations for protecting human health from exposure to environmental noise…*" As the guidelines, which are source specific and not environment specific, are intended to be suitable for policy-making they focus on the most used noise indicators $L_{den}$ and/or $L_{night}$ for exposure at the most exposed façade outdoors. The ENG recommends that indoor guideline values within the WHO CNG (see **Section 3.5.3**) and "*any values not covered by the current guidelines*" should remain valid.

**Table 3.4** provides a summary of the WHO ENG recommendations for road traffic noise, railway noise, aircraft noise and wind turbine noise.


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**Table 3.4: WHO Environmental Noise Guidelines Recommendations**

| Source | Average Noise Exposure (External) | Night Noise Exposure (External) |
|---|---|---|
| Road traffic noise | 53 dB $L_{den}$ | 45 dB $L_{night}$ |
| Railway noise | 54 dB $L_{den}$ | 44 dB $L_{night}$ |
| Aircraft noise | 45 dB $L_{den}$ | 40 dB $L_{night}$ |
| Wind turbine noise | 45 dB $L_{den}$ | No recommendation made |
| Leisure noise | 70 dB $L_{Aeq,24h}$ | Not applicable |

In addition to the specific recommendations the following guiding principles have been developed:

- "*Reduce exposure to noise, while conserving quiet areas;*
- *Promote interventions to reduce exposure to noise and improve health;*
- *Coordinate approaches to control noise sources and other environmental health risks;*

*Inform and involve communities potentially affected by a change in noise exposure*".

### 3.5.5. British Standard BS 4142:2014 + A1:2019

BS 4142 *Methods for rating and assessing industrial and commercial sound* provides a method for the measurement and rating of industrial type noise sources and background noise levels outside dwellings. The rating level (defined in the BS) is used to rate the noise level of the source (this is defined as the 'specific sound level') outside residential dwellings.

The rating level is determined by assessing the character of the noise and applying an acoustic feature correction, if appropriate, to the specific sound level. Corrections are applied for the tonality, impulsivity and intermittency of the noise source which can all increase the impact of noise.

The initial assessment described in BS 4142 to determine whether an adverse impact is likely is based on establishing the difference between the rating level and the background noise level outside the residential property of interest. The British Standard states that the following points should be considered:

- "*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*


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*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.*"

Where it is considered that the initial assessment of the impact needs to be modified due to the context in which the noise is occurring, BS 4142 suggests that all pertinent factors are taken into consideration, including:

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

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

   *Where residual sound[2] levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.*

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

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

   i. facade insulation treatment;

   ii. ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and

   iii. acoustic screening.

There is also a requirement within BS 4142:2014 to consider the uncertainty in the measurement and assessment procedure.

[2] The residual sound is defined as the ambient sound level at the assessment location in the absence of the specific sound source


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## 3.6. Target Noise Levels

The target internal and external noise levels for new residential dwellings have been derived from the ProPG, BS 8233 and the WHO guidelines and primarily relate to noise without specific character (i.e. road traffic and railway noise).

### 3.6.1. External Noise Levels

Noise levels within private amenity areas (i.e. communal gardens, private gardens, balconies and terraces) should achieve a noise level within or below the range of 50 dB to 55 dB $L_{Aeq, 16hr}$.

### 3.6.2. Internal Noise Levels

Noise levels within habitable rooms (i.e. living rooms and bedrooms) should achieve a daytime noise level not exceeding 35 dB $L_{Aeq, 16hr}$ and a night-time noise level not exceeding 30 dB $L_{Aeq, 8hr}$. Maximum noise levels ($L_{AFmax}$) should not normally exceed 45 dB internally more than 10 times during the night-time.


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# 4. NOISE MEASUREMENT SURVEY

A noise measurement survey was carried out in order to determine the extent to which the site is currently affected by noise.

## 4.1. Noise Measurement Survey Methodology

A detailed noise measurement survey was carried out at the site in order to determine the extent to which the site is currently affected by noise from road traffic and existing commercial/industrial uses. Noise measurements were carried out in order to characterise the existing noise climate over a 24-hour period. The noise measurements were carried out between 1320 hrs on Thursday 8th October 2020 and 1520 hrs on Friday 9th October 2020. Five noise monitoring positions were utilised. The noise measurement positions have been identified in **Figure F.1**.

The weather conditions recorded on Thursday 8th October 2020 were dry with approximately 60% cloud cover. The wind was recorded from an easterly direction with gusts up to 3 m/s and a temperature of 17°C.

A period of heavy rain occurred between approximately 1108 hrs to 1238 hrs on Friday 9th October 2020. An attended road traffic noise measurement was paused until the road surface had begun to dry out. As a result, the unattended noise measurement period was extended and data from the period when rain fell and through to the road drying out has been excluded from the data analysis.

At the end of the noise measurement period there was 50% cloud cover and the site (a grassy field) was wet underfoot due to the earlier period of rain. There was a northerly wind of 1.2 m/s and a temperature of 12°C.

### 4.1.1. Semi-Permanent Noise Measurements

The semi-permanent noise measurements utilised two Class 1 Sound Level Meters: a Svantek 971 and a Rion NL-52. Both of these meters hold current certificates of calibration, which are available upon request. The equipment was field calibrated before and after the noise measurement period to ensure that it had remained within reasonable calibration limits (±0.5 dB).

Noise Measurement Position 1 (**MP1**) was located approximately 92 m to the south-west of Broomhill Junior School and 180 m to the east of School Road. The microphone was mounted at a height of 1.5 m in a free-field position with a line of sight to Broomhill Junior School. The noise climate generally comprised distant road traffic noise and birdsong. At the time of setting up the equipment, a lunchtime break period was occurring at Broomhill Junior School and the sounds of children playing were audible.

Noise Measurement Position 2 (**MP2**) was located approximately 30 m to the north-west of Bonville Road. The microphone was mounted at a height of 1.5 m in a free-field position. The noise climate generally comprised distant road traffic, intermittent traffic on Bonville Road and intermittent plant operation from Quince Designs. Between 1435 hrs and 1505 hrs noise from the use of quad bikes occurred on the site close to the noise measurement position and that period of activity has been excluded from the noise measurement summary.


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The daytime and night-time free-field noise levels measured at **MP1** and **MP2** are summarised in **Table 4.1**. The detailed noise measurement results are presented in **Appendix 2**.

**Table 4.1: Summary of Free-Field Noise Levels from Semi-Permanent Noise Monitoring**

| Position | Period (hours) | $L_{Aeq,T}$ (dB) | $L_{AFmax}$ (dB) | Average $L_{A10,5min}$ (dB) | Average $L_{A90,5min}$ (dB) | Typical (Modal) $L_{A90,\ 5min}$ (dB) |
|---|---|---|---|---|---|---|
| **MP1** | Daytime (0700 hrs – 2300 hrs) | 48 | 69 (70) | 48 | 43 | 46 |
| | Night-time (2300 hrs – 0700 hrs) | 44 | 60 (56) | 42 | 39 | 37 |
| **MP2** | Daytime (0700 hrs – 2300 hrs) | 49 | 68 (71) | 49 | 43 | 39 |
| | Night-time (2300 hrs – 0700 hrs) | 43 | 56 (58) | 43 | 39 | 37 |

Note: The noise measurements were carried out over consecutive five-minute periods. The $L_{Aeq,\ 5min}$ was subsequently logarithmically averaged over the time periods indicated in **Table 4.1**, the Average $L_{A10,5min}$ and Average $L_{A90,5min}$ were arithmetically averaged. The $L_{AFmax}$ was arithmetically averaged and the $L_{AFmax}$ in brackets is the tenth highest $L_{AFmax}$ during this period.

### 4.1.2. Short-term Attended Noise Measurements

Short-term attended noise measurements were carried out between 1355 hrs and 1625 hrs on Thursday 8th October 2020 and between 1005 hrs and 1405 hrs on Friday 9th October 2020. Three noise monitoring positions were utilised and have been identified in **Figure F.1**.

The noise measurements utilised a Norsonic 118 Class 1 Sound Level Meter which holds a current certificate of calibration which is available upon request. Before and after the noise measurement period the equipment was field calibrated in order to ensure that the equipment had remained within reasonable calibration limits (±0.5 dB).

Noise Measurement Position 3 (**MP3**) was located approximately 5 m to the east of School Road. The noise climate was dominated by road traffic noise.

Noise Measurement Position 4 (**MP4**) was located approximately 4 m to the east of Broomhill Road and approximately 4.3 m to the north of Whitmore Avenue.

Noise Measurement Position 5 (**MP5**) was utilised to measure the noise level emitted from a plant source at Quince Designs. **MP5** was located on Bonville Road, 12 m to the south-west of a dust extract plant system on the north façade of Quince Designs.

A summary of the free-field noise measurements are identified in **Table 4.2**.


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**Table 4.2: Summary of Free-Field Noise Levels from Short-term Attended Noise Monitoring**

| Measurement Position | $L_{Aeq,T}$ (dB) | $L_{AFmax}$ (dB) | Average $L_{A10,5min}$ (dB) | Average $L_{A90,5min}$ (dB) |
|---|---|---|---|---|
| **MP3** | 66 | 89 (81) | 72 | 50 |
| **MP4** | 68 | 87 (82) | 72 | 58 |
| **MP5** | 57 | - | - | 57 |

Note 1: The measurement MP3 was interrupted by the heavy rain period on Friday 9th October 2020.

## 4.2. Data Validation

As a result of the Covid-19 pandemic and associated Government advice, the noise measurements carried out may not necessarily have represented a typical baseline scenario.

At the time of the survey the Department for Transport (DfT) were publishing daily transport use relative to typical conditions earlier in 2020 to inform how Covid-19 measures were affecting transport use, including traffic flows.

**Table 4.3: DfT Statistics for 8th October and 9th October 2020**

| Date | Cars | Light Commercial Vehicles | Heavy Goods Vehicles | All Motor Vehicles |
|---|---|---|---|---|
| 8th October 2020 | 84% | 98% | 104% | 88% |
| 9th October 2020 | 88% | 100% | 104% | 91% |
| Average | 86% | 99% | 104% | 90% |

**Table 4.3** identifies that the average overall reduction of traffic during the noise measurement period was 90% of a typical day earlier in 2020. A reduction in traffic to 90% equates to approximately 0.5 dB reduction in the road traffic noise level. Whilst this level of noise reduction is unlikely to be noticeable to receptors in the area, for the avoidance of doubt, the calibration of the noise model utilised to inform the noise assessments in this report has taken this likely reduction in traffic into consideration.


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# 5. NOISE IMPACT ASSESSMENT

## 5.1. Noise Modelling

The CadnaA noise modelling software has been utilised to calculate the external noise levels from road traffic movements at the proposed development site. CadnaA is a three-dimensional noise model developed by DataKustik and has been extensively used by ACCON and others to develop noise models for a wide variety of situations and noise sources. CadnaA utilises the methodology in the Department of Transport's Technical Memorandum *'Calculation of Road Traffic Noise'* (CRTN) to predict the noise levels from road traffic and ISO 9613 *Acoustics – Attenuation of sound during propagation outdoors* to assess sound from point and area sources (i.e. plant noise and school playground etc.).

The results of the noise measurement survey detailed in **Section 4** have been utilised to calibrate the noise model predictions of the existing site with regard to the data validation in **Section 4.2**.

## 5.2. ProPG Stage 1: Initial Site Noise Risk Assessment

**Figure F.2** presents the daytime and night-time ($L_{Aeq, T}$) noise contours for the site at ground floor level (a height of 1.5 m). **Figure F.3** presents the daytime and night-time ($L_{Aeq, T}$) noise contours at first floor level (a height of 4.5 m).

For the purpose of the initial site noise risk assessment, it has been assumed that the site topography will not be significantly altered from the current topography. It is noted that there are proposals to form a pedestrian and cycle access between the site and School Road which is likely to result in a change in topography in the north-western area of the site, however, this is very unlikely to significantly affect the results of this noise assessment.

The initial site noise risk assessment only considers the effects of road traffic noise on the proposed development site and includes road traffic noise from School Road, Broomhill Road and Bonville Road as well as the A4 Bath Road to the south-west of the site. Plant noise sources have been excluded in this Stage 1 assessment as some of the potential sources of noise from the industrial area to the south-east may at times be considered dominant due to the relatively low levels of road traffic noise from Bonville Road. Noise from the industrial area is considered separately in **Section 5.4** and **Section 5.5**.

**Figure F.2** indicates that the site, at ground floor level, is generally of a negligible risk of adverse noise effect across the site during the daytime period. During the night-time, the site is generally of a negligible to low adverse noise effect. There is an area of medium adverse noise effect within 28 m of School Road during the daytime and within 48 m during the night-time. Within 22 m of Bonville Road there is an area of medium noise effect during the night-time.

**Figure F.3** indicates that the site, at first floor level, is generally of a negligible risk of adverse noise effect during the daytime period. During the night-time, the site is generally of a low adverse noise effect. For areas within 35 m of School Road during the daytime and between 19 m and 62 m during the night-time, there is a risk of medium adverse noise effect. Within 19 m of School Road during the night-time, there is a high risk of adverse noise effect.


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However, it should be noted that with the implementation of the development, traffic and therefore noise, is likely to reduce on School Road. Within 25 m of Bonville Road there is an area of medium risk of adverse noise effect during the night-time.

## 5.3. ProPG Stage 2: Noise Impact Assessment

### 5.3.1. External Noise Levels

The daytime external noise levels ($L_{Aeq, 16hr}$) predicted using the CadnaA noise model will be compared against the target external noise level range of 50 dB to 55 dB $L_{Aeq, 16hr}$ or below within amenity areas. Amenity areas could include communal garden areas, play areas, private gardens, private balconies and terraces.

**Table 5.1** identifies the daytime external noise levels within public open amenity spaces. The amenity space receptors are shown on the illustrative masterplan in **Figure F.4**.

**Table 5.1: External Communal Amenity Area Noise Levels**

| Receptor | External Noise Level $L_{Aeq, 16hr}$ (dB) | Within or Below Target Noise Level Range? |
|---|---|---|
| Neighbourhood Lawn | 41 | Yes |
| Village Green | 42 | Yes |
| Play on the Way | 45 | Yes |
| Brislington Heights | 46 | Yes |

It can be identified in **Table 5.1** that the external noise levels for public amenity areas are within or below the target external noise level range of 50 dB to 55 dB $L_{Aeq, 16hr}$.

**Figure F.5** presents the daytime external noise levels ($L_{Aeq, 16hr}$) in the context of the proposed Illustrative Masterplan. **Figure F.5** identifies that all proposed amenity areas will experience noise levels meeting the target external noise criteria. Therefore, noise mitigation measures specific to external amenity areas will not be required.

### 5.3.2. Internal Noise Levels

The CadnaA noise model has been utilised to predict the external period ($L_{Aeq, T}$) noise levels at the facades of the proposed dwellings in order to calculate the minimum combined building façade sound reductions required to achieve the internal noise levels identified in **Section 3.6.2**. The night-time $L_{AFmax}$ noise levels have been calculated using point source distance corrections from the noise survey measurement results obtained at MP1, MP2, MP3 and MP4.

BS 8233 states that *"if partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB"*. The WHO guidelines also state that a slightly open windows would result in "*a [sound] reduction from outside to inside of 15 dB"*.

For dwellings adjacent to the western site boundary with habitable rooms overlooking School Road, the tenth highest measured $L_{AFmax}$ noise level at **MP3** during the daytime has been


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utilised as a worst-case scenario to consider night-time maximum noise levels. The $L_{AFmax}$ noise levels have been calculated by applying a point source distance correction from School Road.

Similarly, for dwellings immediately adjacent to Broomhill Road, the tenth highest measured $L_{AFmax}$ noise level at **MP4** during the daytime has been utilised, with the $L_{AFmax}$ noise levels also calculated by applying a point source distance correction from Broomhill Road.

**Table 5.2** presents the highest predicted external noise levels for a representative selection of plots across the proposed development. **Table 5.2** also identifies the minimum combined façade sound reduction values required to achieve the target internal noise levels. For receptors indicated as 'no specific requirement', the target noise levels would be achieved with windows open to provide ventilation and therefore no further mitigation would be required. In these cases, it is not necessary to specify the minimum required façade sound reduction. The receptor locations are identified in **Figure F.4**.

**Table 5.2: Predicted Daytime and Night-time Noise Levels and sound Reduction Required to Achieve Internal Noise Levels**

| Receptor | Predicted External Noise Level | | | Minimum Combined Building Façade Sound Reduction Required to Achieve Target Internal Noise Levels (dB(A)) |
|---|---|---|---|---|
| | Daytime $L_{Aeq, 16hr}$ (dB) | Night-time $L_{Aeq, 8hr}$ (dB) | Night-time $L_{AFmax}$ (dB) | |
| R1 | 56 | 59 | 64 | 21 |
| R2 | 56 | 50 | 64 | 21 |
| R3 | 51 | 50 | 56 | 20 |
| R4 | 45 | 39 | 56 | no specific requirement |
| R5 | 52 | 46 | 60 | 17(1) |
| R6 | 51 | 45 | 60 | 16(1) |
| R7 | 57 | 51 | 74 | 29 |
| R8 | 41 | 36 | 60 | no specific requirement |

Note (1): The internal noise levels exceed the targets marginally by up to 2 dB during some or all periods. With reference to the advice in the ProPG (see **Figure 3.1)**, internal noise levels up to 5 dB above the target criteria are not considered to be unreasonable for those periods when windows need to be opened.

**Table 5.2** identifies that, to achieve the target internal noise levels, the highest level of sound reduction required is 29 dB(A). This is based on the illustrative masterplan layout which includes a single plot adjacent to (and overlooking) Broomhill Road. For dwellings which exceed the target noise criteria by up to 5 dB (as identified by Note 1 in the **Table 5.1**), the ProPG identifies that these internal noise level will still be seen as reasonable and therefore no specific mitigation will be required for dwellings which required a sound reduction of up to 20 dB(A).

Noise mitigation measures to achieve the target internal levels are discussed in **Section 6.2**.


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With reference to the measured noise levels and the initial site noise risk assessment, daytime and night-time external ambient noise levels for the majority of the proposed development site are predicted to be less than 50 dB $L_{Aeq,16hr}$ for the daytime and 45 dB $L_{Aeq,8hr}$ for the night-time. However, this part of the assessment does not explicitly consider noise from the industrial estate (refer to **Section 5.4** and **Section 5.5**).

## 5.4. Dust Extract Plant Noise Assessment at Quince Designs

### 5.4.1. Specific Sound Levels

The dust extract plant at Quince Designs on Bonville Road was audible at **MP2** but not at **MP1**.

The dust extract plant has been modelled as a point source on the north façade of the Quince Designs building at a height of 1.5 m above ground level. The plant noise source has been modelled with a sound power level of 88 dB $L_{WA}$ which has been calibrated with the noise measurement obtained at **MP5**.

Specific sound levels have been calculated at measurement position **MP2** and a noise contour map is presented in **Figure F.6**.

### 5.4.2. Acoustic Feature Corrections

When ACCON personnel attended the site, a low frequency tone was perceived when the dust extract system was operational. A review of the one-third octave band noise level data measured at **MP5** identifies that this tone is at 50 Hz. The measured one-third octave band noise level data is presented in **Table 5.3.** The acoustic measurements shown are the logarithmically averaged levels over the one-minute attended source noise measurement period.

**Table 5.3: One-Third Octave Band Noise Levels Measured at MP5**

| Measurement Position | One-Third Octave Frequency Bands (dB) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 25 Hz | 31.5 Hz | 40 Hz | 50 Hz | 63 Hz | 80 Hz | 100 Hz | 125 Hz |
| MP5 | 56 | 55 | 59 | 71 | 57 | 52 | 52 | 49 |

ACCON have completed a tonal analysis in line with the 'Objective Method' detailed in BS1412:2014+A1:2019. The 'Objective Method' states: *"for a discrete tone to be identified as present, the time-averaged sound pressure level in the one-third-octave band of interest is required to exceed the time-averaged sound pressure levels of both adjacent one-third-octave bands by:*

- *15 dB in the low-frequency one-third-octave bands (25 Hz to 125 Hz);*
- *8 dB in the middle-frequency one-third-octave bands (160 Hz to 400 Hz); and*
- *5 dB in the high-frequency one-third-octave bands (500 Hz to 10 000 Hz)."*

The one-third octave band noise levels identified in **Table 5.3** do not indicate that a tonal correction is required for the 50 Hz tone when assessed in line with the 'Objective Method'. However, the tone is considered to be highly perceptible in line with the 'Subjective Method'


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described in BS 4142:2014+A1:2019. Therefore, an acoustic feature correction of +6 dB has been applied to the predicted specific sound levels of the dust extract system. .

Due to the plant sound source having identifiable on/off conditions which are readily distinctive against the residual acoustic environment, an acoustic feature correction for intermittency of +3 dB has also been added to the predicted specific sound levels.

The total acoustic feature correction is therefore +9 dB.

### 5.4.3. Background Sound Levels

**Table 5.4** summarises the typical (modal) background sound levels ($L_{A90,\ 5mins}$) measured at **MP1** and **MP2** during the daytime and night-time periods. The background sound levels measured at **MP2** are considered to be most representative of the background sound levels for the majority of the proposed site as background sound levels at **MP1** are likely to have been partially affected by birdsong and tree branches moving in the breeze.

**Table 5.4: Summary of Typical (Modal) $L_{A90,T}$ Background Sound Levels**

| Measurement Position | Typical (Modal) Background Sound Levels $L_{A90,\ 5mins}$ (dB) | |
|---|---|---|
| | Daytime | Night-time |
| **MP1** | 46 | 37 |
| **MP2** | 39 | 37 |

### 5.4.4. BS 4142 Assessment

**Table 5.5** presents the results of a BS 4142 assessment for the operation of the dust extract system at Quince Designs at receptor **MP2**.

**Table 5.5: Daytime BS 4142 Assessment at MP2**

| Results | MP2 | Relevant Clauses of BS 4142:2014 | Commentary |
|---|---|---|---|
| Typical Background Sound Level $L_{A90,5min}$ (dB) | 39 | 8.1, 8.2 | The typical (modal) background sound level measured at **MP2** during the daytime (**Table 4.1**) |
| Specific Sound Level $L_{Aeq,1hr}$ (dB) | 43 | 7.3.7, 7.3.9, 7.3.11 | Determined from the CadnaA noise model |
| Acoustic Feature Correction (dB) | +9 | 9.2 | An Acoustic Feature Correction has been applied for Highly Perceptible Tonality and Intermittency |
| Rating Level (dB) | 52 | 9.2 | (Specific Sound Level + Acoustic Feature Correction) |
| Difference between Rating Level and Background Sound Level (dB) | +13 | 9.2 | |


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| | | | |
|---|---|---|---|
| Initial Estimate of Impact | Significant adverse impact | 11 | |

The assessment in **Table 5.5** of the available data identifies that there would be an indication of a significant adverse impact on dwellings in the vicinity of **MP2**.

To consider the potential noise impact at the nearest proposed houses with private amenity areas (gardens), an assessment has been carried out at R8.

**Table 5.6: Daytime BS 4142 Assessment at R8**

| Results | R8 | Relevant Clauses of BS 4142:2014 | Commentary |
|---|---|---|---|
| Typical Background Sound Level $L_{A90,5min}$ (dB) | 39 | 8.1, 8.2 | The typical (modal) background sound level measured at **MP2** during the daytime (**Table 4.1**) |
| Specific Sound Level $L_{Aeq,1hr}$ (dB) | 38 | 7.3.7, 7.3.9, 7.3.11 | Determined from the CadnaA noise model at R8 |
| Acoustic Feature Correction (dB) | +9 | 9.2 | An Acoustic Feature Correction has been applied for Highly Perceptible Tonality and Intermittency |
| Rating Level (dB) | 47 | 9.2 | (Specific Sound Level + Acoustic Feature Correction) |
| Difference between Rating Level and Background Sound Level (dB) | +8 | 9.2 | |
| Initial Estimate of Impact | Adverse - Significant adverse impact | 11 | |

**Table 5.6** identifies that the initial BS 4142 assessment for external amenity areas at R8 would result in an adverse to significant adverse impact. Therefore, noise mitigation will be required.

### 5.4.5. Discussion of Context

When considering the impact of noise using BS 4142 it is necessary to consider the context of the noise. The plant is located on the north façade of Quince Designs and is used for dust extraction from a workshop. Quince Designs specialise in bespoke handmade kitchen, bedroom and bathroom furniture.

The typical background sound level measured at **MP2** in the absence of the sound source is 39 dB $L_{A90,5mins}$ during the daytime (see **section 5.4.3**).

When ACCON personnel arrived at the site, the plant corresponding with Quince Designs was operational during an initial site walk around (at approximately 1230 hrs). However, by the time the measurement equipment at **MP2** was installed and the measurement period commenced, the plant source had been switched off. It was then operational on Friday 9th October 2020 between approximately 0720 and 0920 hrs. Whilst the Quince Designs operation at the time of the noise measurement survey was relatively limited, there may have


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been an impact on the business as a result of the Covid-19 pandemic such that the use of the dust extraction system was not operational in a normal pattern. Operation of the plant may therefore occur more frequently or over longer durations under typical operating conditions.

**Figure F.6** presents the specific noise level contours for the dust extraction plant at Quince Designs. This demonstrates that at 89 m to the west of the source and 59 m to the south west of the source, there will be no impact (the excess of the rating level over the background sound level will be equal to or lower than 0 dB). The noise mitigation scheme for dwellings and external amenity spaces located closer to the plant noise source than indicated above will need to consider the impact of noise from the dust extraction plant. It would be expected that  For the dwellings located further into the site any acoustic mitigation needed will be much less or otherwise not required. This is primarily due to the greater distance from Quince Designs, although some plots would benefit from screening from the intervening buildings to be constructed as part of the proposed development.

### 5.4.6. Discussion of Uncertainty

ACCON carried out a 24-hour semi-permanent noise measurement on a weekday to obtain typical background sound levels representative of proposed noise sensitive receptors. It is considered that the noise measurement period was carried out on a reasonably typical day for background sound levels without any extraordinary Covid-19 restrictions in place such as lockdown periods or tier 2 or tier 3 restrictions.

A point source at this location has been calibrated using a spot measurement at a distance of 12 m from the plant noise source which was not affected by any local road traffic noise.

The CadnaA noise model has included the local topography and all existing buildings which have been modelled with heights determined through on-site observations. The CadnaA noise model utilises the methodology within ISO 9613 to calculate the sound pressure level of a source at a receptor location.

It is considered that the effects of uncertainty have been minimised as far as possible based on the information available to support this assessment.

## 5.5. Air Conditioning

There are a number of externally mounted condenser units located on the roofs of units 20 – 24 of Bonville Business Centre on Bonville Road (identified in **Figure F.1**). It is assumed that the condenser units are related to air conditioning and will therefore only be in operation during the daytime period of warmer days. None were noted to be audible at the time of the noise measurement survey. These condenser units have been modelled in CadnaA with a sound power level of 65 dB(A) per unit, based on typical sound power data for these types of units. The highest predicted noise level at the site boundary at a height of 4 m above ground level is 27 dB $L_{Aeq,T}$. Such a sound level is greater than 10 dB lower than the background sound level measured at **MP2**, not accounting for acoustic feature corrections, which is unlikely to result in an exceedance of the background sound level. It can therefore be determined that the condenser units will not cause a significant noise impact on occupants of the proposed development.


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## 5.6. General Commentary on the Industrial Area

At the time of the noise measurement survey, activities at the industrial area may have been restricted or curtailed as a result of the Covid-19 pandemic and the businesses response to ensure the safety of workers. All visible fixed plant noise sources have been considered, measured if operational, and assessed where possible to inform this assessment. Vehicle movements have been incorporated in the ProPG initial site noise risk assessment based on on-site observations and considered in the corresponding Stage 2 assessment and mitigation measures in **Section 6** below.

A review of the existing businesses in the industrial area suggests that any noise mitigation measures implemented to protect future residents from noise due to the operation of the dust extract plant should be sufficient to ensure that residents will also be protected from noise from any other potential noise sources which could not be witnessed at the time of the survey and also take into account reasonable changes to activities and businesses in the future.

## 5.7. Noise from School Playgrounds

There was no discernible difference in the overall noise levels when the playground was in operation to when it was vacant at **MP1**. However, the character of the noise when children are playing is readily distinguishable over and above the ambient noise climate measured in the absence of activity on the playground.

An area source has been included within the CadnaA noise model to represent the playground at Broomhill Junior School. This has been included within the calibration of the noise model and has a sound power per unit area of 65 dB $L_{WA}$. The predicted noise levels at the boundary of the rear gardens of the plots backing on to Broomhill Junior School (nearest the playground) due to playground noise alone is 50 dB $L_{Aeq,T}$. The predicted noise level takes account of the differences in ground level between the development site and the school. Activity noise from the school playground is unlikely to exceed the target external noise level range of 50 dB to 55 dB $L_{Aeq,T}$,. However, due to the character of the noise, acoustic fencing should be including for gardens of the plots indicated above to avoid undue disturbance to future residents from noise from the school playground.


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# 6. NOISE MITIGATION MEASURES

## 6.1. External Noise Levels

**Section 5.3.1** indicates that the external noise levels within the majority of all proposed amenity areas would be within or below the target noise level range.

**Table 6.1** provides the BS 4142 daytime assessment at R8 including a 2 m acoustic fence to the external amenity areas. The barrier location is identified in **Figure F.4**.

**Table 6.1: Daytime BS 4142 Assessment a R8 with 2m Acoustic Fence**

| Results | R8 with 2m Acoustic Fence | Relevant Clauses of BS 4142:2014 | Commentary |
|---|---|---|---|
| Typical Background Sound Level $L_{A90,5min}$ (dB) | 39 | 8.1, 8.2 | The typical (modal) background sound level measured at **MP2** during the daytime (**Table 4.1**) |
| Specific Sound Level $L_{Aeq,1hr}$ (dB) | 30 | 7.3.7, 7.3.9, 7.3.11 | Determined from the CadnaA noise model |
| Acoustic Feature Correction (dB) | +9 | 9.2 | An Acoustic Feature Correction has been applied for Highly Perceptible Tonality and Intermittency |
| Rating Level (dB) | 39 | 9.2 | (Specific Sound Level + Acoustic Feature Correction) |
| Difference between Rating Level and Background Sound Level (dB) | 0 | 9.2 | |
| Initial Estimate of Impact | Low impact | 11 | |

The initial estimate of impact for R8 will reduce from adverse – significant adverse impact to a low impact.

Acoustic fencing 2 m in height (as identified in **Figure F.4**) should be included for gardens of the plots nearest to the school playground to avoid undue disturbance to future residents.

## 6.2. Internal Noise Levels

**Section 5.3.2** has identified the minimum combined building façade sound reductions required for selected plots across the proposed site.

It is assumed that the external wall construction provides a minimum sound reduction of 50 dB $R_w$ (typically achievable by a standard brick and block cavity wall construction, or similar), and therefore the glazing and any ventilation openings will be the weakest elements of the building façade. **Table 6.2** below indicates the different types of glazing specifications for the required attenuation of the proposed dwellings.


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**Table 6.2: Glazing Specifications**

| Required Attenuation | Example of Glazing |
|---|---|
| Up to 28 dB(A) | Typical double-glazed window systems (i.e. in a 4 mm glass, 6 mm to 16 mm air gar, 6 mm glass formation) |
| 29dB(A) | Glazing in a 10 mm glass, 6 mm to 16 mm air gap, 4 mm glass formation, or similar |

For plots where 29 dB(A) attenuation is required, any trickle ventilators (or other external ventilators) fitted to habitable rooms will require a sound insulation performance such that the required façade attenuation is achieved with open ventilators.

Note that the above is based on the illustrative masterplan layout. However, as this assessment supports an outline planning application, details of the final building layout, house types and building performance will be confirmed at detailed design stage. Further noise assessments will be carried out at this stage to confirm dwellings meet internal and external target noise levels and that the development will follow the recommendations and mitigation measures in this report.

### 6.2.1. Overheating

For those areas of the site where specific building façade acoustic mitigation measures are likely to be required, the assessment of the internal noise levels should consider the unintended consequences of keeping windows closed. Windows should always be openable for purge ventilation and therefore it will be the choice of the residents to have windows open or closed. However, if overheating effects are likely to result in residents needing to open windows on façades which overlook the primary sources of noise for extended periods of time, the internal noise conditions may be considered unreasonable in a small number of dwellings. It may be prudent to consider mechanical means of ventilation (i.e. ADF System 3 or 4) in dwellings immediately overlooking the primary noise sources to assist in moving the air through the dwellings and minimising the number of days that windows need to be opened for comfort cooling. The specifics of any such mitigation may be considered at the reserved matters stage.


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# 7. ACOUSTIC DESIGN STATEMENT

## 7.1. Initial Site Noise Risk Assessment

The initial site noise risk assessment has identified that the site is generally at a negligible risk of adverse noise effect during the daytime period and at a negligible to low risk of adverse noise effect during the night-time period. The site also has an area of medium to high risk of adverse noise effect within 62 m of School Road and a small area of medium risk of adverse noise effect within approximately 25 m of Bonville Road.

## 7.2. External Noise Levels

The assessment of external noise levels identifies that the majority of private amenity areas will experience noise levels within or below the target noise level range of 50 dB to 55 dB $L_{Aeq, 16hr}$. Noise mitigation in the form of acoustic fencing to the rear of the amenity areas for dwellings with a line of sight to the school playgrounds and for R8 is required.

## 7.3. Internal Noise Levels

It has been identified that for the majority of facades the internal noise level criteria would be achieved with open windows for ventilation.

Based on the Illustrative Masterplan in **Figure F.4**, windows to habitable rooms overlooking School Road should achieve a minimum sound reduction of 21 dB(A) which should be achievable through standard double glazed windows; and for habitable rooms of dwellings directly overlooking Broomhill Road, a minimum sound reduction of 29 dB(A) is required for the building façade.

Recommendations for glazing specifications which achieve this level of sound reduction have been provided in **Section 6.2**, which has also included discussion of sound insulation of ventilators.

## 7.4. Recommendations to the Decision Maker

On the basis of the above, it is recommended that there should be no objection to granting outline planning consent for the proposed development on noise grounds. The exact noise mitigation measures will need to be confirmed and designed in at reserved matters stage. The mitigation measures take the form of acoustic fencing and building façade design measures which can be easily accommodated and therefore present no constraints to development of the site in principle for residential use.


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# ADDITIONAL FIGURES


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## Figure F.1: Proposed Site Layout



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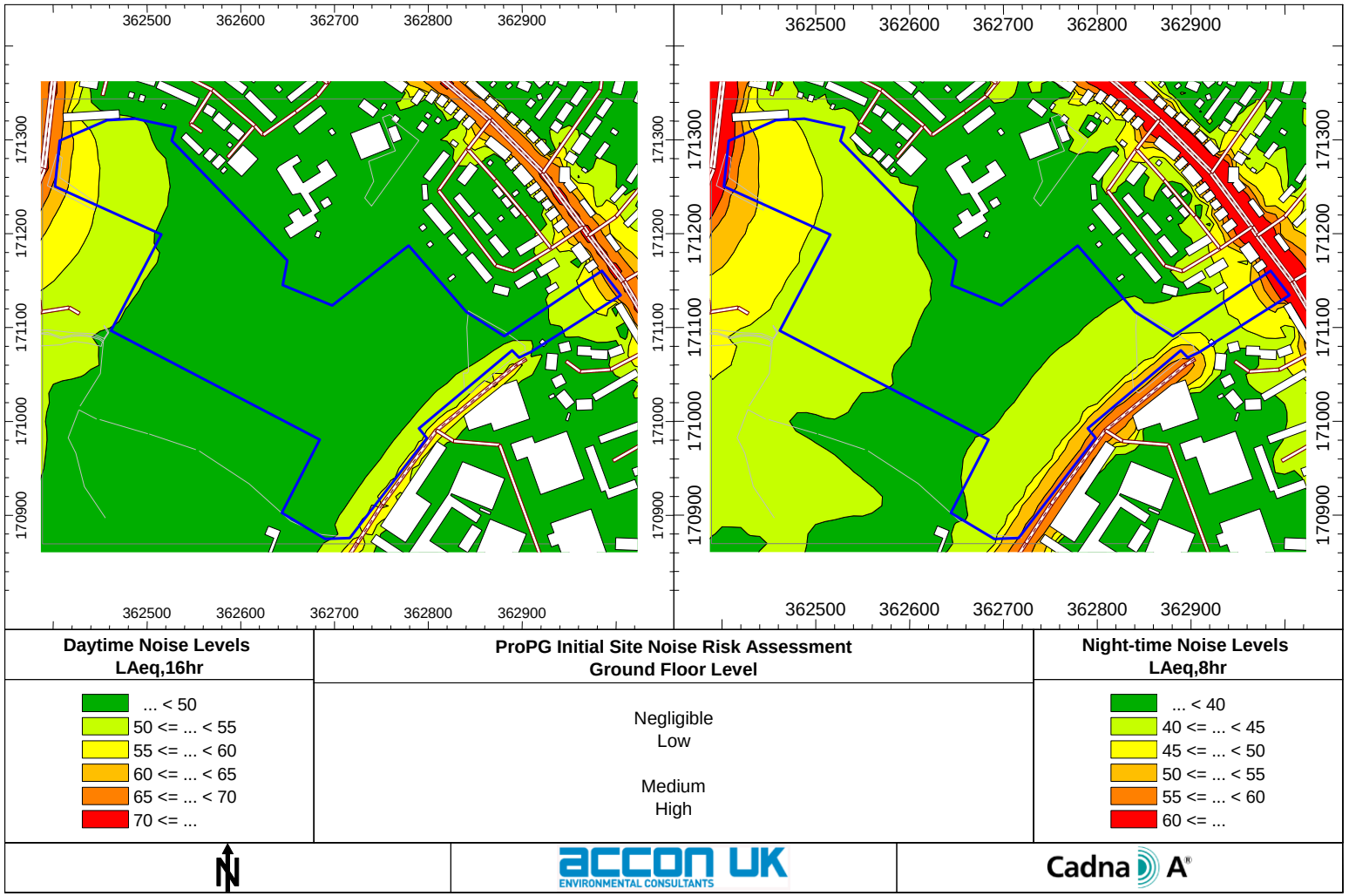
## Figure F.2: ProPG Initial Site Noise Risk Assessment for Ground Floor (Height 1.5 m)



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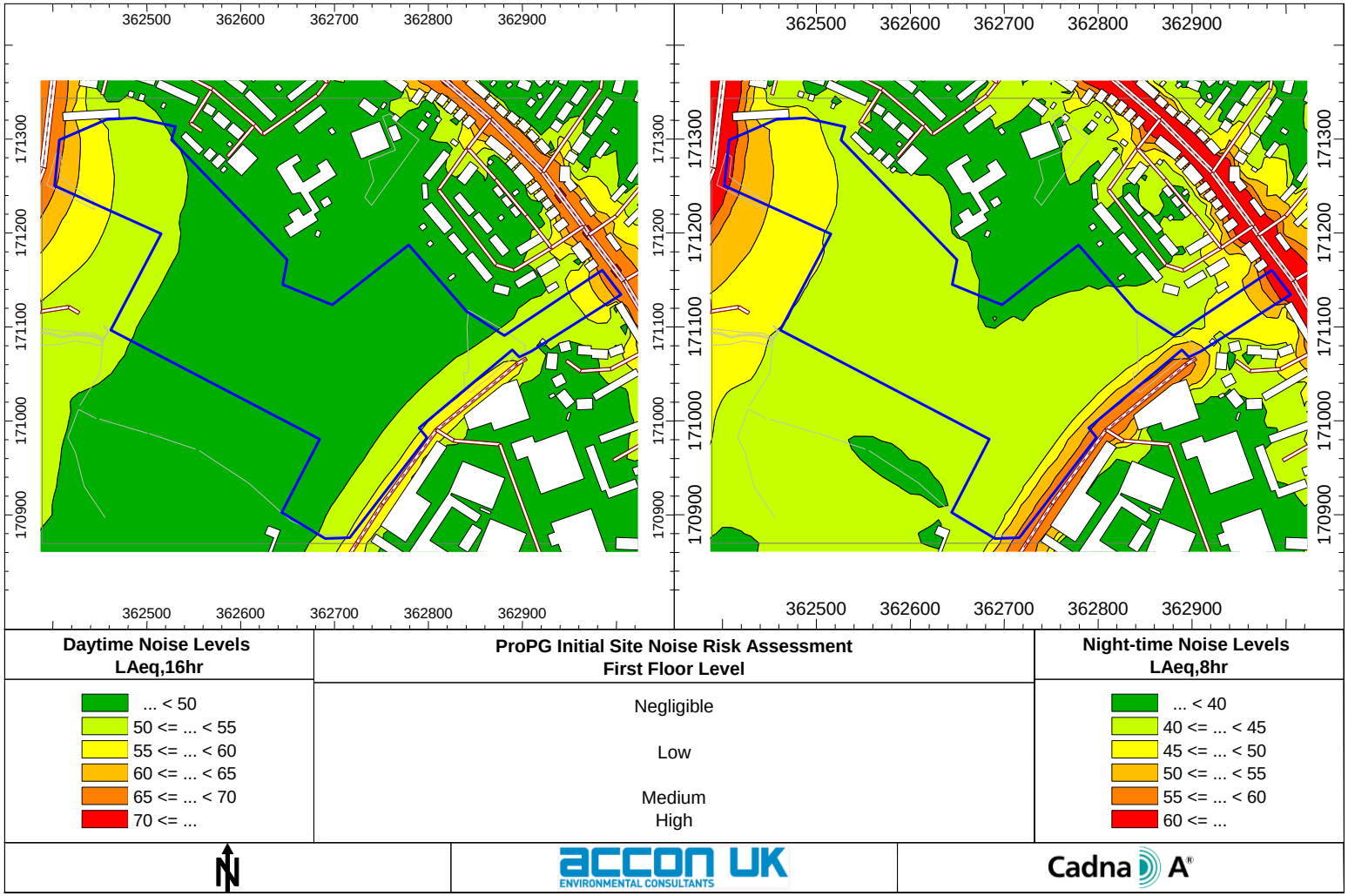
## Figure F.3: ProPG Initial Site Noise Risk Assessment for First Floor (Height 4.5 m)



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## Figure F.4: Illustrative Masterplan with Receptor Locations



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## Figure F.5: Predicted External Noise Levels (Height 1.5 m)


Daytime Noise Levels
LAeq,16hr

... < 50
50 <= ... < 55
55 <= ... < 60
60 <= ... < 65
65 <= ... < 70
70 <= ...

**Predicted Daytime Noise Contours**
**Ground Floor Level (Height 1.5 m)**


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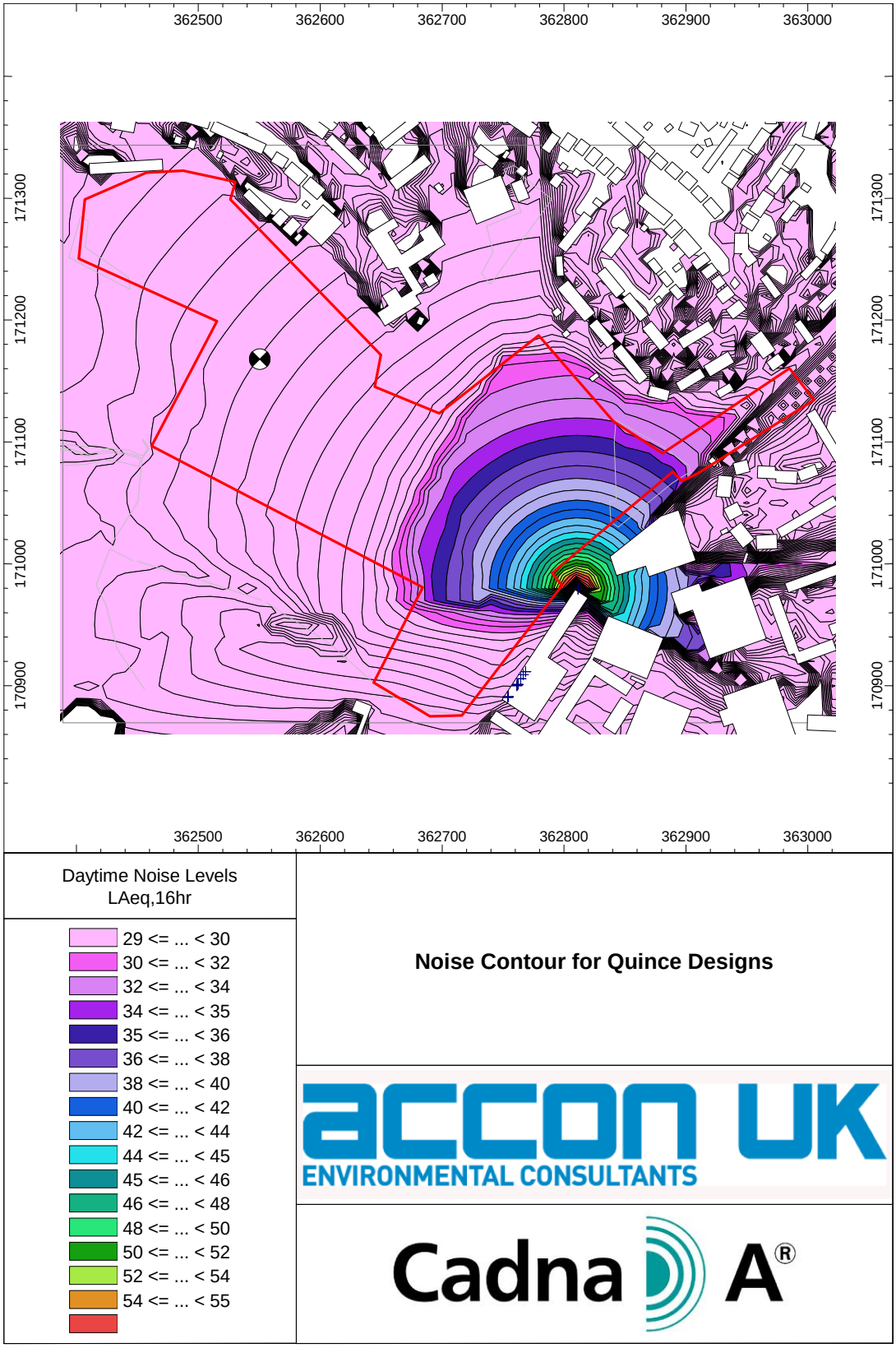
## Figure F.6: Noise Contour for Quince Designs





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# APPENDICES


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Appendix 1
# Glossary of Acoustic Terminology


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| Term | Description |
|---|---|
| *'A'-Weighting* | *This is the main way of adjusting measured sound pressure levels to take into account human hearing, and our uneven frequency response.* |
| *Decibel (dB)* | *This is a tenth (deci) of a bel. A decibel can be a measure of the magnitude of sound, changes in sound level and a measure of sound insulation. Decibels are not an absolute unit of measurement but are an expression of ratio between two quantities expressed in logarithmic form.* |
| *Frequency* | *Frequency is related to sound pitch; frequency equals the ratio between velocity of sound and wavelength.* |
| $L_{Aeq,T}$ *(Ambient /Period Sound Level)* | *The equivalent steady sound level in dB containing the same acoustic energy as the actual fluctuating sound level over the given period, T. T may be as short as 1 second when used to describe a single event, or as long as 24 hours when used to describe the noise climate at a specified location.* $L_{Aeq,T}$ *can be measured directly with an integrating sound level meter.* |
| $L_{A10,T}$ *(Road Traffic Noise Level)* | *The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 10 per cent of a given time. The* $L_{A10,T}$ *is used to describe road traffic noise levels at a particular location.* |
| $L_{A90,T}$ *(Background Sound Level)* | *The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 90 per cent of a given time. The* $L_{A90,T}$ *is used to describe the background noise levels at a particular location.* |
| $L_{Amax}$ | *The 'A'-weighted maximum sound pressure level measured over a measurement period.* |


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# Appendix 2
# **Noise Measurement Results**


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# NOISE MEASUREMENT RESULTS FOR MP1

| Time | $L_{Aeq,T}$ (dB) | $L_{AMax}$ (dB) | $L_{A10,T}$ (dB) | $L_{A90,T}$ (dB) |
|---|---|---|---|---|
| 13:00-14:00 | 51 | 78 | 54 | 46 |
| 14:00-15:00 | 59 | 88 | 52 | 45 |
| 15:00-16:00 | 48 | 70 | 49 | 43 |
| 16:00-17:00 | 46 | 69 | 47 | 43 |
| 17:00-18:00 | 45 | 71 | 46 | 42 |
| 18:00-19:00 | 49 | 74 | 49 | 42 |
| 19:00-20:00 | 43 | 67 | 44 | 40 |
| 20:00-21:00 | 41 | 66 | 42 | 39 |
| 21:00-22:00 | 41 | 65 | 43 | 39 |
| 22:00-23:00 | 41 | 58 | 43 | 39 |
| 23:00-00:00 | 41 | 65 | 41 | 37 |
| 00:00-01:00 | 39 | 57 | 40 | 36 |
| 01:00-02:00 | 37 | 58 | 38 | 34 |
| 02:00-03:00 | 38 | 54 | 40 | 36 |
| 03:00-04:00 | 39 | 59 | 41 | 37 |
| 04:00-05:00 | 41 | 53 | 43 | 40 |
| 05:00-06:00 | 44 | 56 | 45 | 42 |
| 06:00-07:00 | 50 | 77 | 49 | 45 |
| 07:00-08:00 | 50 | 76 | 50 | 47 |
| 08:00-09:00 | 50 | 71 | 50 | 47 |
| 09:00-10:00 | 47 | 69 | 49 | 44 |
| 10:00-11:00 | 48 | 69 | 50 | 45 |


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| Time | $L_{Aeq,T}$ (dB) | $L_{Amax}$ (dB) | $L_{A10,T}$ (dB) | $L_{A90,T}$ (dB) |
|---|---|---|---|---|
| *11:00-12:00*[1] | *48* | *68* | *50* | *46* |
| *12:00-13:00*[1] | *49* | *65* | *51* | *46* |
| 13:00-14:00 | 47 | 67 | 49 | 45 |
| 14:00-15:00 | 50 | 69 | 51 | 46 |
| **Overall Daytime** | **48** | **70** | **48** | **43** |
| **Overall Night-time** | **44** | **60** | **42** | **38** |
| **Daytime**[2] | **48** | **69** | **48** | **43** |
| **Night-time**[2] | **44** | **60** | **42** | **39** |

Note 1: Noise measurements obtained during the period of heavy rain which resulted in a delay to the measurement equipment being collected and is excluded from the data analysis presented in **Table 4.1**.
Note 2: The $L_{Aeq, T}$, $L_{Amax}$, $L_{A10}$, T and $L_{A90, T}$ calculated with the data obtained during the period of rain excluded.


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# NOISE MEASUREMENT RESULTS FOR MP2

| Time | $L_{Aeq,T}$ (dB) | $L_{AMax}$ (dB) | $L_{A10,T}$ (dB) | $L_{A90,T}$ (dB) |
|---|---|---|---|---|
| 13:00-14:00 | 49 | 67 | 51 | 45 |
| *14:00-15:00*[2] | *53* | *75* | *53* | *44* |
| 15:00-16:00 | 50 | 75 | 50 | 43 |
| 16:00-17:00 | 46 | 64 | 48 | 42 |
| 17:00-18:00 | 45 | 61 | 47 | 41 |
| 18:00-19:00 | 46 | 69 | 48 | 40 |
| 19:00-20:00 | 43 | 65 | 43 | 39 |
| 20:00-21:00 | 42 | 65 | 42 | 39 |
| 21:00-22:00 | 41 | 57 | 42 | 39 |
| 22:00-23:00 | 41 | 58 | 43 | 38 |
| 23:00-00:00 | 40 | 56 | 41 | 37 |
| 00:00-01:00 | 38 | 49 | 39 | 36 |
| 01:00-02:00 | 37 | 55 | 38 | 35 |
| 02:00-03:00 | 38 | 50 | 40 | 36 |
| 03:00-04:00 | 40 | 61 | 41 | 37 |
| 04:00-05:00 | 42 | 55 | 44 | 40 |
| 05:00-06:00 | 45 | 57 | 47 | 43 |
| 06:00-07:00 | 49 | 65 | 51 | 45 |
| 07:00-08:00 | 53 | 82 | 54 | 49 |
| 08:00-09:00 | 55 | 76 | 56 | 52 |
| 09:00-10:00 | 50 | 63 | 52 | 46 |


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| Time | $L_{Aeq,T}$ (dB) | $L_{Amax}$ (dB) | $L_{A10,T}$ (dB) | $L_{A90,T}$ (dB) |
|---|---|---|---|---|
| 10:00-11:00 | 50 | 72 | 52 | 45 |
| *11:00-12:00*[1] | *51* | *81* | *52* | *47* |
| *12:00-13:00*[1] | *49* | *75* | *51* | *45* |
| 13:00-14:00 | 47 | 72 | 49 | 44 |
| 14:00-15:00 | 50 | 65 | 52 | 46 |
| **Overall Daytime** | **48** | **69** | **49** | **43** |
| **Overall Night-time** | **43** | **56** | **43** | **39** |
| **Daytime**[3] | **47** | **67** | **49** | **43** |
| **Night-time**[3] | **43** | **56** | **43** | **39** |

Note 1: Noise measurements obtained during the period of heavy rain which resulted in a delay to the measurement equipment being collected and is excluded from the data analysis presented in **Table 4.1**.
Note 2: A period of quad bikes being ridden near MP2 has been excluded as this is not a typical noise climate.
Note 3: The $L_{Aeq,T}$, $L_{Amax}$, $L_{A10}$, T and $L_{A90,T}$ calculated with the data obtained during the period of rain excluded.


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