

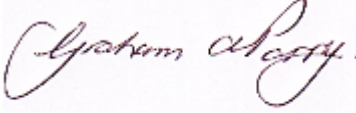
Report for:

Sharp's Commercial

26-28 Southampton Street, Reading
Noise Impact Assessment

Status: Final

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1. INTRODUCTION

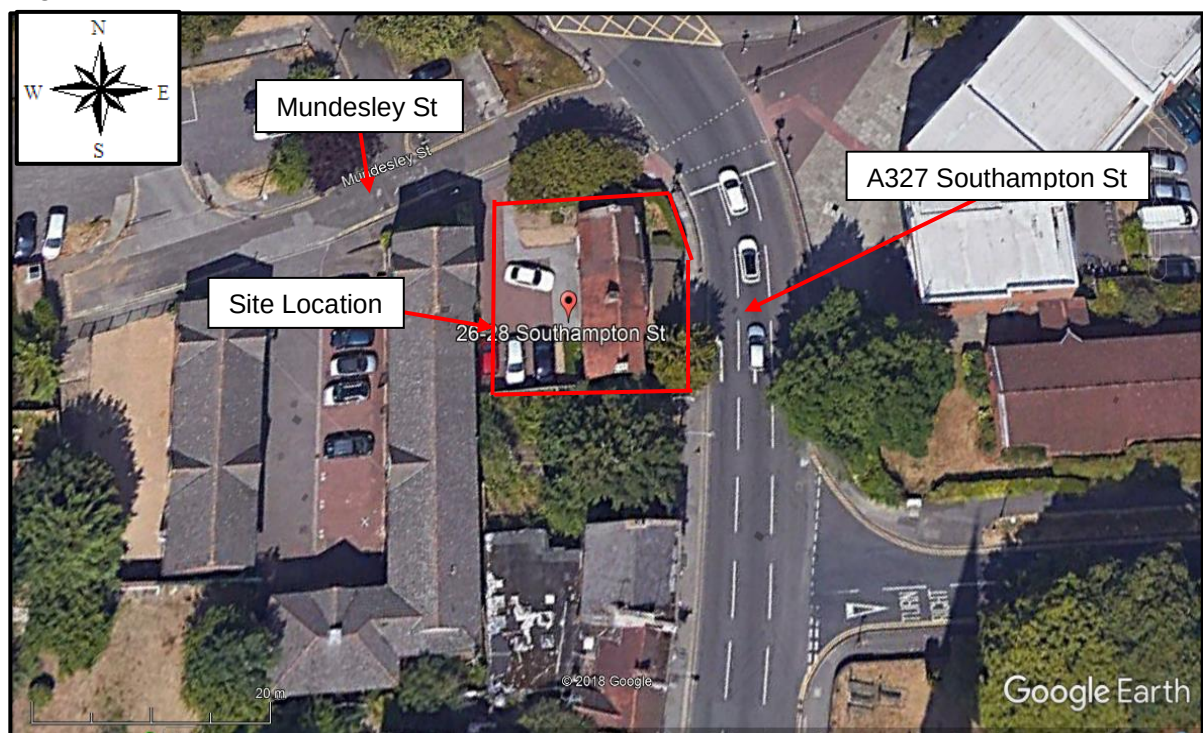
ACCON UK Limited (ACCON) has been commissioned by Sharp's Commercial to carry out a noise impact assessment for 26-28 Southampton Street, Reading. The proposed development is to convert the buildings from offices into two flats and one house. The existing buildings at 26 and 28 Southampton Street are both Grade II Listed Buildings^{1,2}.

The site is located on the junction of the A327 Southampton Street with the Oracle Roundabout and is approximately 40 m to the south of the A329 elevated carriageway which passes over the Oracle Roundabout. St Giles in Reading Church is located approximately 40 m to the south-east of the site on Southampton Street. It is noted that bell-ringing practice occurs on Wednesday evenings for approximately 1 hour between 2000 hrs and 2100 hrs and that the bells are also rung on a Sunday morning before the Church service.

The site is located within the administrative area of Reading Borough Council (RBC).

An environmental noise survey has been carried out at the site and road traffic noise has been identified as the dominant noise source. The results of the noise measurement survey have been utilised in order to assess the impact of road traffic noise on the proposed development.

Figure 1.1: Location Plan



¹ <https://historicengland.org.uk/listing/the-list/list-entry/1113582> Retrieved 5th April 2019

² <https://historicengland.org.uk/listing/the-list/list-entry/1113583> Retrieved 5th April 2019

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 10 dB(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 perceptible³. **Table 2.1** provides typical noise levels of common sources.

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**.

³ Institute of Environmental Management and Assessment (2014). Guidelines for environmental noise impact assessment.

3. NOISE ASSESSMENT CRITERIA

3.1. National Planning Policy Framework

The revised National Planning Policy Framework (NPPF, February 2019) supersedes the 2012 and 2018 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 180 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 182 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.”

3.2. Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) was developed by DEFRA and published in March 2010. The vision of the NPSE is to *'Promote good health and good quality of life through the effective management of noise within the context of Government policy on sustainable development'*.

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 updated in December 2014. The PPG-N provides the following advice on how to determine the noise impact on development:

'Local planning authorities' plan-making and decision taking 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.*

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.'

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 level:

- UOAEL: Unacceptable Observed Adverse Effect Level: This is the level above which extensive and regular changes in behaviour and/or an inability to mitigate the effect of noise lead to psychological stress or physical effects.

It is important to understand that as the PPG-N does not provide any advice with respect to specific 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.

3.4. Reading Borough Council

Reading Borough Local Development Framework: Core Strategy was adopted by Reading Borough Council in January 2008 with alterations adopted on 27th January 2015. The strategy has one policy with respect to noise, which has been reproduced below.

Policy CS34: Pollution and Water Resources

Development will only be permitted where it would not be damaging to the environment through air, land, noise or light pollution; where it would preserve or ideally enhance ground and surface water quality; and where existing water resources, sewerage and wastewater treatment infrastructure are adequate to support the proposed development. Proposals for development that are sensitive to the effects of air, noise or light pollution will only be permitted in areas where they will not be subject to high levels of such pollution, unless adequate mitigation measures are provided to minimise the impact of such pollution. Development will be permitted on land affected by contamination where it can be demonstrated, to the satisfaction of the LPA, that the contamination can be satisfactorily remediated so that it is suitable for the proposed end use.

Reading Borough Council are currently producing a new Local Plan which will replace the current development plans (the Core Strategy, Reading Central Area Action Plan and Sites and Detailed Policies Document). The policy regarding noise in the draft Local Plan (EN16) is the same as the policy in the existing Local Development Framework: Core Strategy.

3.5. Noise Guidance

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

The ProPG was published in May 2017 and has been produced to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England. The scope of the ProPG is applicable to the consideration of new residential development that will be exposed predominantly to airborne noise from transport sources.

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”.

Details of how the above four elements have been considered should be included in a supporting Acoustic Design Statement (ADS).

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

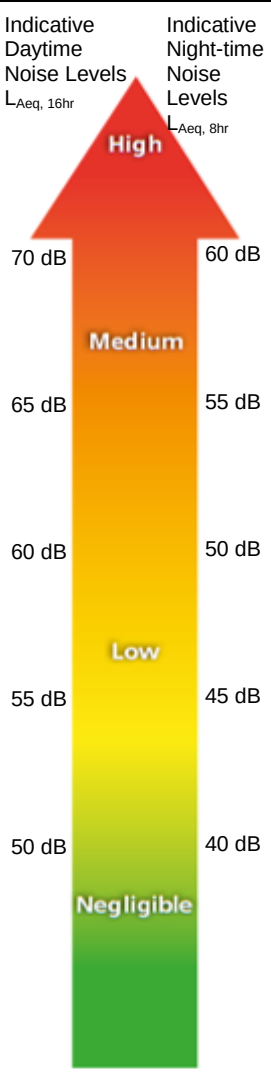
Noise Risk Assessment	Potential Effect Without Noise Mitigation	Pre-Planning Application Advice
	Increasing risk of adverse effect	High noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice. 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. 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: - Indicative noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures. - 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". $L_{Aeq, 16hr}$ is for daytime 0700 - 2300, $L_{Aeq, 8hr}$ is for night-time 2300 - 0700. - 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.		

Figure 3.2 below identifies the internal noise level criteria provided in the ProPG.

Figure 3.2: 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 $L_{Aeq,8hr}$ 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 World Health Organization 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 of ProPG).
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 of ProPG).

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 for the residential environment are reproduced in **Table 3.1**.

Table 3.1: 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 BS8233 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 3.2**. For each specific environment, the stated noise levels are the maximum noise levels to avoid the health effect noted.

Table 3.2: 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_{Amax} level during the night-time period as opposed to the highest level in order to represent typical L_{Amax} 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** Error! eference source not found.) and “any values not covered by the current guidelines” should remain valid.

Table 3.3 provides a summary of the WHO ENG recommendations for road traffic noise, railway noise, aircraft noise and wind turbine noise

Table 3.3: 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”.

3.6. Target Noise Level

3.6.1. External Noise Levels

The target external noise level for amenity areas and gardens is 50 dB $L_{Aeq,16hr}$. However, this level may be ‘relaxed’ to 55 dB $L_{Aeq,16hr}$ assuming that all reasonably practicable mitigation measures have been considered in line with good acoustic design.

3.6.2. Internal Noise Levels

During the daytime, the internal noise levels within living rooms should not exceed 35 dB $L_{Aeq,16hr}$ and within dining rooms should not exceed 40 dB $L_{Aeq,16hr}$. During the night-time, the internal noise levels within habitable rooms should not exceed 30 dB $L_{Aeq,8hr}$ and the maximum noise levels should not normally exceed 45 dB L_{AFmax} more than 10 times a night.

4. NOISE MEASUREMENT SURVEY

4.1. Introduction

A detailed noise measurement study was carried out at an adjacent property in 34-38 Southampton Street over a 24-hour period in May 2017. In order to validate the suitability of these measurements in assessing noise at 26-28 Southampton Street, a further three-hour noise measurement study was carried out on the 5th April 2019 in accordance with the Calculation of Road Traffic Noise (CRTN) Shortened Measurement Procedure. The noise levels measured at 26-28 Southampton Street on the 5th April 2019 have been compared with the noise levels measured over the same period in May 2017 to determine whether there has been a significant change in road traffic noise levels. Any significant change in road traffic noise levels has been factored into the noise modelling for the proposed development.

4.2. Noise Measurements May 2017

The noise measurements were carried out over a 24-hour period at two locations between 1000 hrs on Wednesday 31st May 2017 and 1045 hrs on Thursday 1st June 2017.

Measurement Position 1 (MP1) was located approximately 1 m from the building facade of The Red Lion Public House building (34-36 Southampton Street) and approximately 6 m above local ground level. The noise measurements obtained at this position were corrected to free-field noise levels by applying a -3 dB correction for facade reflections.

Measurement Position 2 (MP2) was located in a free-field position within the external area located between 34-36 Southampton Street and the site at 26-28 Southampton Street. The microphone was positioned on a tripod at a height of 4 m above the local ground level and approximately 3.35 m above some decking which filled part of this area.

The noise measurement positions can be identified on a plan in **Figure F.1**.

Those noise measurements utilised Norsonic 118 and Rion NL-52 Class 1 Sound Level Meters. Calibration certificates for these sound level meters are available upon request. Before and after the noise measurement period, the equipment was calibrated in order to ensure that the equipment had remained within reasonable calibration limits (± 0.5 dB).

The measured free-field noise levels are summarised in **Table 4.1**.

Table 4.1: Summary of Measured Noise Levels May 2017

Measurement Position	Period (hours)	L _{Aeq,T} (dB)	L _{AFmax} (dB)	Average L _{A10,5mins} (dB)	Average L _{A90,5mins} (dB)
MP1	Daytime 0700 hrs to 2300 hrs	70	93.1	69	59
	Night-time 2300 hrs to 0700 hrs	60	81.0	62	46

Measurement Position	Period (hours)	L _{Aeq,T} (dB)	L _{AFmax} (dB)	Average L _{A10,5mins} (dB)	Average L _{A90,5mins} (dB)
MP2	Daytime 0700 hrs to 2300 hrs	62	83.6	63	55
	Night-time 2300 hrs to 0700 hrs	57	73.8	59	45

Note: The L_{Aeq} is logarithmically averaged over the measurement periods, the L_{Amax} is the arithmetic average of the highest L_{Amax} levels recorded in each hour of the measurement period and the L_{A10} and L_{A90} are arithmetically averaged over the measurement periods.

4.3. Noise Measurements April 2019

The noise measurements were carried out between 1200 hrs and 1500 hrs at measurement position 3 (MP3).

MP3 was located at the front of 26-28 Southampton Street approximately 3 m from the facade of the building and 3 m from the carriageway. The noise measurement position with the May 2017 measurement positions, can be identified in **Figure F.1**.

The noise measurements utilised a Rion NL-52 Class 1 Sound Level Meter. The meter holds a current certificate of calibration that can be made available upon request. Before and after the measurement period, the equipment was calibrated to ensure that the equipment had remained within reasonable calibration limits (± 0.5 dB).

The weather conditions recorded during the 5th of April 2019 were dry with approximately 100% cloud cover. The wind had a speed of between 2 and 3 m/s in a south-east direction and a temperature of approximately 11°C.

These weather conditions are considered suitable for the noise measurement survey.

The measured free-field noise levels are summarised in **Table 4.2**.

Table 4.2: Measured free-field noise levels

Measurement Position	Period (hours)	L _{Aeq,T} (dB)	L _{AFmax} (dB)	Average L _{A10,5mins} (dB)	Average L _{A90,5mins} (dB)
MP3	1200 – 1500	70.1	99.5	72.6	62.8

Note: The L_{Aeq} is logarithmically averaged over the measurement periods, the L_{Amax} is the highest L_{Amax} level recorded in the measurement period and the L_{A10} and L_{A90} are arithmetically averaged over the measurement periods.

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, 1988) to predict noise from road traffic.

The noise impact assessment has been carried out with reference to the following KC drawings:

- Drawing No. PL-04 Issued on 26/04/2018, Existing Plans
- Drawing No. PL-02 Issued on 26/04/2018, Proposed Site Plan
- Drawing No. PL-06 Issued on 26/04/2018, Proposed Plans

Figure F.2, **Figure F.3** and **Figure F.4** identify the above plans respectively.

5.2. Stage 1: Initial Site Noise Risk Assessment

Figure F.5 and **Figure F.6** present the baseline daytime and night-time ($L_{Aeq,T}$) period noise contours for the site at a height of 1.5 m and 4.0 m, respectively.

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.

Figure F.5 indicates that the site is generally of medium to high risk of adverse noise effect during the daytime period.

Figure F.6 indicates that the site is generally of a high risk of adverse noise effect during the night-time period.

5.3. Stage 2: Noise Impact Assessment

5.3.1. External Noise Levels

It can be identified in **Figure F.5** that the external noise levels would exceed the target external noise level range of 50 $L_{Aeq,16hr}$ to 55 dB $L_{Aeq,16hr}$ within the rear amenity area.

5.3.2. Internal Noise Levels

The CadnaA noise model has been utilised to calculate the external free-field period noise levels at the façades of the building in order to inform the assessment of internal noise levels.

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 window would result in "a [sound] reduction from outside to inside of 15 dB".

Table C.1 of Appendix 3 presents the highest predicted daytime and night-time external and internal noise levels at the building façades assuming open windows for ventilation. Maximum noise levels (L_{AFmax}) have also been assessed for the different facades of the building.

6. MITIGATION MEASURES

6.1. External Noise Levels

Section 5.3.1 demonstrates that the target noise levels have not been achieved in external amenity areas. A typical 1.8 metre high environmental fence/barrier was considered as a form of mitigation in the CadnaA model, however this only results in a 0.4 dB decrease of the amenity area noise levels.

6.2. Internal Noise Levels

Section **5.3.2** has identified that the target internal noise levels would not be achieved with open windows for ventilation for the majority of the habitable rooms in the proposed development.

Table C.1 in **Appendix 3** identifies the Combined Façade Sound Reduction Requirements for the change of use development in each habitable room.

A minimum combined façade sound reduction of 36 dB (A) for façades overlooking the A327 Southampton Street and 32 dB (A) for the rear facades of the building should be achievable with the addition of a secondary glazing window system from appropriate glazing companies example details of which are provided below:

- Selectaglaze (<https://www.selectaglaze.co.uk/> retrieved on 10/04/2019)
- SecondaryGlazingUK (<https://www.secondaryglazing.com/> retrieved on 10/04/2019)

6.3. Acoustics, Ventilation and Overheating

Whole dwelling ventilation, which is defined in Approved Document F *Ventilation: F1: Means of ventilation* as the dilution and removal of pollutants and water vapour, should be achievable through the provision of open windows, acoustic trickle ventilators, acoustically treated through-wall ventilators or mechanical means of whole house ventilation.

Purge ventilation is typically only required for short periods of time to let out smoke or an odour. When purge ventilation is required by opening windows, exposure to noise will only increase for a very short period of time and is not considered to be a material consideration for the Proposed Development.

The requirement to achieve the target internal noise levels with windows closed may result in the unintended adverse consequences associated with thermal comfort.

In respect of thermal comfort, noise can be considered an issue as windows may otherwise need to be left open for an extended period of time, for example, on warm summer days and nights. In Britain, the requirement for keeping windows open for thermal comfort is typically limited to a relatively small number of days during May to September.

The following advice is provided in ProPG Paragraph 2.34:

“Special care must be taken to design the accommodation so that it provides good standards of acoustics, ventilation and thermal comfort without unduly compromising other aspects of the living environment”.

ProPG also states in paragraph 2.36:

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"It should be noted that overheating issues will vary across the country and any specific design solutions will need to be developed alongside advice from energy consultants"

7. ACOUSTIC DESIGN STATEMENT

An environmental noise survey has been carried out at the site and a detailed noise model has been prepared for the site. The noise model has been calibrated utilising on-site noise measurements which were obtained at Measurement Positions MP1, MP2 and MP3.

The noise modelling has been used to inform the initial site noise risk assessment and noise impact assessment for the change of use development proposals. The assessments should be considered as part of the good acoustic design process

7.1. Initial Site Noise Risk Assessment

The initial site noise risk assessment has identified that the site is of medium to high risk of adverse noise effect during the daytime period and of a high risk of adverse noise effect during the night-time period.

7.2. External Noise Levels

Section 5.3.1 identified that the noise levels within the amenity area to the rear of the buildings would exceed the upper target noise level of 55 dB $L_{Aeq,16hr}$, however would be below 60 dB $L_{Aeq,16hr}$.

7.3. Internal Noise Levels

Section 5.3.2 identified that the target internal noise levels would not be achieved with open windows for ventilation in the majority of the proposed development. Mitigation in the form of a secondary glazing window system is proposed in **Section 6.2**.

7.4. Recommendations to the Decision Maker

On the basis of the above, it is recommended that there should be no objection to granting planning consent for the proposed development on noise grounds.

ADDITIONAL FIGURES

Figure F.1: Noise Measurement Locations

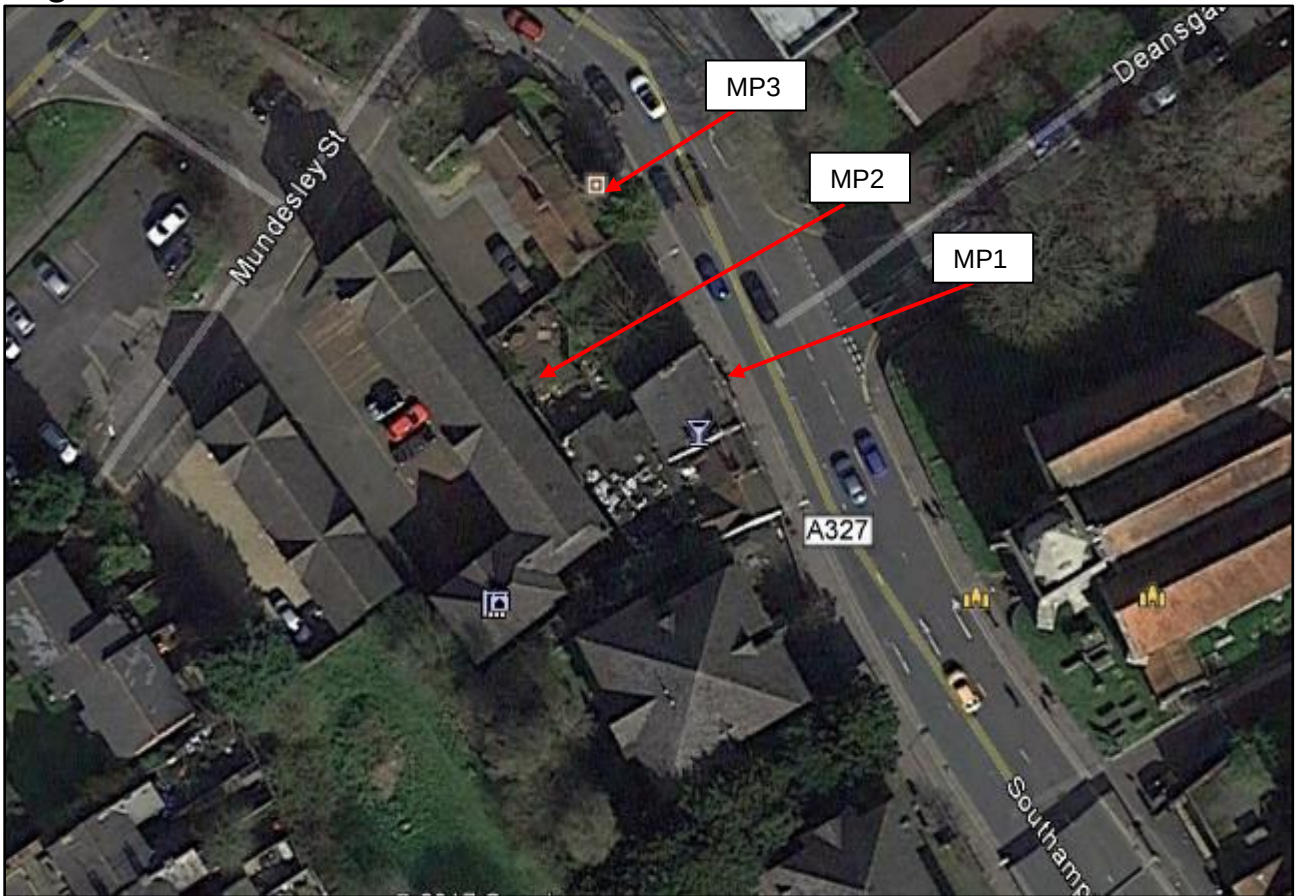


Figure F.2: Existing Indoor Layout Plans

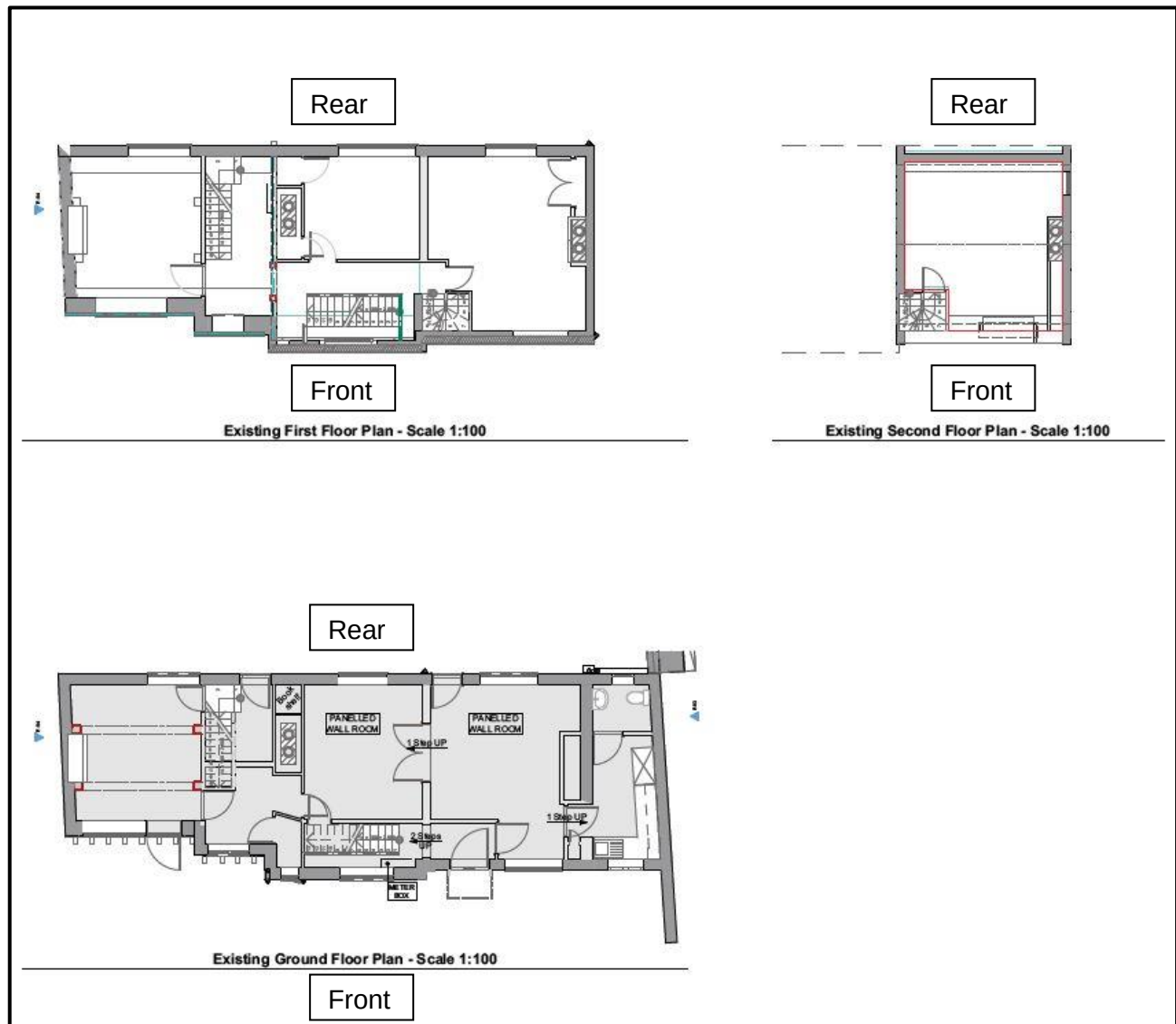


Figure F.3: Proposed Site Layout



Figure F.4: Proposed Indoor Layout Plans

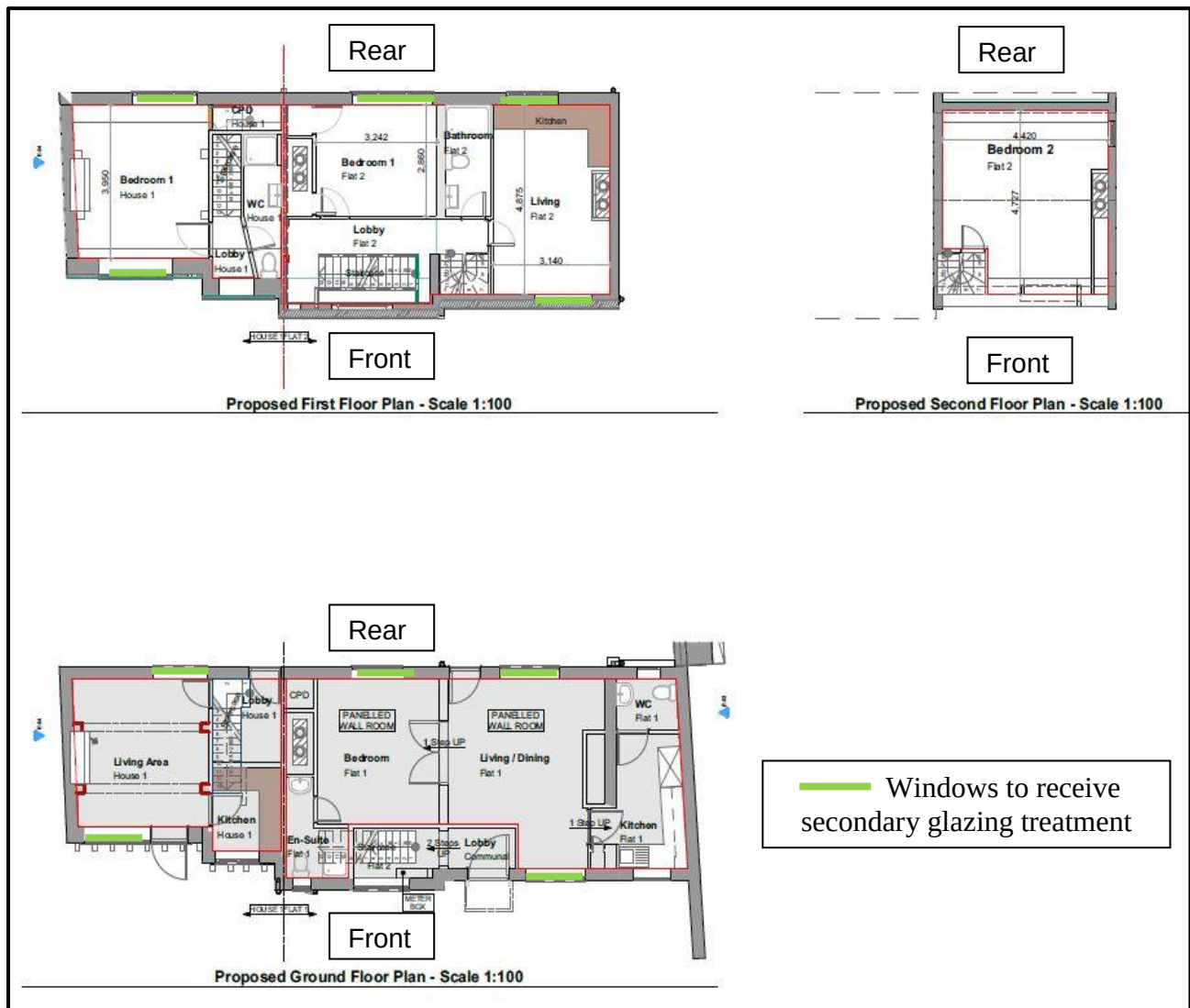


Figure F.5: Initial Site Noise Risk Assessment Daytime

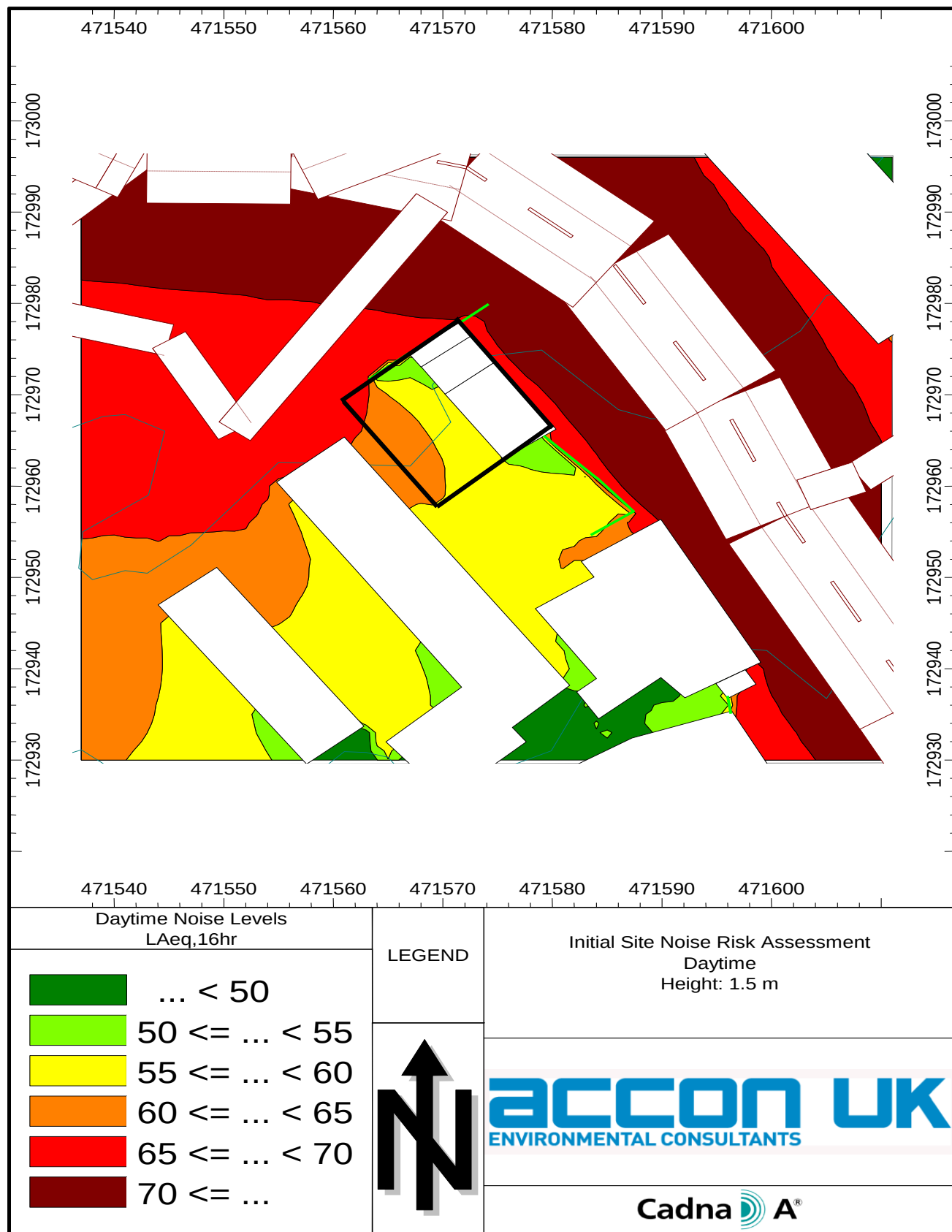
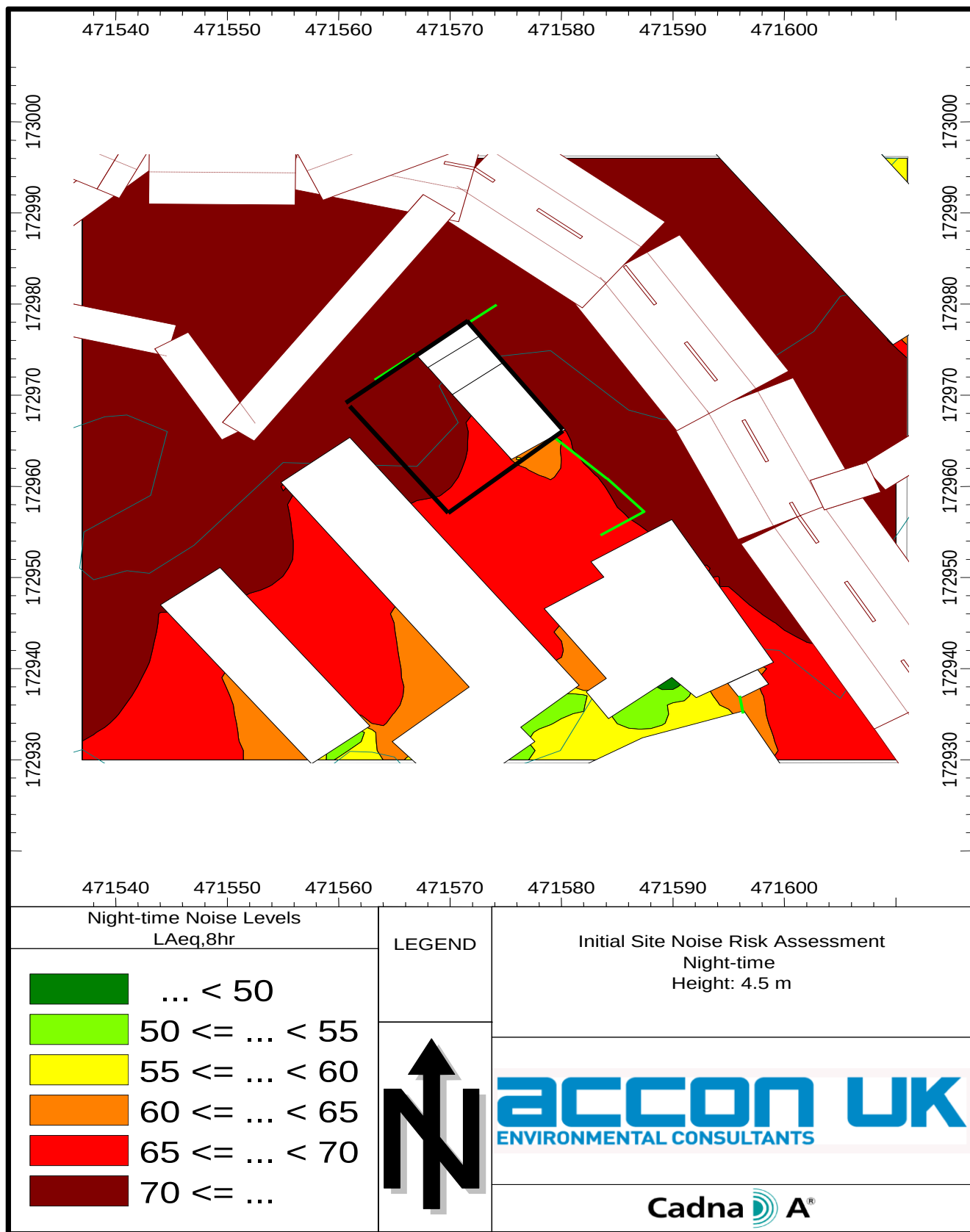


Figure F.6: Initial Site Noise Risk Assessment Night-time



APPENDICES

Appendix 1

Glossary of Acoustic Terminology

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.
$L_{Aeq,T}$ (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}	<i>The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 10 per cent of a given time and is the L_{A10T}. The $L_{A10,18h}$ is used to describe the levels of road traffic noise at a particular location when evaluated as the average level for each hour between 0600 and 0000 hrs on a weekday.</i>
$L_{A90,T}$ (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.
Sound Power Level	The total sound energy radiated by a sound source in all directions. In decibels with a reference level of 1×10^{-12} Watts

Appendix 2

Summary of Noise Measurements

Table 7.1: Noise measurements results for MP1 (May 2017)

Time	L _{Aeq} , T (dB)	L _A F(max) (dB)	L _A 10 (dB)	L _A 90 (dB)
0700 - 0800	66.6	79.6	70.0	59.4
0800 - 0900	68.9	101.7	69.5	59.9
0900 - 1000	70.2	99.9	69.2	59.3
1000 - 1100	66.2	90.8	68.8	59.5
1100 - 1200	74.0	107.3	69.9	59.5
1200 - 1300	66.2	82.6	69.1	59.9
1300 - 1400	66.6	95.1	69.0	59.5
1400 - 1500	65.9	85.8	68.7	59.8
1500 - 1600	75.8	103.2	68.7	59.7
1600 - 1700	74.2	104.1	68.8	59.7
1700 - 1800	66.8	96.7	68.2	59.4
1800 - 1900	70.4	101.7	68.3	59.0
1900 - 2000	68.0	78.4	70.3	58.9
2000 - 2100	71.3	86.2	73.7	63.0
2100 - 2200	65.1	96.6	67.1	55.3
2200 - 2300	62.6	80.6	66.2	53.6
2300 - 0000	62.6	89.5	65.3	50.6
0000 - 0100	59.2	76.4	63.2	46.5
0100 - 0200	56.9	81.9	59.7	42.5
0200 - 0300	55.6	74.0	58.4	39.0
0300 - 0400	57.4	77.5	60.0	43.0
0400 - 0500	57.4	79.9	59.9	43.0

Time	L _{Aeq} , T (dB)	L _{AF} (max) (dB)	L _{A10} (dB)	L _{A90} (dB)
0500 - 0600	61.2	87.1	64.1	47.4
0600 - 0700	64.7	81.9	68.1	55.0
0700 - 2300	70.3	93.1	69.1	59.1
2300 - 0700	60.4	81.0	62.3	45.9

Table 7.2: Noise measurements results for MP2 (May 2017)

Time	L _{Aeq} , T (dB)	L _{AF} (max) (dB)	L _{A10} (dB)	L _{A90} (dB)
0700 - 0800	61.5	80.7	64.0	56.0
0800 - 0900	63.0	89.5	64.6	56.2
0900 - 1000	62.2	86.8	63.3	55.6
1000 - 1100	60.6	80.1	62.9	55.6
1100 - 1200	64.3	90.3	63.8	56.3
1200 - 1300	60.6	76.5	62.9	56.0
1300 - 1400	61.3	86.7	62.6	55.4
1400 - 1500	60.9	81.8	62.3	55.6
1500 - 1600	64.7	92.1	63.5	55.5
1600 - 1700	63.2	90.7	63.0	55.4
1700 - 1800	59.9	80.5	62.0	54.7
1800 - 1900	62.3	89.6	62.4	55.2
1900 - 2000	61.3	76.4	63.4	55.7
2000 - 2100	63.9	79.3	66.2	58.3
2100 - 2200	58.8	82.3	61.1	53.0

Time	L _{Aeq} , T (dB)	L _{AF} (max) (dB)	L _{A10} (dB)	L _{A90} (dB)
2200 - 2300	57.5	73.8	60.3	51.5
2300 - 0000	56.2	76.3	58.7	49.5
0000 - 0100	54.0	68.9	57.1	46.2
0100 - 0200	52.5	76.1	55.6	42.5
0200 - 0300	50.6	68.2	54.5	39.1
0300 - 0400	57.0	76.2	60.2	43.1
0400 - 0500	58.1	71.1	62.4	42.7
0500 - 0600	58.2	72.9	61.8	46.8
0600 - 0700	60.0	80.8	62.7	53.3
0700 - 2300	62.0	83.6	63.0	55.4
2300 - 0700	56.7	73.8	59.1	45.4

Table 7.3: Noise measurement results for MP3 (April 2019)

Time	L _{Aeq} , T (dB)	L _{AF} (max) (dB)	L _{A10} (dB)	L _{A90} (dB)
1200 – 1300	70.7	96.1	72.8	62.7
1300 – 1400	70.3	99.5	73	63.3
1400 – 1500	68.9	91.3	72.1	62.5
1200 - 1500	70.1	99.5	72.6	62.8
0700 - 2300	74.0			
2300 - 0700	64.1			

Appendix 3 **Internal Noise Assessment Results**

Table C.1: Predicted Internal Noise Levels with Open Windows for Ventilation

Location	Predicted External Noise Levels (dB) ⁽¹⁾			Predicted Internal Noise Levels (dB) With opens windows			Target Internal Noise Levels Achieved?	Combined Façade Sound Reduction Required ⁽²⁾ dB(A)
	Daytime L _{Aeq,16hr}	Night-time L _{Aeq,8hr}	Night-time L _{AFmax}	Daytime L _{Aeq,16hr}	Night-time L _{Aeq,8hr}	Night-time L _{AFmax}		
Ground Floor								
House 1 Living Area Front Façade	71	62	81	56	47	66	X	36
House 1 Living Area Rear Façade	57	55	71	42	40	56	X	26
Flat 1 Bedroom Rear Façade	57	53	71	42	38	56	X	26
Flat 1 Living Room Front Façade	71	64	81	56	49	66	X	36
Flat 1 Living Room Rear Façade	57	53	71	42	38	56	X	26

First Floor								
House 1 Bedroom Front Façade	71	62	81	56	47	66	X	36
House 1 Bedroom Rear Façade	61	58	71	46	43	56	X	28
Flat 2 Bedroom Rear Façade	63	60	71	48	45	56	X	26
Flat 2 Living/Kitchen Front Façade	71	62	81	56	47	66	X	36
Flat 2 Living/Kitchen Rear Façade	63	60	71	48	45	56	X	30
Second Floor								
Flat 2 Bedroom Front Façade	71	64	81	56	49	66	X	36
Flat 2 Bedroom Rear Façade	63	62	71	48	47	56	X	32

Notes:

(1) The internal noise levels are not predicted to exceed the target noise levels by more than 5 dB. It is considered that reasonable internal conditions will still be achieved during the occasions when windows are open for ventilation.



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