

**Land at North Street / Weldale
Street, Reading**

**Prepared for Lochailort
Thames Quarter Limited**

by

**Stuart Michael Associates
Limited**

August 2018



Coombe House
Coombe Square
Thatcham
Berkshire
RG19 4JF

T: 01635 867711
F: 01635 861715
E: mail@stuartmichael.co.uk
W: www.stuartmichael.co.uk

SMA Ref: 5946/NA

Issue Status: ISSUE

DOCUMENT CONTROL			
Project	Land at North Street / Weldale Street, Reading		
Job No.	5946		
Document Title	Noise Assessment		
File Location	N:\Admin Project\5900 to 5999\5946 - North Street, Reading\Reports\Noise\47 Unit\5946 - Noise Report - 01.docx		
Prepared by	William Hicks	Date	August 2018
Reviewed by	Jason Mills	Date	August 2018
Approved by	Stewart Andrews	Date	August 2018
Document Issue	Description / Changes	Revised by	Date
ISSUE	Issued to Client for submission	WAH	31/08/2018



COPYRIGHT

The copyright for this document rests with Stuart Michael Associates Limited. Copyright for documents and other published sources of information prepared by others and used in the document may rest with others.

The contents, in whole or in part, of this document are restricted for use by the client and Stuart Michael Associates Limited in connection with the project in accordance with the terms of engagement. Stuart Michael Associates Limited accepts no liability or responsibility for use of this document for purposes other than those originally intended. Third parties relying on the contents of the document do so at their own risk.

No part of the contents of this document may be copied from any digital viewing system maintained to provide access for public scrutiny or any other source without written permission from the Company Secretary of Stuart Michael Associates Limited.

© Stuart Michael Associates Limited 2018

Stuart Michael Associates Ltd. Registered in England and Wales. Registration Number: 3739154

Registered Office: Coombe House, Coombe Square, Thatcham, Berkshire RG19 4JF.

Telephone: 01635 867711 Facsimile: 01635 861715.



CONTENTS

SECTIONS

		PAGE
1.0	INTRODUCTION	1
2.0	LEGISLATION AND POLICY	5
3.0	METHODOLOGY	12
4.0	EXISTING NOISE PROFILE	13
5.0	NOISE ASSESSMENT	15
6.0	EFFECTS OF THE PROPOSALS DURING CONSTRUCTION	18
7.0	MITIGATION MEASURES	20
8.0	SUMMARY AND CONCLUSIONS	24

FIGURES

Figure 1.1	Site and Noise Measurement Location Plan
Figure 7.1	Glazing Mitigation Plan

TABLES

Table 1.1:	Typical Noise Levels
Table 2.1:	Summary of Internal Noise Criteria: BS 8233 & WHO
Table 4.1:	Equipment used during the field measurements
Table 4.2:	Summary of Recorded Noise Levels at SLM1
Table 6.1:	Construction noise levels at sensitive receptors
Table 7.1:	Example Window Systems

APPENDICES

Appendix 1	Site Layout
Appendix 2	Noise Profile (Graphs)
Appendix 3	Construction Noise Assessment



ACRONYMS AND ABBREVIATIONS

'A' weighted	'A' weighting is applied to the measured sound pressure levels so that these levels correspond more closely to the subjective response - expressed as dB(A)
BRE	Building Research Establishment
BS 5228	Code of practice for noise and vibration control on construction and open sites – Part 1: Noise (2009)
BS 8233	British Standard 8233 'Sound insulation and noise reduction for buildings – Code of practice' (2014)
CIRIA	Construction Industry Research and Information Association
CRTN	Calculation of Road Traffic Noise (1988)
°C	Degrees Celsius
dB	Decibel – unit of measurement of sound
EU	European Union
Hertz	Frequency oscillation in cycles per second i.e. 1000 Hertz is a thousand cycles per second
L _{Aeq,T}	'A' weighted equivalent continuous noise level over a time period, T
L _{Amax}	'A' weighted maximum noise level
LOAEL	lowest observed adverse effect level
ms-1	Metres per second
NPPF	National Planning Policy Framework (2012)
NPPG	National Planning Policy Guidance – Noise (2014)
NPSE	Noise Policy Statement for England
RBC	Reading Borough Council
SLM	Sound Level Meter
SMA	Stuart Michael Associates Limited
SRI	Sound Reduction Index
UK	United Kingdom
UKAS	United Kingdom Accreditation Service in reference to sound level meter calibration
WHO	The World Health Organization



1.0 INTRODUCTION

- 1.1 Stuart Michael Associates Limited (SMA), Consulting Engineers, has been appointed by Lochailort Thames Quarter Limited (the 'Applicant') to prepare a noise assessment in support of an Outline Planning Application for the proposed development of a 47 unit housing development at North Street, Reading. Refer to **Figure 1.1** for the site location plan and **Appendix 1** for the proposed site layout.

Site Description

- 1.2 The site is vacant other than ad-hoc usage as a private car park. It was formerly occupied by a temporary primary school, and before that by Social Services Offices (which have long since been demolished).
- 1.3 The area is administrated by Reading Borough Council (RBC). The site is located on the corner of North Street and Weldale Street. Immediately north of the site is Reading ambulance station and Great Knollys Street. To the west are existing residential properties. To the east is Reading town centre and train station. Existing vehicle access to the site is from North Street. The roads adjacent to the site have very low traffic levels as they are only used for access to local facilities and residential dwellings. There is no through road on Wealde Street or Great Knollys Street.
- 1.4 Approximately 100m to the southeast of the proposed development site, there is an Iceland and Wickes retail store and associated car parking. This site has received planning permission for redevelopment for residential-use. This development comprises 429 flats as part of a high-rise development on Weldale Street. This will act as a significant noise barrier to the A329 Caversham Road and Chatham Street. Furthermore, local traffic levels are predicted to decrease in the near vicinity of the site as a result of this development.
- 1.5 However, the site already currently benefits from a good acoustic environment. The main roads in the area are the A329 Caversham Road and Chatham Street. However, these roads were not distinguishable / audible within the proposed development site during the site visits. This is due to distance from noise source to receiver and the existing buildings acting as a noise barrier. [Audible] ambulance sirens are typically not switched on when they enter or exit the ambulance station.



Pre-Application Consultation

- 1.6 Pre-application consultation was undertaken with Elizabeth Senyah, Environmental Health Officer (EHO) at RBC on 27th August 2017. The following information was provided by the EHO regarding noise impacts on development:

Noise impact on development

- 1.7 *“A noise assessment should be submitted in support of applications for new residential proposed in noisy areas.*
- 1.8 *The noise assessment will be assessed against the recommendations for internal noise levels within dwellings and external noise levels within gardens / balconies in accordance with BS 8233:2014 and WHO guidelines for Community Noise. The report should identify any mitigation measures that are necessary to ensure that the recommended standard is met.*
- 1.9 *Where appropriate, the noise assessment data should also include noise events ($L_{A_{Max}}$) and the design should aim to prevent noise levels from noise events exceeding 45dB within bedrooms at night. Noise levels above 45dB are linked with sleep disturbance.*
- 1.10 *The proposed development is located in an area surrounded by existing noise generating activities in close proximity including the ambulance station, bus depot and industrial units. So a noise assessment will need to be submitted with the full application.*
- 1.11 *It may be possible though clever design to reduce the need for additional noise mitigation measures, for example, ensuring that noise sensitive rooms are located on the quieter façades and bathrooms, kitchens, hallways and cupboards etc. on the noisiest facades.*
- 1.12 *Noise mitigation is likely to focus on the weak point in the structure; glazing. Given that the acoustic integrity would be compromised should the windows be opened, ventilation details must also be provided, where mitigation relies on closed windows. Ventilation measures should be selected which do not allow unacceptable noise ingress and should provide sufficient ventilation to avoid the need to open windows in hot weather, however non-openable windows are not considered an acceptable solution due to the impact on living standards.*



- 1.13 *The mitigation measures shall be installed in accordance with the approved specifications prior to occupation.”*

Assessment Methodology

- 1.14 For this study a noise assessment has been undertaken to determine the constraints on the development and the potential impacts that may occur due to its construction. The constraints are how the existing environment will impact on the development. The impacts are how the construction of the development will impact on the existing environment.
- 1.15 Constraints on development with regard to noise levels have been assessed using measured sound levels at the development site. A noise level survey was undertaken for 48 hours within the site.
- 1.16 During construction the potential impact from activities within the site has been assessed using the “Fixed” method described in BS 5228. At this stage, the timetable for construction and landscaping is not known. An approximation has been made as to what type of plant will be used for each phase. There are a limited number of residential properties nearby. The potential impacts have been assessed at distances of 10 metres to 60 metres from the noise source to the sensitive receptor.

The Nature, Measurement and Effect of Noise

- 1.17 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 measure 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.
- 1.18 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.



- 1.19 When related to changes in noise, a change of ten decibels from say 60 dB(A) to 70 dB(A) would represent a doubling in 'loudness'. Similarly, a decrease in noise 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. **Table 1.1** details typical noise levels.

Table 1.1: 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 a car
80	Household vacuum cleaner at 1 m
100	Pneumatic drill at 1 m
120	Threshold of pain



2.0 LEGISLATION AND POLICY

- 2.1 It is important to consider the relevant legislation, policy and associated guidance in relation to noise effects on a proposed development. Following the revocation of Planning Policy Guidance Note 24 'Planning and Noise' (PPG24), the National Planning Policy Framework (NPPF), British and International Standards and local authority guidance have become the relevant guidance with regard to noise and residential developments.

Calculation of Road Traffic Noise 1988 (CRTN)

- 2.2 It is common practice in the UK to assess the impacts of road traffic noise in accordance with the method prescribed in The Department for Transport document 'Calculation of Road Traffic Noise 1988 (CRTN)'. Paragraph 1 of the introduction states that:

"These procedures are necessary to enable the entitlement under the Noise Insulation Regulations to be determined but they also provide guidance appropriate to the calculation of traffic noise for more general applications e.g. environmental appraisal of road schemes, highway design and land use planning".

- 2.3 Section II of CRTN outline the procedures to be followed when calculating the prediction method for future road traffic noise and Section III of CRTN details the procedure and requirements to be met using the measurement method with details of a simplified measurement procedure.

- 2.4 All noise levels are expressed in the terms of the index $L_{10,(T)}$ dB(A) where L_{10} is the noise level exceeded for 10% of the time period (T) expressed in decibels with an A weighting, which broadly agree with the range of human hearing.

- 2.5 The shortened measurement method comprises measurement of L_{10} over any three consecutive hour periods between 10:00 and 17:00. Using L_{10} (3 hour) as the arithmetic mean of the three consecutive values of hourly L_{10} , the current value of L_{10} (18 hour) can be calculated using the formula:

$$L_{10} (18 \text{ hour}) = L_{10} (3 \text{ hour}) - 1 \text{ dB(A)}$$

- 2.6 Chart 7 in CRTN and the associated formulae can be used to adjust the recorded/calculated sound level from road traffic with a change in distance from the source.



WHO Guidelines and BS 8233:2014

- 2.7 Guidance on absolute limits for noise inside buildings is provided in BS 8233:2014 “Sound insulation and noise reduction for buildings – Code of practice”. Similar guidance can also be found in the current World Health Organisation (WHO) “Guidelines on Community Noise” and “Night Noise Guidelines for Europe” and the BRE/CIRIA document “Sound control for homes”. A summary of the noise criteria can be seen in **Table 2.1**.

Table 2.1: Summary of Internal Noise Criteria: BS 8233 & WHO

Criterion	Activity	Location	0700 to 2300	2300 to 0700
BS 8233:2014	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 $L_{Aeq,8hr}$
WHO Onset of sleep disturbance		Bedroom		30 dB $L_{Aeq,8hr}$

- 2.8 Individual noise events such as passing trains have the potential to cause sleep disturbance and the WHO recommend a reasonable individual noise event of 45 dB ($L_{Amax,F}$) within the bedrooms during the night. Above this level the onset of sleep disturbance can occur.
- 2.9 Guidelines for external noise levels in public and private open space, such as gardens and parks, is available in the WHO guidelines. According to the WHO guidelines, during the daytime ($L_{eq,16hr}$), moderate annoyance may be experienced at noise levels between 50 dB(A) and 55 dB(A) and serious annoyance may be experienced above 55 dB(A).
- 2.10 During the night time ($L_{eq,8hr}$), an interim target (IT) level of 55 dB(A) is recommended (from WHO Night Noise Guidelines for Europe – 2009). The 55 dB(A) is the lowest observed adverse effect level (LOAEL).
- 2.11 However, it should be noted that the WHO Guidelines for Community Noise – 1999 recommend an external night time noise level of 45 dB(A) ($L_{eq,8hr}$) in relation to the reduction in noise level through an open window to achieve an internal noise level in bedrooms of 30 dB.



- 2.12 With regard to the prediction of noise levels from road traffic noise, the $L_{10,18hr}$ can be converted to $L_{Aeq,16hr}$ by subtracting 2 dB from the $L_{A10,18hr}$ (BS 8233 paragraph 6.2.2) $L_{Aeq,16hr} = L_{A10,18hr} - 2 \text{ dB}$.
- 2.13 The night time noise level, $L_{Aeq,8hr}$, can be calculated from $L_{A10,18hr}$ using the conversion formula in the TRL document "*Converting the UK traffic noise index $L_{A10,18hr}$ to EU noise indices for noise mapping*".

BS 5228-1:2009

- 2.14 Within BS 5228 "Code of practice for noise and vibration control on construction and open sites – Part 1: Noise" a method for predicting noise from construction activity is provided. It is the accepted Standard employed for the assessment of noise and vibration from construction sites.
- 2.15 The Standard also provides a framework for good working practice and guidance on methods of mitigating noise by employing a number of different techniques.
- 2.16 Annex E of BS 5228 outline three approaches to the assessment of significance of noise effects which are:
- i) Significance based on fixed noise limits. Noise levels should not exceed 70 dB(A) in rural, suburban and urban areas away from main road traffic and industrial noise, or 75 dB(A) in urban areas near main roads in heavy industrial areas;
 - ii) Significance based on noise change – method 1. Noise levels should not exceed thresholds determined from existing ambient noise levels using the "ABC Method":
 - A - 65 dB (daytime) when ambient noise levels (when rounded to the nearest 5 dB) are less than this value,
 - B - 70 dB (daytime) when ambient noise levels (when rounded to the nearest 5 dB) are the same as the category A value,
 - C - 75 dB (daytime) when ambient noise levels (when rounded to the nearest 5 dB) are higher than the category A value.
 - iii) Significance based on noise change – method 2. Construction noise levels are deemed to be significant if the total noise (ambient +



construction) exceeds the pre-construction ambient noise level by 5 dB or more, subject to the lower cut-off value of 65 dB (daytime).

National Planning Policy Framework (NPPF)

2.17 The NPPF set out the Government's latest planning policies for England. There are a number of sections within the NPPF which mention noise in a planning context and they have been reproduced below.

2.18 The first time noise is mentioned is at Section 11. "Conserving and enhancing the natural environment" which states, amongst other things, that:

"Paragraph 109. 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 an unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability;...*

"Paragraph 123. Planning policies and decisions should aim to:

- *Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of a new development;*
- *Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
- *Recognise that development will often create some noise and existing business wanting to develop in continuance of their business should have not unreasonable restrictions put on them because of changes in nearby land uses since they were established, and*
- *Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason...*



Noise Policy Statement for England (NPSE)

2.19 The National 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’.*

National Planning Practice Guidance (NPPG)

2.20 The National Planning Practice Guidance (NPPG), published March 2014, provides 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.”

2.21 The document goes on to provide a definition for the levels of noise exposure at which an effect may occur:

“Significant observed adverse effect level: this is the level of noise exposure above which significant adverse effects on health and quality of life occur.

Lowest observed adverse effect level: this is the level of noise exposure above which adverse effects on health and quality of life can be detected.



No observed effect level: this is the level of noise exposure below which no effect at all on health and quality of life can be detected.”

- 2.22 It is important to understand that as the NPPG 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.

Local Council Policy

- 2.23 A draft new Local Plan for the Borough has been produced which sets out how Reading will develop up to 2036. At the time of writing this noise report, the new Local Plan is in draft version. Therefore, the local policy referred to below has been referenced from the original documents.
- 2.24 Local policy for Reading Borough Council (RBC) is presented in the RBC Local Development Framework (LDF) which includes the Core Strategy, Reading Central Area Action Plan, and, Sites and Detailed Policies Documents (SDPD).
- 2.25 Within the Core Strategy, Policy CS34: Pollution and Water Quality deals specifically with pollution and water quality with regard to development and states:

“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.”

- 2.26 The Reading Central Area Action Plan is one of RBC Development Plan Documents (DPD) and should be read in conjunction with other LDF documents. Policy RC9: Living in the Centre presents criteria which proposed development in the centre of Reading should be assessed against. The policy covers a number of criteria and with regard to air quality states that:



“Proposals for residential development within the central area will be assessed against the following criteria:

ii. Proposals for new residential development within the central area will be required to demonstrate how the issue of potential noise disturbance from neighbouring land uses and other sources, and air quality implications of residential development, have been considered and if necessary, mitigated. New residential development should not be located next to existing town centre uses where those uses would give rise to unacceptable levels of noise and disturbance to the occupiers of the new scheme, unless this can be mitigated.”

2.27 Within the SDPD there are a number of policies which mention noise however the most relevant policy with regard to new residential development is Policy DM4: Safeguarding Amenity which states that:

“Development will not cause a significant detrimental impact to the living environment of existing or new residential properties, in terms of:

- *Privacy and overlooking;*
- *Access to sunlight and daylight;*
- *Visual dominance and overbearing effects of a development;*
- *Noise and disturbance;*
- *Artificial lighting;*
- *Vibration;*
- *Dust and fumes;*
- *Smell; or*
- *Crime and safety.”*



3.0 METHODOLOGY

3.1 This section describes the approach to assessing the noise constraints and impacts in respect of the proposed development at North Street, Reading. The assessment deals with both constraints (effects of the surrounding environment on the proposed development) and any impacts during the construction phase of the development.

3.2 The basic outline methodology employed is detailed below:

- Utilise recorded sound levels to establish the noise profile of the site;
- Determine the constraints from the “Do Something” scenario for sensitive receptors on the development;
- Determine the impacts from construction activities on local receptors using BS 5228;
- Compare the constraints and impacts against relevant noise standards or objectives;
- Recommend mitigation as necessary.



4.0 EXISTING NOISE PROFILE

- 4.1 The existing noise profile of the development site was determined through measurement and calculation of noise levels.

Noise Level Survey

- 4.2 The environmental noise measurement method detailed in British Standard 7445:1991 was used to record the 'A' weighted ambient ($L_{eq,T}$), maximum ($L_{max,T}$), background ($L_{90,T}$) and 10th percentile ($L_{10,T}$) noise levels. For this noise assessment the reference time periods, T, were sixteen hours during the daytime (0700 – 2300) and eight hours during the night time (2300 – 0700).
- 4.3 Noise levels were recorded for 48 hours at a worst-case location within the site. The sound level meter (SLM) was positioned at the site boundary adjacent to the Ambulance Station. Extraneous noise consisted of activity within the car-park forecourt. The location of the measurement position SLM1 is presented on Figure 1.1.
- 4.4 The SLM microphone was mounted at grazing incidence 1.5 metres above ground level on a tripod at the monitoring location. The SLM was calibrated before and after the measurement periods using an acoustic calibrator. The acoustic calibrator was set to 94 dB at a frequency of 1000 Hertz.
- 4.5 The local weather conditions were recorded at the start of the measurements and at regular interval throughout the measurement period. A description of the weather conditions are presented later on in this chapter.

Equipment Used

- 4.6 The equipment used during the field measurements on site are listed in **Table 4.1**. The SLM and acoustic calibrator have been calibrated at an UKAS accredited centre (certificates available on request).

Table 4.1: Equipment used during the field measurements

Equipment	Type	Serial Number
Sound Level Meter	Brüel and Kjær Type 2250 Light	3004648
Microphone	Brüel and Kjær Type 4950	2913913
Calibrator	Brüel and Kjær Type 4321	2388830
Anemometer/thermometer	Kestrel 2000	449331
Tripod	Mirander – 1.5 metre	



Results from the Noise Monitoring

Noise Levels

- 4.7 The SLM was setup at 1100 on Wednesday 10th January 2018 and the survey ended on Friday 12th January 2018. Presented in **Table 4.2** is a summary of the results from the measurements. Refer to **Appendix 2** for an illustration of the noise levels on graphs.

Table 4.2: Summary of Recorded Noise Levels at SLM1 (January 2018)

Measurement Location	Time	Ambient Noise Level ($L_{Aeq,T}$)	Maximum Noise Level ($L_{Amax,T}$)	10 th Percentile Noise Level ($L_{A10,T}$)	Background Noise Level ($L_{A90,T}$)
SLM1 10/01/2018	1100-2300	49.6	78.6	52.6	45.1
	2300-0700	47.4	80.5	49.8	39.3
SLM1 11/01/2018	0700-2300	50.5	79.4	52.9	45.8
	2300-0700	46.3	74.8	48.2	37.7

Weather Conditions

- 4.8 The weather conditions were recorded at regular intervals throughout the noise measurement survey. The conditions were typically suitable for noise survey, although there was a period of foggy conditions on Wednesday night-time. On 10 January the air temperature was (average) 8°C, and the wind speed was 0.6 ms⁻¹ (average). On 11 January, the air temperature was (average) 6°C and the wind speed was 0.4 ms⁻¹. Throughout the surveys, the wind was south-westerly and there was between 0% and 75% cloud cover.

Impact Assessment Methodology

Constraints

- 4.9 Using the results of the monitoring, the future noise levels across the site are assessed against the WHO guidelines for external noise levels, the British Standard 8233 for internal noise levels and against any local noise policy.

Impacts – Construction

- 4.10 The potential impacts from site preparation, earthworks, construction and landscaping have been determined using the fixed method as detailed in BS 5228 part 1. The receptor locations are provided on Figure 1.1.



5.0 NOISE ASSESSMENT

- 5.1 From Table 4.2 it can be seen that noise levels are approximately 50 dB during the daytime (0700 – 2300) and approximately 46 / 47 dB during the night time (2300 – 0700).
- 5.2 The maximum individual noise level recorded during the night was 80.5 dB ($L_{MAX,F}$). Appendix 2 illustrates that this maximum noise level does not occur regularly throughout the night.
- 5.3 However, as noise levels are predicted to be above 45 dB $L_{Aeq,T}$ during the night-time, and individual noise events have been demonstrated to exceed 60 dB $L_{MAX,F}$ more than 10 times during the night time, a commensurate level of mitigation will be required to achieve internal noise levels that comply with local policy, British Standards and WHO guidelines.
- 5.4 Noise can enter a building, whether commercial or residential, through windows, ventilators, walls, roof and doors. In most cases, however, windows provide the main path for noise and it is important they be insulated properly. Section 8.4.7 of BS 8233 (2014) “Windows” Table 10, details the noise reduction of a thermal insulating window (6 – 12 – 6) as of the order of 33 dB(A) for a closed window (Alternate window configurations are available) and 10 dB(A) to 15 dB(A) for a partially open window.
- 5.5 As detailed in Table 2.1 of this report, BS 8233 (2014) suggests that internal **daytime** ($L_{eq,16hr}$) noise levels of 40 dB(A) and 35 dB(A) are design targets for dining rooms, and living rooms and bedrooms respectively. During the **night time**, ($L_{eq,8hr}$) internal noise levels in bedrooms should be 30 dB(A) and noise due to individual events ($L_{max,f}$) should not exceed the 45 dB(A) threshold. To achieve an internal noise level of 30 dB(A) with an open window, façade noise levels must be no greater than 45 dB(A) ($45 - 15 = 30$ dB(A)).
- 5.6 Section 5.4.4 of BS 8233 (2014) “Obstructing the sound” gives examples of how sound can be enclosed or obstructed by a solid barrier such as a fence between the noise source and receiver. It should be noted that attenuation levels of around 10 dB are common; however, the benefits from ground absorption may be reduced.



- 5.7 Section 7.7.3.2 of BS 8233 (2014) “Design criteria for external noise” presents details of the recommended noise levels in external areas used for amenity spaces. The section has been reproduced for reference in this report:

“.....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.

Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space.”

- 5.8 The Buildings Research Establishment (BRE) and Construction Industry Research and Information Association (CIRIA) publication ‘Sound Control for Homes’ 1993 presents practical advice on the control within dwellings of noise from outside sources and noise transmitted within and between dwellings. Part B: Scheme Design – Planning to control external noise, gives advice on the potential noise reduction from low-rise dwellings acting as a barrier block between the noise source and noise sensitive areas.



- 5.9 The first paragraph on page 24 of BRE and CIRIA publication Sound Control for Homes states that 'On an estate of low rise dwellings, those closest to a noise source can give some protection to the remainder of the site'. The order of reduction in noise levels behind these buildings can be in the order of 10 dB for the whole site, where the gaps between the dwellings not exceeding 30% of the site frontage.
- 5.10 Table 13 of the BRE and CIRIA publication Sound Control for Homes gives guidance on the 'design background noise levels arising from external sources' and suggests that an internal noise level of <50 dB for less sensitive areas such as the kitchen, bathroom utility room, WC and internal and communal circulation areas is acceptable.
- 5.11 The World Health Organisation (WHO): Guidelines for Community Noise report covers, amongst other things, recommended internal and external noise levels for residential dwellings. From "Table 6.1: Guideline values for community noise in specific environments", it can be seen that for outdoor living areas a guideline for serious and moderate annoyance for both daytime and evenings is 55 dB(A) and 50 dB(A) respectively.
- 5.12 The site layout has been designed so that outside amenity space will be protected from noise (refer to Appendix 1).



6.0 EFFECTS OF THE PROPOSALS DURING CONSTRUCTION

Effect of Construction Noise on Nearby Sensitive Receptors

- 6.1 The magnitude of construction noise impacts can be predicted by considering noise emissions data for typical construction equipment based on the expected methods of construction for each phase of work on each worksite. The prediction method follows that recommended in BS 5228 Noise and Vibration Control on Construction and Open Sites, Part 1:2009.
- 6.2 The guidance contained in BS 5228 does not extend to provide criteria against which to assess construction noise. However, the Department of Environment (DoE) Advisory Leaflet (AL) 72 (1976) "Noise Control on Building Sites" gives advice on the maximum levels of construction site noise at residential locations during daytime hours based on levels associated with speech interference. This publication states that during daytime hours (0700 to 1900 hours) the L_{Aeq} noise level at the building façade should not exceed:
- **75 dB in urban areas, near main roads or in heavy industrial areas:**
 - 70 dB in rural, suburban and urban areas away from main road traffic and industrial noise.
- 6.3 At present, the exact program of works is not known. The following activities have therefore been assessed:
- Site Preparation
 - Groundwork;
 - Construction and highway works;
 - Landscaping.
- 6.4 Site preparation activities will be across the site along with the groundwork and landscaping. Other activities will be more localised and of varying duration.
- 6.5 An assessment has been undertaken using generic construction machinery and operation at distances from 10 metres to 60 metres from the noise source. Two "Sensitive Receptors" adjacent to the site have been assessed: Burford Court (10m) and Strathedan Place (20m). The daytime ($L_{Aeq,16hr}$) façade noise levels at these receptors are 50 dB(A). Refer to Figure 1.1 for receptor locations.



- 6.6 According to the BS 5228 'Fixed Method', the corresponding threshold of significance for the noise levels is 75 dB for urban areas, near main roads or in heavy industrial areas.
- 6.7 The results from the BS 5228 Construction noise assessment is presented in **Appendix 3** and summarised in **Table 6.1**.

Table 6.1: Construction noise levels at sensitive receptors (with mitigation)

Receptor Location (distance from site in metres)	Predicted Noise level, dB(A)				BS 5228 Threshold of Significance dB(A)
	<i>Site Prep.</i>	<i>Earthworks</i>	<i>Construction</i>	<i>Landscaping</i>	
R1: Burford Court (10m)	69	74	74	60	75
R2: Strathedan Place (20m)	64	68	68	60	75

- 6.8 Noise from some construction activities will be audible at the nearest sensitive receptor locations and the calculations indicate that construction noise impacts may be significant. However, if Best Practical Means (BPM) is implemented then noise impacts can be minimised. A list of common mitigation strategies and how BPM can be implemented is given in Section 7.0. It should be noted that construction impacts are temporary and people are generally more tolerant of higher noise levels if they know they are only going to be of a temporary duration. Furthermore construction hours can be limited by a planning condition.



7.0 MITIGATION MEASURES

Constraints on development

- 7.1 To reduce noise levels to below the internal and external noise levels presented in the WHO guidelines, BS 8233 and local planning policy a commensurate level of mitigation is required.
- 7.2 Internal noise levels of any habitable room during the night time period should not exceed 30 dB to comply with BS 8233 and the WHO guidelines. During the daytime, internal noise levels in living rooms/bedrooms and dining areas should not exceed 35 dB and 40 dB respectively to also comply with BS 8233. There are predicted to be façades with levels above 45 dB during the night time.
- 7.3 There are many ways for sound to enter a building. The routes are through the roof, the doors and the main route is through the windows. If the roof is built to current Building Regulations and of sufficient mass it will provide an adequate barrier to the passage of sound. For example, a flat timber joist roof, asphalt on boarding, 12 mm plasterboard ceiling with thermal insulation has a weighted sound reduction of approximately 45 dB. Doors with adequate mass and minimal gaps between the door and door frame can provide sound reduction of approximately 35 dB when fitted to manufacturers' specification.
- 7.4 With regard to windows, thermal double glazed units should be fitted in accordance with Building Regulations as a minimum standard. Units are normally of the configuration 6 – 12 – 6 (glass, air gap and glass) with a weighted sound reduction (R_w) of approximately 33 dB. Presented in **Table 7.1** are sound reduction values for window systems utilising various air gap and window thickness.

Table 7.1: Example Window Systems

Material	Configuration glass/air gap/glass (mm)	Total Thickness (mm)	Sound Reduction (dB)
Sealed Unit	4/12/4	24	27
Sealed Unit	6/12/6	28	33
Sealed Unit	4/12/12	28	36
Sealed Unit	6/12/10	28	37
Laminated glass	6/12/11	29	40
Laminated glass	10/12/16	38	42
Laminated glass	13/12/13	38	45
Sealed Unit	6/20/12	38	41



- 7.5 It should be noted that the sound reduction presented in Table 7.1 does take into account the adjusted factor for road traffic noise (C , C_{tr}). Usually 1 to 2 dB is subtracted for highway road traffic > 80 kmph (C) and between 3 and 6 dB for urban road traffic (C_{tr})* depending on window configuration.
- 7.6 On all floors at the north façade overlooking the ambulance station, the east façade adjacent to North Street and the south façade of the tallest part of the building at the junction of North Street and Weldale Street it is proposed to use a window with a sound reduction of 30 dB ($33 - 3 = 30$ dB). At all other façades and floors it is proposed to use a standard thermal double glazed unit with a sound reduction of 27 dB ($27 - 3 = 24$ dB). Refer to **Figure 7.1** for details.
- 7.7 With the appropriate combination of wall and window, internal noise levels will meet BS 8233 and WHO guidelines on all the façade on all the floors of the proposed development with the windows closed.
- 7.8 If any of the windows or doors is open in the façade, the sound reduction for the façade containing the window or door will be reduced to approximately 15 dB. The effect of having the window or door open is a reduction in transmission loss through the façade and results in a higher internal noise level within the room.
- 7.9 Façades with a noise level of greater than 45 dB during the night time and 50 dB during the daytime and a window or door open will not meet the BS 8233 or WHO guidelines for internal noise levels in bedrooms and sitting rooms.
- 7.10 Where façade noise levels are above 45 dB (night time) or 50 dB (daytime), another method of ventilating the rooms will have to be provided without opening the windows or doors.
- 7.11 Acoustically attenuated background/trickle vents are available with sound reduction properties equal to and greater than levels provided by windows and doors. For example, window mounted and wall mounted trickle vents are available with a sound reduction of approximately 42 dB and 38 dB respectively. Window trickle vents can be mounted in the window frame or above or below the window and provide adequate cross ventilation within the room or hallway.
- 7.12 Windows can be opened for purge ventilation or at the occupants' choice.

* BS EN ISO 717-1:1997, Acoustics – Rating of sound insulation in buildings and of building elements – Part 1: Airborne sound insulation, Annex A, Table A.1 – Relevant spectrum adaptation term for different types of noise source



- 7.13 To minimise the disturbance by noise of future residential occupiers of the flats and its effect on neighbouring residents, residential accommodation must be designed and constructed or converted so as to achieve the insulation requirements set out in Building Regulations Approved Document E.
- 7.14 If the roof is built to current Building Regulations, it will provide an adequate barrier to the passage of sound. With regard to windows, thermal double glazed units should be fitted in accordance with Building Regulations as a minimum standard.
- 7.15 The walls and floors between the apartment bedrooms and the adjacent public areas will require adequate sound reduction to ensure daytime resting (35 dB $L_{Aeq,t}$) and night time sleeping (30 dB $L_{Aeq,8hr}$) conditions are met.

Outside Amenity Area

- 7.16 Proposals for outside amenity areas associated with this development take the form of roof terraces at second, fourth and fifth floor level. Access to these areas is from inside the building.
- 7.17 With regard to mitigation to noise levels in outside amenity areas, the construction of the proposed buildings, boundary treatments such as dwarf brick walls and balustrade help reduce noise levels in these areas. However, taking into account the recorded sound levels and the layout of the proposed development site, noise levels are predicted to be well below the BS 8233:2014 lower guideline limit for noise within external amenity areas. Therefore it is not proposed to provide specific noise mitigation to the amenity areas (roof terraces).

Impacts – Construction

- 7.18 Best practicable means will be used to minimise construction noise through the implementation of the recommendations set out in BS 5228. In particular, the following noise mitigation measures would be implemented:
- Proper use of plant with respect to minimising noise emissions and regular maintenance will be required. All vehicles and mechanical plant will be fitted with effective exhaust silencers and will be maintained in good efficient order;



- The use of inherently quiet plant where appropriate – all major compressors and generators will be ‘sound reduced’ models fitted with properly lined and sealed acoustic covers, which will be kept closed whenever the machines are in use, and all ancillary pneumatic percussive tools will be fitted with mufflers or silencers of the type recommended by the manufacturers;
- Machines in intermittent use will be shut down in the intervening periods between work or throttled down to a minimum;
- All ancillary plant such as generators and pumps will be positioned so as to cause minimum noise disturbance, and where necessary, acoustic enclosures will be provided;
- Where practicable the use of noisy plant will be limited to core daytime periods;
- Channels of communication will be established between the contractor/developer, Local Authority and residents;
- A site representative will be appointed responsible for matters relating to noise;
- Typical levels of noise will be monitored during critical periods and at sensitive locations;
- A 2m high solid site hoarding along the site boundaries will be erected where practical and feasible;
- Localised noise barriers will be erected as necessary around items such as generators or heavy duty compressors;
- Construction compounds will be laid out so as to minimise noise impacts to neighbouring noise sensitive receptors, by locating noisy operations well away from receptors and using on-site structures and materials to screen noise where practicable and necessary.

Impacts – Additional Traffic Movements

- 7.19 The proposed development has been predicted to generate a very small number of vehicular trips (refer to the Applicant’s Transport Statement for further information). Thus the impact from additional traffic movements on the surrounding environment will be negligible and not significant from a noise perspective.



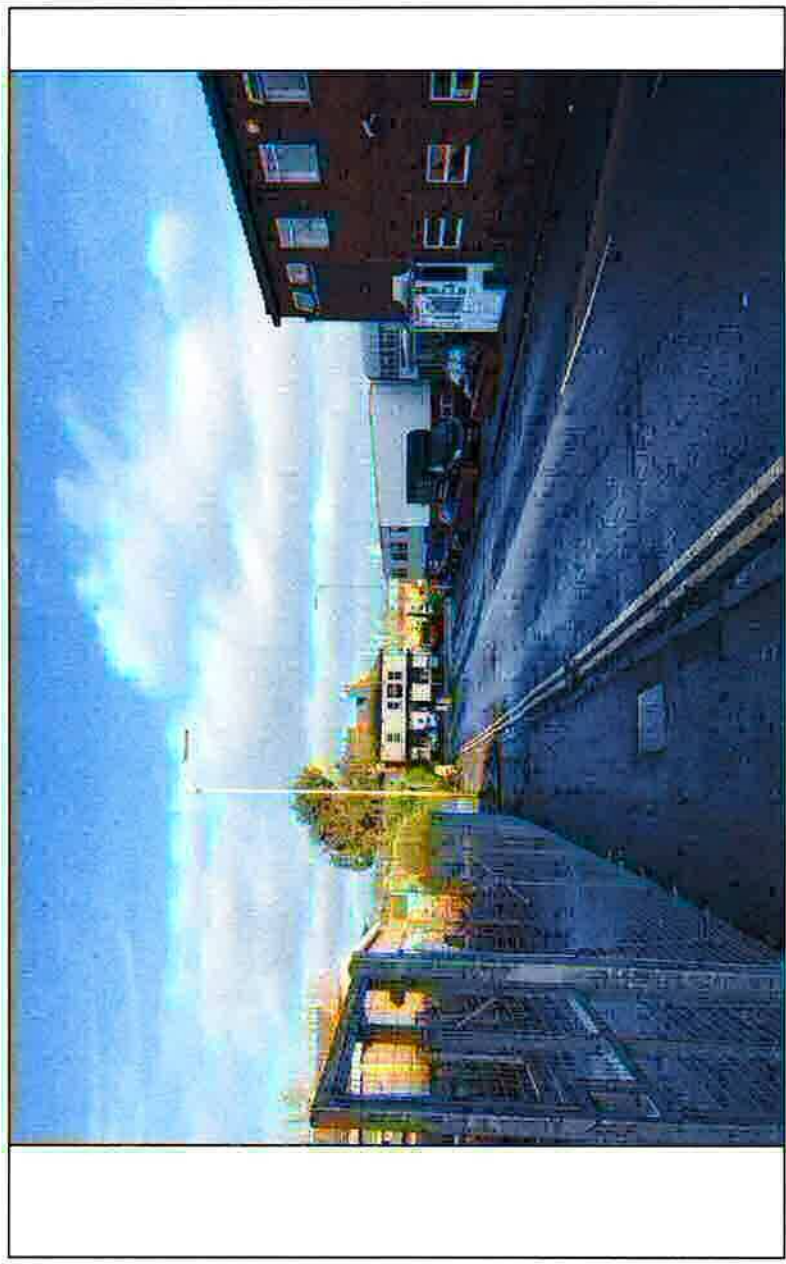
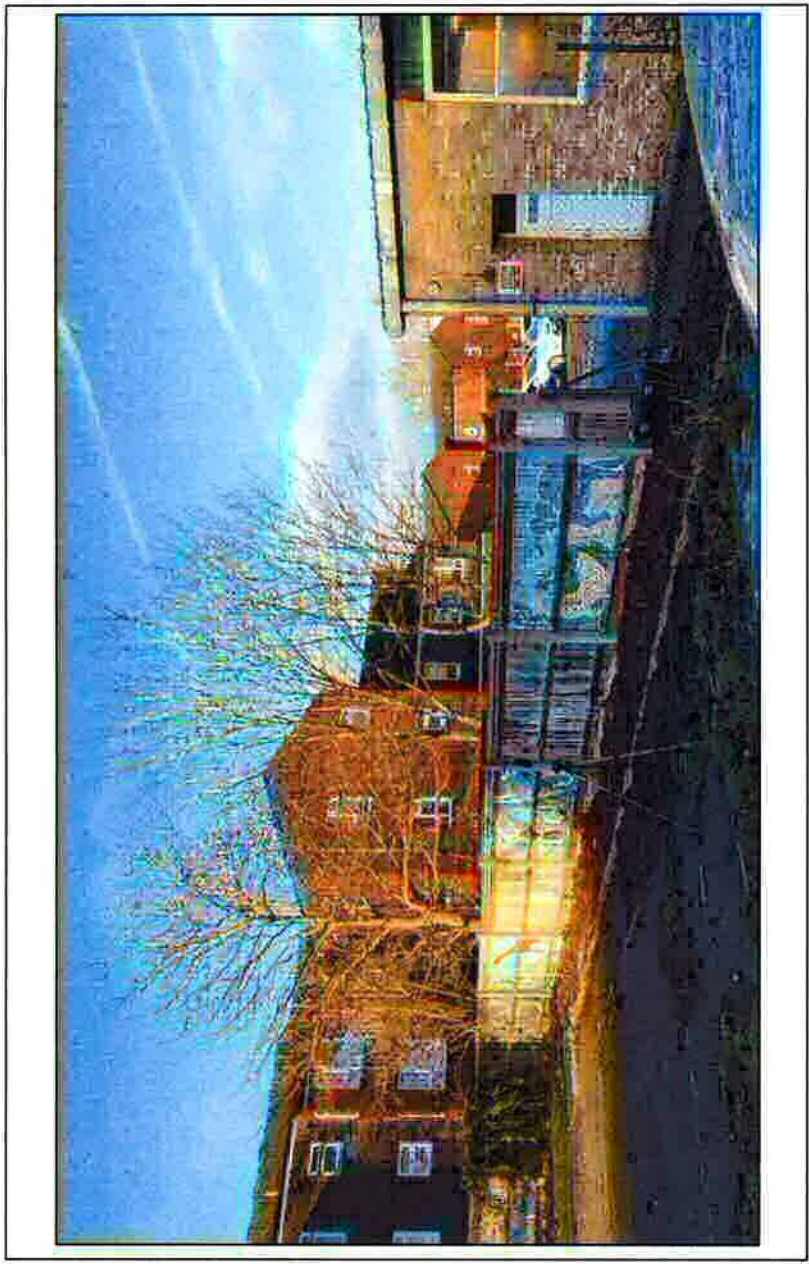
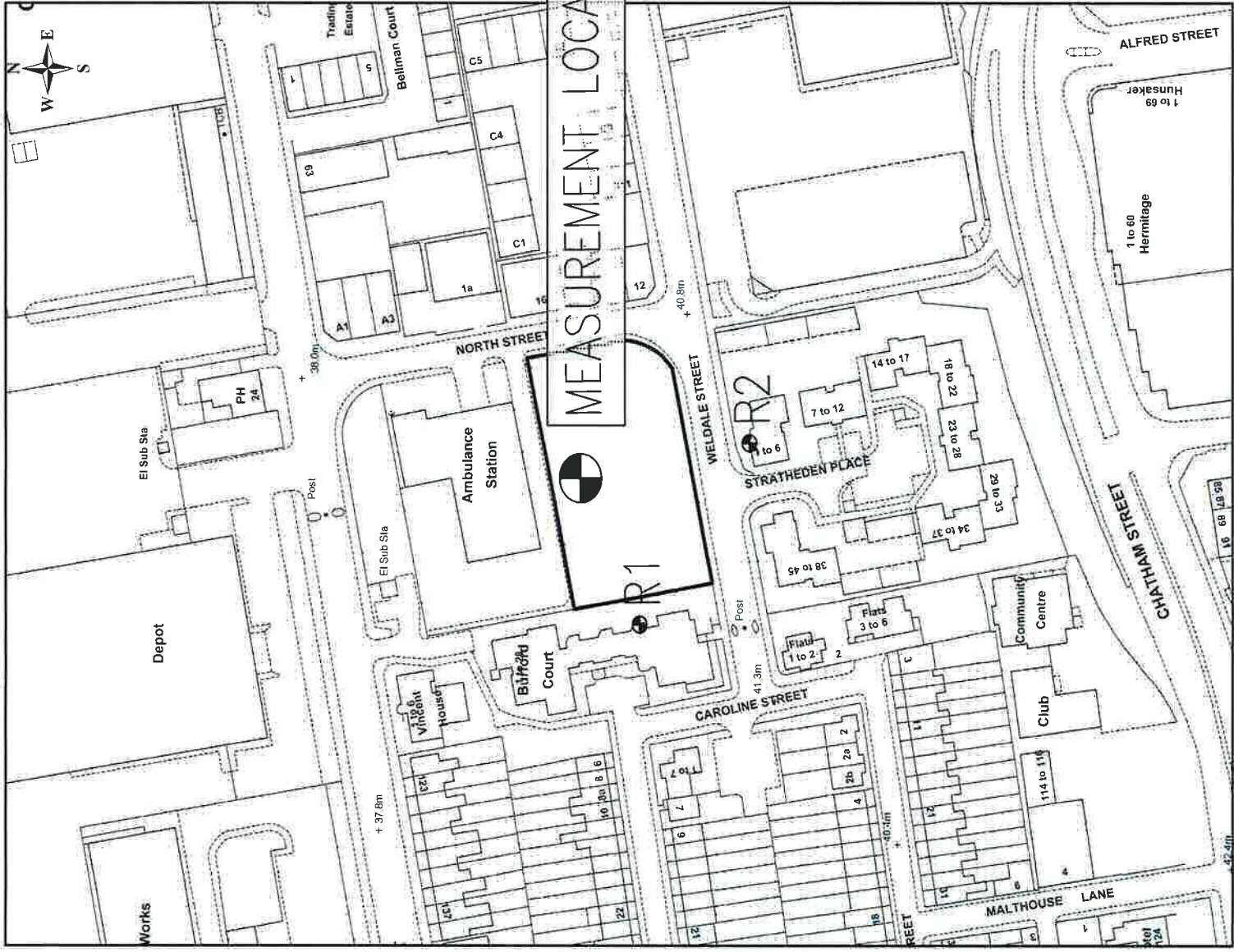
8.0 SUMMARY AND CONCLUSIONS

- 8.1 Stuart Michael Associates Limited (SMA) has been engaged by Lochailort Thames Quarter Limited (the Applicant) to undertake a noise assessment for the proposed residential development at North Street, Reading. The assessment has considered the constraints on the development and potential impacts from the development construction activities.
- 8.2 The constraints on the development have been assessed by noise monitoring. The potential impacts from construction activities have been assessed using the method detailed in BS 5228.
- 8.3 The noise survey was undertaken to determine the existing noise profile of the site. Resultant noise levels within the development site have been assessed against WHO guidelines, British Standard 8233 and local planning policy.
- 8.4 From the results of the noise level surveys, noise levels were recorded below 55 dB during the daytime, but above 45 dB during the night-time. Thus a commensurate level of mitigation will be required.
- 8.5 Maximum noise levels were recorded within the development site during the daytime and night time periods. The maximum noise level recorded during the night was 80.5 dB ($L_{MAX,F}$).
- 8.6 Where façade noise levels are above 50 dB during the daytime and 45 dB during the night time and maximum levels are predicted to be above 60 dB for a reasonable number of times during the night, mitigation measures are proposed to ensure internal noise levels meet BS 8233:2014, WHO guidelines and local planning policy.
- 8.7 On all floors at the north façade overlooking the ambulance, the east façade adjacent to North Street and the south façade of the tallest part of the building at the junction of North Street and Weldale Street it is proposed to use a window with a sound reduction of 30 dB ($33 - 3 = 30$ dB). At all other façades and floors it is proposed to use a standard thermal double glazed unit with a sound reduction of 27 dB ($27 - 3 = 24$ dB).



- 8.8 Incorporating an appropriate alternative ventilation system which negates the need to open windows will result in internal noise complying with BS 8233 and WHO daytime and night time internal noise guideline levels. A Noise Mitigation Strategy can be secured as a Condition of Development to confirm the alternative ventilation specifications.
- 8.9 From the results of the noise monitoring which show that free field daytime noise levels are below 55 dB, it is not proposed to provide specific noise mitigation to the outside amenity areas (roof terraces).
- 8.10 The results from the BS 5228 assessment indicate that the predicted noise levels at the two sensitive receptors adjacent to the site will be below the threshold limits during the four main phases of construction which is considered significant. Mitigation will be required to minimise the construction noise impacts.
- 8.11 Noise from some construction activities will be audible at the nearest sensitive receptor locations, but if Best Practical Means (BPM) is implemented then noise impacts can be minimised. It should be noted that construction impacts are temporary and people are generally more tolerant of higher noise levels if they know they are only going to be of a temporary duration. Furthermore, the permitted hours of undertaking construction activities can be secured as a Condition of Development.
- 8.12 Based on the results of the noise assessment, it has been concluded that with appropriate mitigation, noise levels will be acceptable for future residents of the proposed development at North Street, Reading. The predicted internal and external noise levels are in accordance with national guidance and local policy.

FIGURES

[illegible]

KEY

Rw 27dB (4/12/4)

Rw 33dB (6/12/6)





STUART MICHAEL ASSOCIATES
CONSULTING ENGINEERS

Stuart Michael Associates Ltd
Coombe House, Coombe Square, Thatcham, Berkshire RG19 4JF
T: 01635 867 711 e: mail@stuartmichael.co.uk
F: 01635 861 715 w: www.stuartmichael.co.uk

LOCHAILORT

Copyright © 2018 dha architecture ltd. All rights reserved. Limited reproduction and distribution permitted for the sole purpose of the planning of the proposed development only.
Cadastral Survey data © Crown Copyright. All rights reserved. Licence number: 100041812
Do not scale other than for local authority planning purposes.

dha architecture ltd
Brooklands Farm Business Park
Bottle Lane
Brimfield
Berkshire
RG42 5QX
t. 0118 934 9666
e. sumam@dhaarchitecture.co.uk
w. www.dhaarchitecture.co.uk

LOCHAILORT READING LIMITED

NORTH STREET READING

GLAZING MITIGATION PLAN

061807-AP01

Appraisal Layout

27.07.18 created
1:200 @ A2 scaling
SM/TP contact

land off weldale street, reading

rev date by details

Rev	Description	Drm	Chk	Date
REVISIONS				
Preliminary	Approval		Tender	Const.
DRAWING STATUS				
DATE	SEPTEMBER 2018	WAH	JPM	ISSUE CHECKBOX
DRAWING No.	FIGURE 7.1	REV	SCALE	NTS
				@ A3

© This drawing is the copyright of Stuart Michael Associates Limited. It may not be reproduced or amended without the written approval of Stuart Michael Associates

APPENDICES

APPENDIX 1



appraisal layout

Reading Ambulance
Service

NORTH STREET



Position of Pre-App
perspective view

WELDALE STREET

land off weldale street, reading

LOCHAILORT

LOCHAILORT ARCHITECTURE LTD
1200 & A2 scaling
SMTP contact

dho architecture ltd

Brooklands Farm Business Park
Belle Lane
Berkshire
RG42 5QX
Tel: 0116 934 9886
E: dho@architecture.co.uk
W: www.dhoarchitecture.co.uk

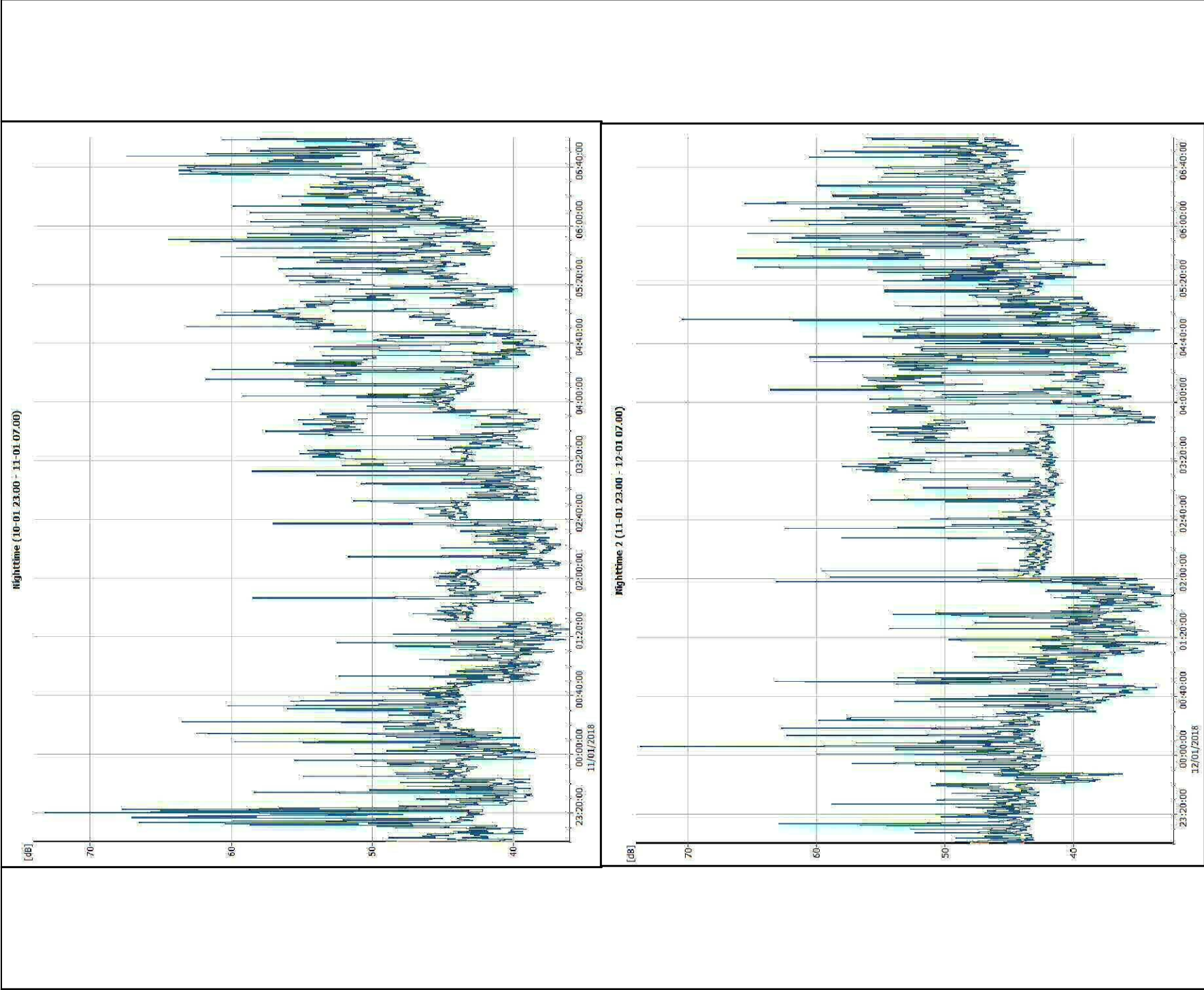
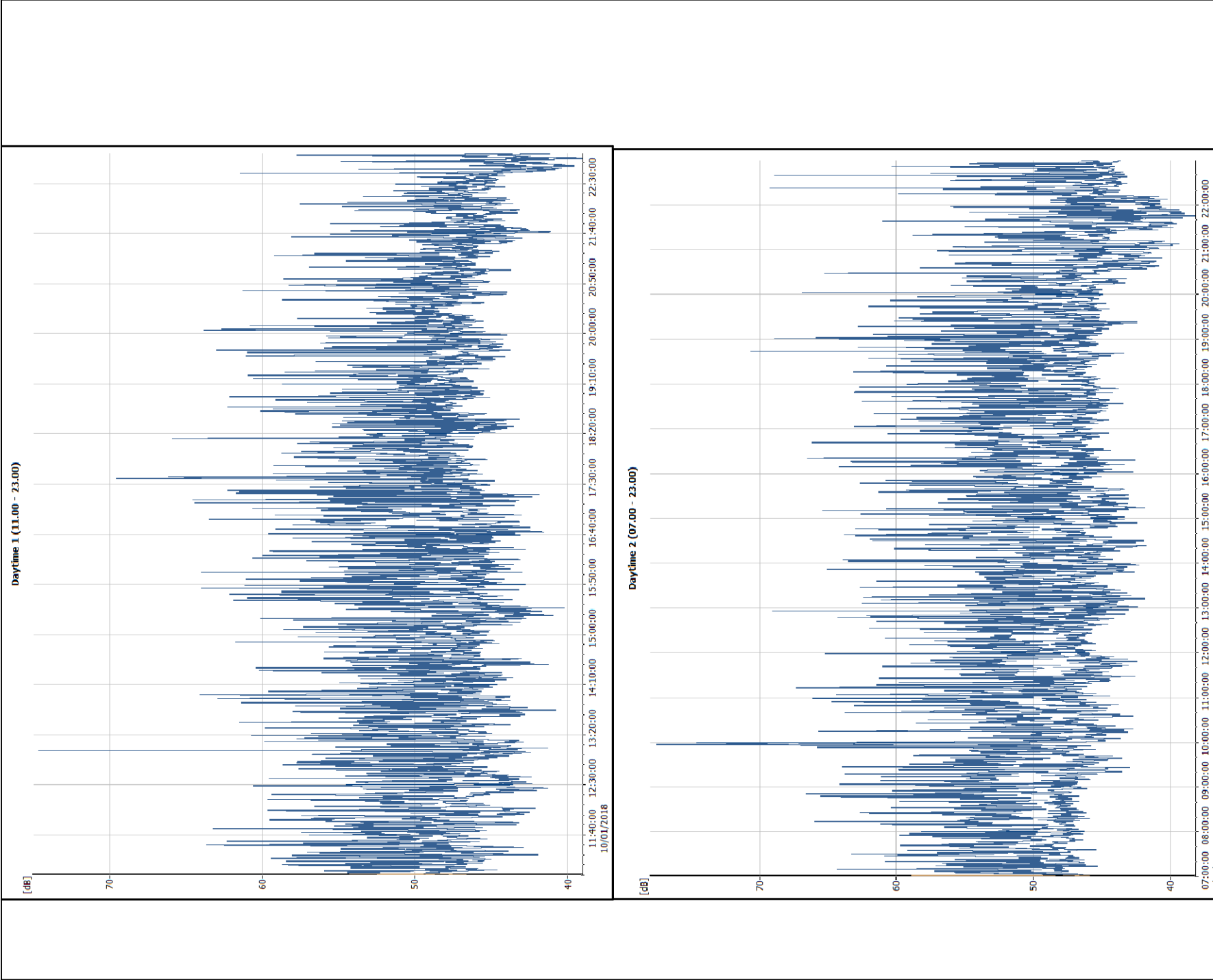


27.07.18 revised
1200 & A2 scaling
SMTP contact

061807-AP01

by dho

APPENDIX 2



DAYTIME NOISE PROFILE

NIGHT-TIME NOISE PROFILE



Stuart Michael Associates Ltd
Coombe House, Coombe Square, Thatcham, Berkshire RG19 4JF
T: 01635 867 711
F: 01635 861 715
e: mail@stuartmichael.co.uk
w: www.stuartmichael.co.uk

LOCHAILORT READING LIMITED

NORTH STREET
READING

NOISE PROFILE

Rev		Description		Drn		Chk		Date	
REVISIONS									
Preliminary		Approval		Tender		Const.			
DRAWING STATUS									
DATE		FEBRUARY 2018		DRAWN		WAH		CHECKED	
						JPM		ISSUE CHECKBOX	
DRAWING No.		APPENDIX 2		REV		.		SCALE	
						N/A		@ A3	
©		This drawing is the copyright of Stuart Michael Associates Limited. It may not be reproduced or amended without the written approval of Stuart Michael Associates							

APPENDIX 3

APPENDIX 3 - BS 5228 Construction Noise Calculations

No Mitigation

Receptors adjacent to the site	Ambient Noise Level (dB(A))	Distance from source to receptor (metres)						
		Specific construction noise level	10	20	30	40	50	60
R1: Burford Court - A	50	Total noise level (dB(A))	79	73	69	68	66	64
R2: Strathedan Court - B	50							
				73	69	68	66	64

Earthworks

Receptors adjacent to the site	Ambient Noise Level (dB(A))	Distance from source to receptor (metres)	10	20	30	40	50	60
			84	78	74	72	70	68
R1: Burford Court - A	50	Total noise level (dB(A))	84	78	74	72	70	68
R2: Strathedan Court - B	50							
			78	74	72	70	68	68

Construction

Receptors adjacent to the site	Ambient Noise Level (dB(A))	Distance from source to receptor (metres)	10	20	30	40	50	60
			84	78	74	72	70	68
R1: Burford Court - A	50	Total noise level (dB(A))	84	78	74	72	70	68
R2: Strathedan Court - B	50							
			78	74	72	70	68	68

Landscaping

Receptors adjacent to the site	Ambient Noise Level (dB(A))	Distance from source to receptor (metres)	10	20	30	40	50	60
			69	69	65	63	61	59
R1: Burford Court - A	50	Total noise level (dB(A))	69	69	65	63	61	60
R2: Strathedan Court - B	50							
			69	65	63	61	60	60

With Mitigation

Site Preparation

Receptors adjacent to the site	Ambient Noise Level (dB(A))	Distance from source to receptor (metres)	10	20	30	40	50	60
			69	63	59	57	55	53
R1: Burford Court - A	50	Total noise level (dB(A))	69	64	60	58	57	55
R2: Strathedan Court - B	50							
			64	60	58	57	55	55

Earthworks

Receptors adjacent to the site	Ambient Noise Level (dB(A))	Distance from source to receptor (metres)	10	20	30	40	50	60
			74	68	64	62	60	58
R1: Burford Court - A	50	Total noise level (dB(A))	74	68	64	62	60	58
R2: Strathedan Court - B	50							
			68	64	62	60	58	58

Construction

Receptors adjacent to the site	Ambient Noise Level (dB(A))	Distance from source to receptor (metres)	10	20	30	40	50	60
			74	68	64	62	60	58
R1: Burford Court - A	50	Total noise level (dB(A))	74	68	64	63	61	59
R2: Strathedan Court - B	50							
			68	64	63	61	59	59

Landscaping

Receptors adjacent to the site	Ambient Noise Level (dB(A))	Distance from source to receptor (metres)	10	20	30	40	50	60
			59	59	55	53	51	49
R1: Burford Court - A	50	Total noise level (dB(A))	60	60	56	55	54	53
R2: Strathedan Court - B	50							
			60	56	55	55	54	53



Coombe House
Coombe Square
Thatcham
Berkshire
RG19 4JF

T: 01635 867711
F: 01635 861715
E: mail@stuartmichael.co.uk
W: www.stuartmichael.co.uk