NoiseAir
ACOUSTICS & AIR QUALITY

Tel: 0116 272 5908
Email: info@noiseair.co.uk
Web: www.noiseair.co.uk

THIRTEEN GROUP LIMITED

NOISE IMPACT ASSESSMENT REPORT

AMBERLEY & HARROGATE STREET, HENDON, SUNDERLAND SR2 8ES

Client: Thirteen Group Limited

Report Ref: P5359-R1-V3

Issue Date: 6th May 2022

Document Status: Version 3

Unit 14, Chapel Court, Wervin, Chester, Cheshire, CH2 4BT
The Counting House, High Street, Lutterworth, Leicestershire, LE17 4AY

DATE ISSUED: **6th MAY 2022**

REPORT REFERENCE **P5359-R1-V3**

THIRTEEN GROUP LIMITED

NOISE IMPACT ASSESSMENT REPORT

AMBERLEY & HARROGATE STREET, HENDON, SUNDERLAND SR2 8ES

REPORT VERSION CONTROL:

Document Reference	Date	Report Prepared by	Report Checked and Authorised by
P5359-R1-V1	29/04/2022	Joshua McLelland, Ba(Hons), PGDip, AMIOA	M. J. Malone, BSc (Hons), MIOA
			
P5359-R1-V2	04/05/2022	Joshua McLelland, Ba(Hons), PGDip, AMIOA	M. J. Malone, BSc (Hons), MIOA
			
P5359-R1-V3	06/05/2022	Joshua McLelland, Ba(Hons), PGDip, AMIOA	M. J. Malone, BSc (Hons), MIOA
			

CONTENTS

APPENDICES

1 INTRODUCTION

1.1.1 By instruction from Thirteen Group Limited ('the client'), NoiseAir was commissioned to undertake a Noise Impact Assessment (NIA) for a proposed residential development at the location: Amberley & Harrogate Street, Hendon, Sunderland, SR2 8ES, herein referred to as the 'development site'.

1.1.2 It is understood that proposals are to be submitted for a residential development at the aforementioned address. Therefore, an NIA is required to support the planning application to ensure that future occupants at the site are not exposed to adverse noise impacts from the surrounding area.

1.1.3 General limitations with respect to this NIA are outlined in **Appendix A**.

1.2 Site Description

1.2.1 At the time of writing, the development site is an unoccupied site located c. 620 m to the south west of Sunderland City Centre.

1.2.2 Land use surrounding the development site is predominantly residential. Immediately to the east of the development site is Deerness Park Medical Centre.

1.2.3 The development site is flanked to the west, south and east by Salem Street, Mowbray Road and Suffolk Street respectively. Each of these roads are small single carriageway residential access roads trafficked be vehicles at speeds of up to 30 mph.

1.2.4 At the time of writing, Harrogate Street and Amberly Street are oriented in a north to south direction through the development site.

1.2.5 At a distance of c. 100 m to the northern boundary of the development site is the A1231. The A1231 is a single carriageway road connecting Sunderland and Washington in Tyne and Wear.

1.2.6 **Figure 1** shows an aerial photograph of the development site boundary with respect to the local area and its context.

Figure 1: Site aerial photograph

1.3 Development Proposals

1.3.1 It is understood that a proposed planning application is to be submitted to Sunderland Local Planning Authority to provide a new residential development (c. 103 no. units) on a currently undeveloped site.

1.3.2 The proposed development is to be comprised of a mixture of 2 bedroom bungalows and 2, 3 and 4 bedroom houses with associated external amenity areas.

1.3.3 The proposed site layout plans are detailed in the following JDDK Architectures Limited drawings:

- Proposed Site Plans – Drawing Number 3997 Rev 8– dated 30/03/21.

1.3.4 The aforementioned drawing is presented in **Appendix B**.

2 ASSESSMENT METHODOLOGY AND SCOPE OF WORKS

2.1 Planning Guidance and Noise

2.1.1 This acoustic report has been prepared in support of a planning application and therefore it is considered that reference should be made to the appropriate planning guidance documentation, specifically:

- National Planning Policy Framework (NPPF), 2021;
- Noise Policy Statement for England (NPSE), 2010; and,
- Planning Practice Guidance – Noise, 2019.

2.1.2 A summary of the relevant planning documentation and its relevance with respect to noise is provided below.

National Planning Policy Framework [NPPF 2021]

2.1.3 The NPPF was initially published in March 2012 with the most recent version updated in July 2021. The NPPF sets out the Governments planning policies for England and how these are expected to be applied across a number of areas.

2.1.4 With respect to noise specifically, Section 15, Paragraph 170 of the NPPF 2021 states:

> *'Planning policies and decisions should contribute to and enhance the natural and local environment by:*
>
> - *preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;'*

2.1.5 The NPPF 2021 continues to state in Paragraph 180:

> *'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:*

- *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; and,*
- *identify and protect tranquil areas 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 2010]

2.1.6 The Noise Policy Statement for England (NPSE), published in March 2010, states the long-term vision of Government noise policy is to "*promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development*".

2.1.7 This long-term vision is supported by the following aims; 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;
- Where possible, contribute to the improvement of health and quality of life.

2.1.8 The NPSE also introduces the below categories with respect to 'adverse impacts'.

'NOEL – No Observed Effect Level

- This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

- This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level

- This is the level above which significant adverse effects on health and quality of life occur'.

2.1.9 The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided. The second aim refers to the situation where the impact lies somewhere between LOAEL and SOAEL, and it requires that all reasonable steps are taken to mitigate and minimise the adverse effects of noise. However, the requirement to mitigate and minimise the adverse effects of noise does not mean that such adverse effects cannot occur.

Planning Practice Guidance - Noise [PPG 2019]

2.1.10 The National Planning Practice Guidance (PPG) is a web-based resource, launched by the Department for Communities and Local Government (DCLG) in March 2014 to support the NPPF[1].

2.1.11 The PPG advises on how planning can manage potential noise impacts in new development. The guidance is regularly reviewed and updated and noise is listed as a specific category, the noise category was most recently updated on 22nd July 2019.

2.1.12 The PPG provides further detail about how the effect levels can be recognised. Above the NOEL noise becomes noticeable, however it has no adverse effect as it does not cause any change in behaviour or attitude. Once noise crosses the LOAEL threshold it begins to have an adverse effect and consideration needs to be given to mitigating and minimising those effects, taking account of the economic and social benefits being derived from the activity causing the noise.

2.1.13 Increasing noise exposure further might cause the SOAEL threshold to be crossed. If the exposure is above this level the planning process should be used to avoid the effect occurring by use of appropriate mitigation such as by altering the design and layout. Such decisions must be made taking account of the economic and social benefit of the activity causing the noise, but it is undesirable for such exposure to be caused.

2.1.14 At the highest extreme the situation should be prevented from occurring regardless of the benefits which might arise.

2.1.15 **Table 1** summarises the noise exposure hierarchy outlined within the PPG.

[1] https://www.gov.uk/guidance/noise--2

Table 1: National Planning Practice Guidance noise exposure hierarchy			
Perception	**Examples of Outcomes**	**Increasing Effect Level**	**Action**
Not noticeable	No effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Effect Level			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for non-awakening sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

2.2 Consultation and Scope of Works

2.2.1 The location of the development site is an inner city urban area surrounded on all sides by residential dwellings and residential access roads. Therefore, it is considered that the NIA should consider noise primarily from traffic noise sources.

2.2.2 The scope of this assessment includes consideration of noise at each facade of the development where noise sensitive areas might be located in terms of the potential impact of local noise sources.

Consultation with Local Planning Authority

2.2.3 Pre-app comments received from the Local Planning Authority regarding the development are presented below:

> *"NOISE: A Noise Assessment should be provided to support any full application. The assessment should consider the existing noise climate at the proposed site and any noise that may impact future occupiers, in addition to recommending appropriate noise mitigation to ensure suitable noise levels are achieved inside residential accommodations and at amenity and open leisure areas. Noise levels are expected to be influenced by road traffic on the A1231 to the north of the site, together with traffic on Suffolk Street and Mowbray Road. A rail line emerges at the surface some 340 metres to the south east of the application site.*
>
> *The assessment should utilise guidance with World Health Organisation Guideline Values for Community Noise, BS 8233:2014 Guidance on sound insulation and noise reduction for buildings and where appropriate BS4142:2014 Methods for rating and assessing industrial and commercial sound, and be undertaken by a suitably experienced and qualified noise specialist."*

2.2.4 NoiseAir contacted Sunderland Planning Authority via email on the 7th April 2022. However, at the time of writing, NoiseAir have yet to receive a response.

2.3 Assessment Criteria

2.3.1 In order to achieve noise levels which are considered to be in alignment with the planning approaches and policies discussed in Section 2.1, it is considered that all efforts are made to ensure that future occupants are unlikely to be exposed to noise levels which might breach the LOEL criteria.

2.3.2 It should be noted however that planning guidance does not preclude development where the LOEL is likely to be breached in certain circumstances as long as reasonable efforts are made to mitigate and reduce such an effect.

2.3.3 It is therefore considered that the noise assessment and subsequent criteria should be undertaken in accordance with Pro-PG:2017 Planning and Noise, a summary of which is provided below.

2.3.4 At the time of the acoustic survey, it was observed that road traffic noise was the dominant source of noise to the north, south, east and west of the development site. As such, the 3D noise model – as discussed in Section 4 of this report – will be calibrated to road traffic noise data acquired in line with the guidance set out in guidance document Calculation of Road Traffic Noise 1988 (CRTN).

2.3.5 Noise data acquired in this fashion can be converted to $L_{Aeq,\ 16hour}$ and $L_{Aeq,\ 8hour}$ values as specified in a Defra-commissioned study, prepared by TRL and entitled "Method for Converting the UK Road Traffic Noise Index $L_{A10,18h}$ to the EU Noise Indices for Road Noise Mapping."

Pro-PG – Planning & Noise [Pro-PG 2017]

2.3.6 Pro-PG:2017 Planning and Noise provides professional practice guidance in relation to new residential development exposed to noise from transport sources. It provides practitioners with a recommended approach to the management of noise within the planning system in England.

2.3.7 The guidance reflects the Government's overarching National Planning Policy Framework, the Noise Policy Statement for England, and Planning Practice Guidance (including PPG-Noise) and draws on other authoritative sources of guidance. It provides advice for Local Planning Authorities and developers, and their professional advisers, on achieving good acoustic design in and around new residential developments.

2.3.8 Pro-PG:2017 adopts a two-stage approach to assessment:

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

2.3.9 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 Area Noise Assessment"; and,
- **Element 4** – consideration of other relevant issues.

2.3.10 Internal noise level guidelines are set out in Figure 2 of Pro-PG:2017 which have been reproduced in **Table 2**.

Table 2: Summary of internal noise guidelines.

Activity	Location	0700 – 2300 hours	2300 – 0700 hours
Resting	Living Room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room / area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$ 45 dB L_{AMax}

2.3.11 There are multiple notes outlined within Pro-PG:2017 with respect to **Table 2** which should be considered in full however the main points for consideration are outlined below:

- The table provides recommended internal $L_{Aeq,T}$ target levels for overall noise in the design of a building. These are the sum total of structure-borne noise and airborne noise sources.
- The internal $L_{Aeq,T}$ target levels shown in the table are based on the existing guidelines issued by the World Health Organisation (WHO) and assume normal diurnal fluctuation in external noise.
- The internal $L_{Aeq,T}$ 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.
- Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. 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 $L_{Amax,F}$ 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.
- 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.

- 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.

2.3.12 The guidelines presented in **Table 2** reflect and extend current practice contained in BS 8233:2014.

2.3.13 In terms of external amenity noise assessment, Pro-PG:2017 again draws upon guidelines set presented by the WHO and also presented in BS 8233:2014.

2.3.14 BS 8233:2014 states that "the acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq,16hr}$". The standard continues… "These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces but should not be prohibited."

2.3.15 Pro-PG:2017 also promotes the use of BS 4142:2014 in circumstances where commercial or industrial noise is considered to be prominent / measurable at the development site.

2.3.16 Based on the results and observations outlined from the survey site visits and measurement undertaken and reported in this report it is considered that, due to the development site being affected by predominantly traffic type noise sources, assessment in accordance with BS 4142:2014 is not appropriate and assessment in accordance with BS 8233:2014 should be conducted based on the values outlined in **Table 2**.

Calculation of Road Traffic Noise 1988

2.3.17 CRTN provides methods for measuring and calculating noise from road traffic. Guidance is provided for general environmental impact appraisals of road schemes, highway design and land use planning. The CRTN document is divided into three sections.

Section 1

2.3.18 In Section 1, a general method of calculation is set out, step by step for predicting noise levels at a distance from a highway, taking into account different traffic parameters, intervening ground cover, road configuration and site layout.

Section 2

2.3.19 Section 2 provides additional procedures that may need to be considered when applying the method given in Section 1 to specific situations, for example, road constructions.

Section 3

2.3.20 In Section 3 the procedure and requirements to be met during such measurements are detailed, together with details of a simplified measurement procedure which is acceptable in certain circumstances.

CRTN Shortened Measurement Procedure

2.3.21 Methods are presented in the CRTN guidance document that allow a $L_{10,\ 18hour}$ to be derived from a shorter $L_{10,\ 3hour}$ measurement.

2.3.22 Measurements of L_{10} are made over any three consecutive hours between 10:00 and 17:00 hours. Using $L_{10,\ 3hour}$ as the arithmetic mean of the three consecutive values of hourly $L_{10,}$ the current value of $L_{10,\ 18hour}$ can be calculated by arithmetically subtracting 1 from the $L_{10,\ 3hour}$.

2.4 Converting the UK Traffic Noise Index $L_{A10,18h}$ to EU Noise Indices for Noise Mapping

2.4.1 The Commission of the European Communities has published proposals to establish a common EU framework for the assessment and management of exposure to environmental noise.

2.4.2 The 'Converting the UK Traffic Noise Index LA10,18h to EU Noise Indices for Noise Mapping' document is a Defra-commissioned study, prepared by TRL, it is the source of the method promulgated in Highways Agency document HD 213/11 for estimating night-time noise levels from the calculated or measured $L_{A10,18h}$.

2.4.3 This study, however, also provides methods for the conversion of $L_{A10,18h}$ index to other indices, including various period $L_{Aeq,T}$ values. Whilst these conversions have been developed primarily for compliance with strategic EU noise mapping requirements, they provide one potential approach to estimating the range of noise indicators which are relevant to modelling traffic noise.

2.5 Noise Survey

2.5.1 As part of this assessment, NoiseAir has carried out an attended noise surveys to measure the existing sound levels at the site and at the closest identified noise sensitive receptors.

2.5.2 The primary noise sources assessed are:

- Road traffic noise breakout from the A1231;
- Road traffic noise breakout out from Salem Street;
- Road traffic noise breakout from Mowbray Road; and,

- Road traffic noise breakout from Suffolk Street.

2.5.3 The above noise source has been assessed in relation to the below identified receptors:

- Future occupants at the proposed development site.

3 ACOUSTIC SURVEY

3.1 Acoustic Survey Details

3.1.1 NoiseAir conducted attended noise monitoring at various locations around the development site between 22nd March 2022 and 24th March 2022.

3.1.2 Noise monitoring was undertaken at five monitoring locations (ML1, ML2, ML3, ML4 and ML5). The noise monitoring locations are shown in **Figure 2** and described in **Table 3** below.

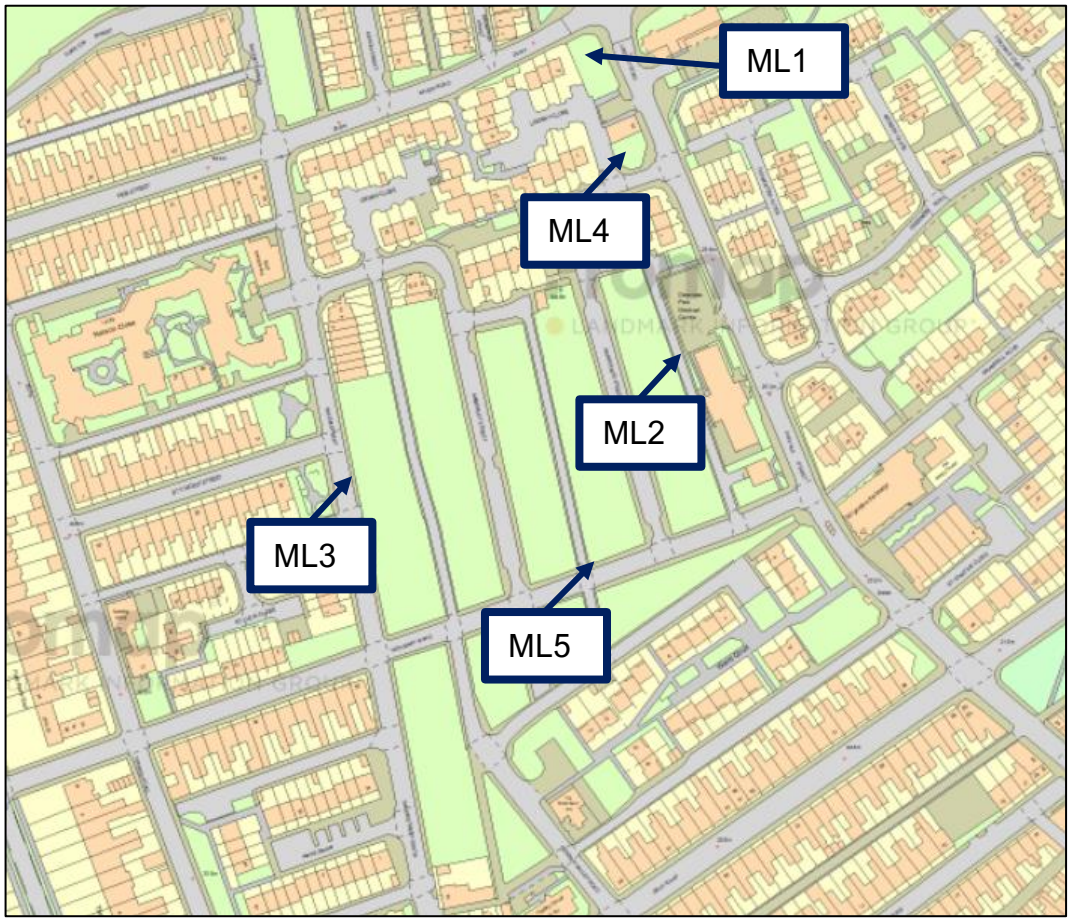

Figure 2: Site layout plan and noise monitoring locations.

Table 3: Summary of Unattended Noise Monitoring Locations

Monitor Location Number	Location Description	Time Period Monitored		Attended or Unattended Monitoring
		Start	End	
ML1	Tripod mounted microphone c. 1.5 m above local ground level. Positioned c. 15 m from A1231 roadside.	22/03/22 12:15	22/03/22 15:15	Attended

Table 3: Summary of Unattended Noise Monitoring Locations				
Monitor Location Number	**Location Description**	**Time Period Monitored**		**Attended or Unattended Monitoring**
		Start	**End**	
ML2	Boom mounted microphone c. 2 m above local ground level. Positioned to the eastern boundary of the proposed development site.	22/03/22 21:00	22/03/22 22:00	Attended
		23/03/22 05:00	23/03/22 09:00	
ML3	Boom mounted microphone c. 2 m above local ground. Positioned on Salem Street to the west of the development site.	22/03/22 22:00	22/03/22 23:00	Attended
		23/03/22 05:00	23/03/22 09:00	
		23/03/22 10:30	23/03/22 12:30	
ML4	Tripod mounted microphone c. 1.5 m above local ground level. Positioned c. 10 m from Suffolk Street roadside.	23/03/22 13:00	23/03/22 16:00	Attended
		24/03/22 10:45	24/03/22 11:45	
ML5	Boom mounted microphone c. 2 m above local ground level. Positioned at the side of Mowbray Road.	24/03/22 09:45	24/03/22 10:45	Attended

3.1.3 ML1, ML2, ML3, ML4 and ML5 are considered to be representative of the noise levels at the approximate location of the development site and so data from these locations will be adopted for the calibration of the 3D sound model.

3.1.4 The noise measurements were made using Class 1, integrating sound level meters (SLMs).

3.1.5 The acoustic equipment was calibrated to comply with Section 4.2 of BS 7445-1:2003[2], before and after the noise monitoring periods.

3.1.6 Details of the SLMs and associated field calibrations can be found in **Table 4** below:

[2] BS 7445-2003 "Description and measurement of environmental noise – Part 1: Guide to quantities and procedures.

Table 4: Summary of SLMs used for survey and associated field calibration						
SLM (Serial Number)	Preamp (Serial Number	Microphone (Serial Number)	Calibrator (Serial Number)	Start Calibration	End Calibration	Drift
NOR140 (1403057)	NOR1209 (12320)	NOR1225 (168289)	BK4231 (2699086)	-26.0	-26.1	0.1 dB
NOR140 (1403328)	NOR1209 (12694)	NOR1225 (72914)	BK4231 (2699086)	-26.0	-25.9	0.1 dB

3.1.7 The weather conditions were noted to be as outlined in **Table 5** during each site visit.

Table 5: Summary of Weather Conditions Noted During Each Site Visit.			
	22nd March 2022	23rd March 2022	24th March 2022
Roads (Wet / Dry)	Dry	Dry	Dry
Temperature (˚C)	14	15	16
Wind speed (ms^{-1})	< 5.0	< 5.0	< 5.0
Cloud Cover (Approx. %)	30	10	0
Humidity (%)	63	55	65

3.1.8 A-weighted[3] L_{eq}[4] and L_{AMax}[5] noise levels were measured to comply with the requirements of Pro-PG:2017, WHO and BS 8233:2014. A-weighted L_{90}[6] were also measured to provide additional information.

3.1.9 Attending the development site during each survey monitoring period provided opportunity for observations and detailed notes to be made of the significant noise sources, which contribute to the measured levels.

ML1

Road Traffic Noise – Road traffic noise from the A1231 was the dominant source of noise at ML1. Cars, vans, motorbikes, busses, HGVs and emergency vehicles were observed.

Pedestrian Noise – Pedestrian activity was also present at ML1.

[3] An electronic filter in a sound level meter which mimics the human ear's response to sounds at different frequencies under defined conditions.
[4] Equivalent continuous noise level; the steady sound pressure which contains an equivalent quantity of sound energy as the time-varying sound pressure levels.
[5] The instantaneous maximum noise level recorded for a measurement period.
[6] The noise level which is exceeded for 90% of the measurement period.

ML2

Road Traffic Noise – Road traffic noise from Suffolk Street and to a lesser extent the A1231 was the dominant source of noise at ML2. Cars, vans, motorbikes, busses, and emergency vehicles were observed.

Pedestrian Noise – Pedestrian activity was also present at ML2.

ML3

Road Traffic Noise – Road traffic noise from Salem Road was the dominant source of noise at ML3. Cars and vans were observed.

Pedestrian Noise – Pedestrian activity was also present at ML3.

ML4

Road Traffic Noise – Road traffic noise from Suffolk Street was the dominant source of noise at ML3. Cars, vans, motorbikes, busses, LGVs and emergency vehicles were observed.

Pedestrian Noise – Pedestrian activity was also present at ML4.

ML5

Road Traffic Noise – Road traffic noise from Mowbray Road was the dominant source of noise at ML3. Cars, vans, motorbikes and busses were observed.

Pedestrian Noise – Pedestrian activity was also present at ML5.

3.2 Measured Sound Levels

3.2.1 The results for the monitoring locations during the daytime and night-time periods are presented in **Table 6** below.

Table 6: Average Measured Daytime and Night-time Noise Levels

Monitoring Location	Date and Time	Measured Noise Level		
		dB $L_{Aeq,1hour}$ / dB $L_{Aeq,15mins}$	dB $L_{A90,1hour}$ / dB $L_{A90,15mins}$	$L_{A10,\ 1hour}$
ML1	22/03/22 12:15-15:15	67.2 – 67.8 -	56.3 – 57.9 -	70.1 – 70.6
ML2	22/03/22 21:00-22:00	56.5 -	40.6 -	-
	23/03/22 05:00-09:00	51.3 – 53.6 44.9 – 50.5	54.9 – 56.6 47.6 – 53.7	-
ML3	22/03/22 22:00-23:00	51.8 -	42.2 -	-
	23/03/22 05:00-09:00	53.2 – 55.0 48.8 – 52.5	52.2 – 54.9 41.5 – 46.6	-

Table 6: Average Measured Daytime and Night-time Noise Levels				
Monitoring Location	Date and Time	Measured Noise Level		
		dB $L_{Aeq,1hour}$ / dB $L_{Aeq,15mins}$	dB $L_{A90,1hour}$ / dB $L_{A90,15mins}$	$L_{A10,\ 1hour}$
	23/03/22 10:30-12:30	52.1 – 55.2 -	42.5 – 45.1 -	-
ML4	23/03/22 13:00-16:00	60.2 – 62.3 -	47.1 – 47.7 -	64.6 – 65.4
	24/03/22 10:45-11:45	65.9 -	47.7 -	-
ML5	24/03/22 09:45-10:45	61.7 -	53.4 -	-

3.2.2 The maximum night time noise levels at ML2 and ML3 are presented in **Table 7**.

Table 7: Summary of the Maximum Night-time Noise Levels (Figures in dB L_{AFmax}).	
Monitoring Location	Measured Maximum Noise Level During the Night-Time Period (dB(A))
ML2	67
ML3	76

3.3 Calculation of Daytime and Night-time noise levels at ML1 and ML4 using Methods Outlined in CRTN and Defra-Commissioned Study, prepared by TRL

3.3.1 **Table 8** below presents the derivation of daytime and night-time road traffic noise levels at ML1 (A1231)

Table 8: Calculation of Daytime and Night-time Road Traffic Noise Levels at ML1	
Description	dB(A)
Hour 1 $L_{A10,\ 1\ hour}$	70.1
Hour 2 $L_{A10,\ 1\ hour}$	70.6
Hour 3 $L_{A10,\ 1\ hour}$	70.6
Mean Average $L_{A10,\ 1hour}$	70.4
$L_{A10,\ 18hour}$ = Average $L_{A10,\ 1hour}$ - 1	69.4
$L_{Aeq,\ 16hour}$	71.8
$L_{Aeq,\ 8hour}$	58.7

3.3.2 **Table 9** below presents the derivation of daytime and night-time road traffic noise levels at ML4 (Suffolk Street).

Table 9: Calculation of Daytime and Night-time Road Traffic Noise Levels at ML4	
Description	**dB(A)**
Hour 1 $L_{A10,\ 1\ hour}$	64.6
Hour 2 $L_{A10,\ 1\ hour}$	65.4
Hour 3 $L_{A10,\ 1\ hour}$	65.3
Mean Average $L_{A10,\ 1hour}$	65.1
$L_{A10,\ 18hour}$ = Average $L_{A10,\ 1hour}$ - 1	64.1
$L_{Aeq,\ 16hour}$	62.3
$L_{Aeq,\ 8hour}$	53.9

4 3D SOUND MODEL

4.1.1 A 3D sound model has been constructed in SoundPLAN™ to calculate the predicted sound pressure levels at selected potential receiver facades. The model uses the calculation method from ISO 9613-2:1996[7] to account for the distance between the source and receiver and any screening or reflections provided by the surrounding buildings. The model is based on and calibrated against data collected during the survey presented in Section 3.2 of this report.

4.1.2 The 3D noise model specifically includes the following noise sources:

- **Noise breakout from A1231** – Line source at 0.5 m above local ground level calibrated to daytime and night-time noise levels as derived in **Table 8.** Daytime noise levels were set to 71.8 dB(A) and night-time noise levels were set to 58.7 dB(A).
- **Noise breakout from Suffolk Street** – Line source at 0.5 m above local ground level calibrated to daytime and night-time noise levels as derived in **Table 10.** Daytime noise levels were set to 62.3 dB(A) and night-time noise levels were set to 53.9 dB(A).
- **Noise breakout from Salem Street** – Line source at 0.5 m above local ground level calibrated to daytime and night-time on site noise levels as discussed in Section 3 of this report. Daytime sound power levels were set to 65.8 dB(A) L_{WA} and night-time sound power levels were set to 63.0 dB(A).
- **Noise breakout from Mowbray Road** – Line source at 0.5 m above local ground level calibrated to daytime and night-time on site noise levels as discussed in Section 3 of this report. Daytime sound power levels were set to 72.5 dB(A) L_{WA} and night-time sound power levels were set to 61.7 dB(A).

4.1.3 Each line source was given a L_{Amax} value of 76 dB(A).

4.1.4 The 3D sound model in each instance has been constructed considering high resolution terrain data in order to account for the elevation differences from the site and the identified receptor locations.

4.1.5 A noise contour plot illustrating the propagation of the sound from source to receptor during the daytime ($L_{Aeq,16hour}$), night time ($L_{Aeq,\ 8hour}$) and night time (L_{AFmax}) condition is given in **Figure 3, Figure 4** and **Figure 5** respectively.

[7] ISO9613-2:1996 "Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation"

Figure 3: Noise contour plot illustration of the predicted propagation of sound to the proposed development during the daytime – $L_{Aeq,16hour}$.

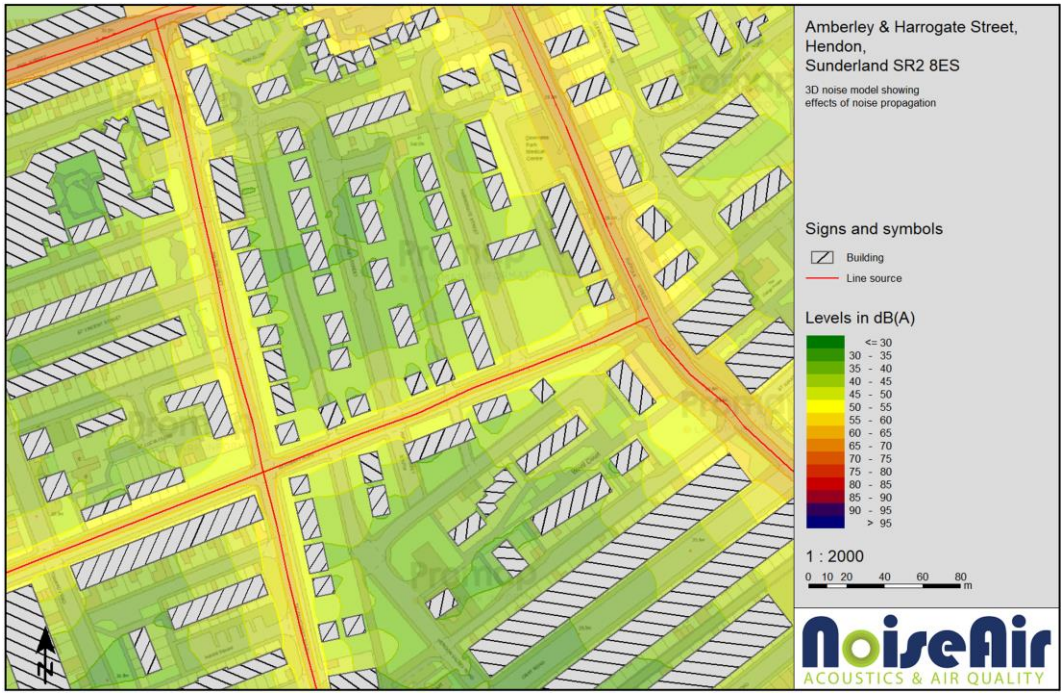

Figure 4: Noise contour plot illustration of the predicted propagation of sound to the proposed development during the night-time – $L_{Aeq,8hour}$.

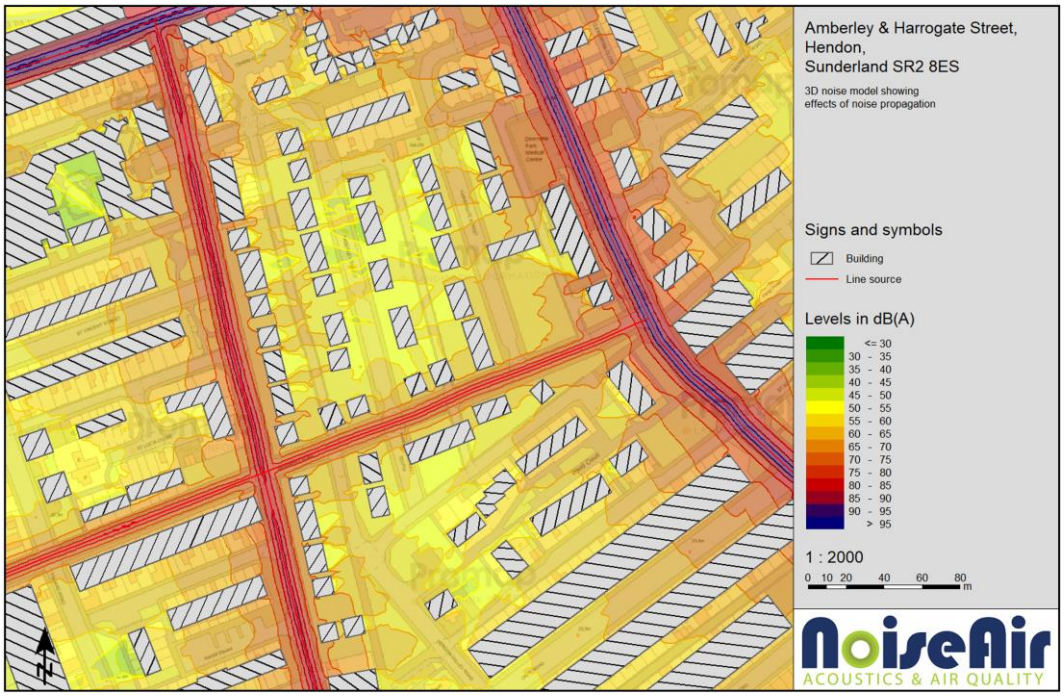

Figure 5 Noise contour plot illustration of the predicted propagation of instantaneous maximum sound to the proposed development during the night-time – L_{Amax}.

4.1.6 Receptor locations used in the noise model with calculated façade levels are presented in **Figure 6** below.

Figure 6*:* Illustration of the 3D sound model Receptor Locations*.*

4.1.7 **Table 16** in **Appendix C** details the predicted noise levels at each façade receptor location.

4.1.8 **Table 17** in **Appendix C**, includes the calculated level at the amenity areas of the dwellings of the development.

4.1.9 Given that the calculated noise levels at a number of the proposed amenity spaces are elevated above WHO guidelines for noise in external amenity spaces, an investigation into the effects of a 1.8 m high acoustic barrier – located around each proposed external amenity space – has been undertaken.

4.1.10 The locations of the aforementioned acoustic barriers are presented in **Figure 7** below.

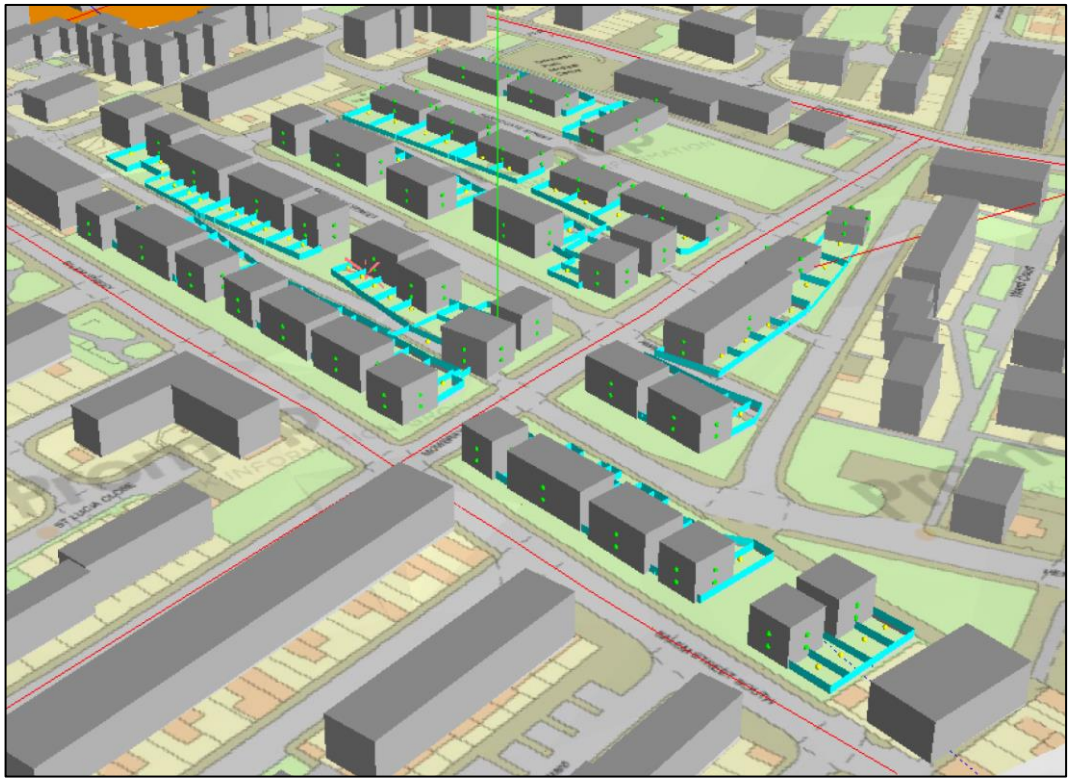

Figure 7: View of the sound model showing location of acoustic barriers around each plot's amenity space.

4.1.11 The benefits of installing a series of 1.8 m acoustic barriers around the amenity areas of each the plots have been investigated and are presented as a comparison in **Table 18, Appendix C**.

5 PRO-PG:2017 SITE NOISE RISK ASSESSMENT AND ACOUSTIC DESIGN STATEMENT

5.1 Pro-PG Stage 1: Initial Site Noise Risk Assessment

5.1.1 Based on the results of the 3D sound model and in accordance with the Pro-PG:2017, a Site Noise Risk Assessment (SNRA) has been conducted. The SNRA assesses the initial risk of noise to have an adverse impact on a proposed development based on the overall measured levels with no mitigation in place.

5.1.2 The worst-case daytime results at Plots 45, 46 and 47 and night-time results at Plots 14 and 15 are presented in **Table 11**, and have been compared to the information provided in Figure 1 of the Pro-PG:2017 document.

Table 11: Stage 1 Risk Assessment of Noise Levels

Receptor Point	Façade	Daytime Noise Level (dB L_{Aeq})	Risk of Adverse Effect	Night-time Noise Level (dB L_{Aeq})	Risk of Adverse Effect
127	West	-	-	51	Low
178	South	61	Low	-	-

5.1.3 **Table 11** indicates that during the daytime and night-time periods, proposed receptors of the development are at a **'Low'** risk of adverse effect at the façades of the development site.

5.1.4 ProPG states that:

> *'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.*

5.1.5 The Site Noise Risk Assessment shows that local noise mitigation and good acoustic design will be required to ensure that the potential risk of the noise impact is minimised, and guideline internal and external noise levels are achieved.

5.1.6 In accordance with Pro-PG 2017, a Stage 2 full noise assessment, which includes an acoustic design statement, is required to ensure future residents are protected and good acoustic design has been implemented.

5.2 Pro-PG:2017 Stage 2 Acoustic Design Statement

5.2.1 The results of the Pro-PG Stage 1: Initial Site Noise Risk Assessment shows that receptors at the proposed development are likely to be at **'low'** risk of experiencing an adverse noise impact, with no mitigation in place. Therefore, an assessment against the criteria in WHO and BS 8233:2014 has been undertaken with reference to the general sound levels at the site.

5.2.2 This section forms the Stage 2 Acoustic Design Statement of Pro-PG:2017.

WHO Assessment of Daytime Noise Levels in Outdoor Living Areas

5.2.3 Analyses of the 3D sound model, specifically the receiver locations placed in proposed external amenity areas across the site (i.e., the proposed amenity areas of the plots) are summarised in **Table 17**, presented in **Appendix C**:

5.2.4 Analysis of the calculated levels indicates:

- The external amenity areas of 56 no. plots have been calculated to remain below the recommended 50 dB(A) $L_{Aeq,T}$ WHO guidance value for people being moderately annoyed.
- The external amenity areas of 33 no. plots have been calculated to exceed the recommended 50 dB(A) $L_{Aeq,T}$ WHO guidance value for people being moderately annoyed, but below the 55 dB(A) $L_{Aeq,T}$ WHO guidance value people being seriously annoyed.
- The external amenity areas of 14 no. plots have been calculated to exceed the recommended 55 dB $L_{Aeq,T}$ WHO guidance value for people being seriously annoyed with the worst-case amenity noise level calculated at 60.3 dB(A) for Plot 33, Plot 34 and Plot 35 being 5.3 dB(A) above the aforementioned limit value.

5.2.5 The benefits of installing a series of 1.8 m acoustic barriers around the amenity areas of each the plots has been investigated and are presented as a comparison in **Table 18, Appendix C**.

5.2.6 Analysis of the calculated levels with the inclusion of the recommended acoustic barriers indicate:

- The external amenity areas of 91 no. plots have been calculated to remain below the recommended 50 dB $L_{Aeq,T}$ WHO guidance value for people being moderately annoyed.

- The external amenity areas of 7 no. plots have been calculated to exceed the recommended 50 dB $L_{Aeq,T}$ WHO guidance value for people being moderately annoyed, but below the 55 dB $L_{Aeq,T}$ WHO guidance value people being seriously annoyed.

- The external amenity areas of 5 no. plots have been calculated to exceed the recommended 55 dB $L_{Aeq,T}$ WHO guidance value for people being seriously annoyed with the worst-case amenity noise level calculated at 58.1 dB for Plot 15, being 3.1 dB above the aforementioned limit value. It should be noted that the additional 4 no. plots with noise levels that exceed the recommended 55 dB $L_{Aeq,T}$ WHO guidance value for people being seriously annoyed only marginally exceed the guidance by no more than 0.4 dB(A).

5.2.7 It is noted that the above assessment summary indicates that with the inclusion of a 1.8 m high acoustic barrier around each of the amenity areas noise can be reduced.

WHO:1999 and BS 8233:2014 Assessment of Daytime Noise Levels in Living Rooms and Bedrooms

5.2.8 The predicted noise levels at the façades of the proposed building structures, as detailed in **Figure 6** and **Table 16.** for the daytime period, together with the level of attenuation required to achieve 35 dB L_{Aeq} in the living room and bedroom areas in accordance with BS 8233:2014 and WHO:1999, are presented in **Table 12** below.

Table 12: Level of Attenuation Required to Achieve the Internal Daytime Noise Guideline Levels (Figures in dB(A))

Façade	Worst Case Noise Level at the Façade of the Property	Worst Case Level of Attenuation Needed to Achieve 35 dB L_{Aeq} in Living Room and Bedroom Areas
All	61	26

Assessment of Night-time Noise Levels in Bedrooms

5.2.9 The noise levels calculated from the 3D sound model at the façades of the proposed building structures, as detailed in **Figure 6** and **Table 16** for the night-time period, together with the level of attenuation required to achieve 30 dB L_{Aeq} and 45 dB $L_{Amax,f,}$ in the bedrooms, are summarised in **Table 13**.

Table 13: Level of Attenuation Required to Achieve the Internal Night-time Noise Guideline Levels (Figures in dB(A))			
Façade	**Worst Case Noise Level at the Façade of the Property (dB L_{Aeq})**	**Maximum Noise Level at the Façade of the Property (dB $L_{Amax,f}$)**	**Worst Case Level of Attenuation Needed to Achieve the Noise Guideline Levels in Bedrooms (dB)**
All	51	71*	26
L_{Amax} value calculated by SoundPLAN™ was calculated at receptor point 107 which corresponds to Plots 1 and 2 (west façade)			

6 SOUND INSULATION SCHEME

6.1 Building Envelope Requirements – Windows Closed

6.1.1 Proposals for the development site at the time of writing outline residential use to the first floor and above. Noise sensitive rooms are proposed to all facades of the property. Therefore, internal noise levels are required to not exceed 35 dB L_{Aeq} during the daytime hours in all rooms and 30 dB L_{Aeq} and 45 dB L_{Amax} during the night-time hours in bedrooms.

6.1.2 When assessing sound levels in habitable areas of the proposed development, the sound attenuation provided by the overall building facade should be considered. To mitigate sound levels, the composition of the building facade can be designed to provide the level of attenuation required. Glazing is generally the building element which attenuates noise the least, so the proportion of glazing in a building facade is an important consideration when assessing overall sound attenuation. Additionally, any façade penetrations should also be considered such as for ventilation, e.g., trickle ventilation.

6.1.3 Based on the design details forwarded, worst case façade attenuation calculations have been undertaken in accordance with BS EN ISO 12354-3:2017. Full details of the calculations undertaken are presented in **Appendix D**.

6.1.4 Calculations show that to achieve a reasonable internal acoustic environment in habitable rooms as specified within BS 8233:2014, the building envelope constructions should be selected to meet the sound reduction index (SRI) values presented in **Table 14** and **Table 15**.

6.1.5 The building envelope construction is based on a passive ventilation system being installed. However, if an active ventilation system is required, relaxed glazing specifications are also presented.

Table 14: Summary of Building Envelope Performance Requirements to all Facades – Living Rooms

Walls	50 R_w+C_{tr}	Typical example: 100 mm brick exterior wall, 100 mm cavity with 60 mm 10 kg / m^3 fiberglass insulation, 100 mm lightweight concrete block / breeze block and two layers of plasterboard.
Glazing	30 R_w+C_{tr}	Typical example: Double glazed unit consisting of 10 mm pane, 6 -16 mm air filled cavity and 4 mm pane[8].
Acoustic Vent	37 $D_{n,e}+C_{tr}$	Typical example: Titan TA5235 (V75) + TA5236 (C75) 5000EA. Other manufacturer may be

[8] Glazing acoustic values are based on those presented in BS 12758:2011. Specialist glazing advice should be sought.

Table 14: Summary of Building Envelope Performance Requirements to all Facades – Living Rooms		
(Up to 2 no. trickle vents per room)		suitable as long as the units comply with 37 $D_{n,e}$ +C_{tr} in the open position.
NOTE: where an active ventilation system is adopted (i.e., MVHR) and passive ventilation is not required (i.e., no trickle vents) the glazing specification can be relaxed to a worse case at the façade of 26 dB R_w+C_{tr}.		
Table 15: Summary of Building Envelope Performance Requirements to all Facades - Bedrooms		
Walls	50 R_w+C_{tr}	Typical example: 100 mm brick exterior wall, 100 mm cavity with 60 mm 10 kg / m^3 fiberglass insulation, 100 mm lightweight concrete block / breeze block and two layers of plasterboard.
Glazing	30 R_w+C_{tr}	Typical example: Double glazed unit consisting of 10 mm pane, 6 -16 mm air filled cavity and 4 mm pane[9].
Acoustic Vent (Up to 2 no. trickle vents per room)	39 $D_{n,e}$ +C_{tr}	Typical example: Titan TA5225 (V75) + TA5204 (C50) 2500EA. Other manufacturer may be suitable as long as the units comply with 39 $D_{n,e}$ +C_{tr} in the open position.
NOTE: where an active ventilation system is adopted (i.e., MVHR) and passive ventilation is not required (i.e., no trickle vents) the glazing specification can be relaxed to a worse case at the façade of 27 dB R_w+C_{tr}.		

6.2 Building Envelope Performance – Windows Open

6.2.1 The sound performance requirements for bedrooms, living and dining rooms at the development during the daytime and night-time in rooms with windows closed are summarised in Section 6.1.

6.2.2 However, with windows open, the attenuation provided by the façade will be approximately 10-15 dB(A). This would potentially allow the recommended internal noise limit to be exceeded in most rooms at the development during certain parts of a typical day / night.

6.2.3 **Table 19** in **Appendix C** presents the calculated internal noise level based on 15 dB reduction for a partially open window and outlines which facades at the proposed development are likely to achieve acceptable internal noise levels with windows in the partially open position.

6.2.4 It is noted that most facades at the development site are considered to be able to achieve acceptable internal noise levels with windows in the partially open position.

[9] Glazing acoustic values are based on those presented in BS 12758:2011. Specialist glazing advice should be sought.

6.2.5 It is considered that in many circumstances, such as urban / sub-urban developments, an exceedance of up to 5 dB(A) in accordance with BS 8233:2014 is likely to be acceptable to future residents and therefore is unlikely to breach the LOEL criteria discussed in Section 2 of this report.

6.2.6 Where exceedances are likely to be greater than +5 dB, on occasions, this may be acceptable to a resident, but when quiet conditions are required, the resident should be able to close the windows whilst maintaining adequate ventilation. Facades that make up this category at the proposed development site are considered to be in minority and in general as a result of L_{Amax} events rather than $L_{Aeq,8hour}$ sound levels being elevated.

6.2.7 Active ventilation may be a consideration for habitable rooms facades where noise levels are considered to be elevated. However, as **Table 14** and **Table 15** demonstrates, adequate ventilation can be achieved with passive ventilation.

6.3 Ventilation Requirements

6.3.1 It is recommended that the acoustic ventilation proposed at the site should, as a minimum, comply with Building Regulations 2000 Approved Document F1 Means of Ventilation and British Standard BS5925 1991: “Code of Practice for Ventilation Principles and Designing for Natural Ventilation”. Acoustic ventilation is only recommended for noise sensitive rooms, which are bedrooms and living/dining rooms.

6.3.2 Where a passive ventilation system is incorporated into the design, ventilators should be acoustically treated for habitable rooms to all facades. Ventilation openings to these rooms should match or exceed the minimum values set out in **Table 14** and **Table 15.**

6.3.3 The implementation of the recommended glazing would ensure that the required internal daytime and night-time noise limits are achieved.

6.3.4 It should be further noted that the glazing configurations within this report are for guidance only. Similar products to those used in NoiseAir calculations may achieve a similar level of sound reduction, however this should be verified by the manufacturer.

6.3.5 As detailed in Section 6.2 it is likely that noise levels in noise sensitive rooms within most of the proposed rooms will likely rely on the windows being in the closed position and therefore appropriate ventilation design should be completed.

6.3.6 Active ventilation may be a consideration for habitable rooms facades where noise levels are considered to be elevated. However, as **Table 14** and **Table 15** demonstrates, adequate ventilation can be achieved with passive ventilation.

6.3.7 Any mechanical ventilation adopted for the noise sensitive rooms should have a noise output which complies with NR25 noise rating curve.

7 CONCLUSIONS

7.1.1 By instruction from Thirteen Group Limited ('the client'), NoiseAir was commissioned to undertake a Noise Impact Assessment (NIA) for a proposed residential development at the location: Amberley & Harrogate Street, Hendon, Sunderland, SR2 8ES.

7.1.2 It is understood that a proposed planning application is to be submitted to Sunderland Local Planning Authority to provide a new residential development (c. 103 no. units) on a currently undeveloped greenfield site.

7.1.3 The primary noise sources assessed are:

- Road traffic noise breakout from the A1231;
- Road traffic noise breakout out from Salem Street;
- Road traffic noise breakout from Mowbray Road; and,
- Road traffic noise breakout from Suffolk Street.

7.1.4 The results of the Pro-PG Stage 1: Initial Site Noise Risk Assessment shows that receptors at the proposed development are likely to be at **'low'** risk of experiencing an adverse noise impact, with no mitigation in place.

7.1.5 Calculations show that to achieve a reasonable internal acoustic environment in habitable rooms as specified within BS 8233:2014, the building envelope constructions should be selected to meet the sound reduction index (SRI) values presented in **Table 14** and **Table 15**.

7.1.6 Active ventilation may be a consideration for habitable rooms where noise levels are considered to be elevated. However, as **Table 14** and **Table 15** demonstrates, adequate ventilation can be achieved with passive ventilation.

7.1.7 It is noted that most facades at the development site are considered to be able to achieve acceptable internal noise levels with windows in the partially open position. Internal noise levels exceedances greater than +5 dB are considered to be in minority and in general as a result of L_{Amax} events rather than $L_{Aeq,8hour}$ sound levels being elevated.

APPENDIX A - REPORT LIMITATIONS

This Report is presented to Thirteen Group Limited and may not be used or relied on by any other person or by the client in relation to any other matters not covered specifically by the scope of this report.

Notwithstanding anything to the contrary contained in the report, NoiseAir Limited is obliged to exercise reasonable skill, care and diligence in the performance of the services required by Thirteen Group Limited and NoiseAir shall not be liable except to the extent that it has failed to exercise reasonable skill, care and diligence, and this report shall be read and construed accordingly.

This report has been prepared by NoiseAir Limited. No individual is personally liable in connection with the preparation of this report. By receiving this report and acting on it, the client or any other person accepts that no individual is personally liable whether in contract, tort, for breach of statutory duty or otherwise.

The conclusions and recommendations contained in this report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from who it has been requested and that such information is accurate. Information obtained by NoiseAir Limited has not been independently verified by NoiseAir Limited unless otherwise stated in the report and should be treated accordingly.

Where assessments of works or costs identified in this report are made, such assessments are based upon the information available at the time and where appropriate are subject to further investigations or information which may become available.

Where / if estimates and projects are made within this report, are made based on reasonable assumptions as of the date of this report, such statements however by their very nature involve risks and uncertainties that could cause actual results to differ materially from the results predicted. NoiseAir Limited specifically does not guarantee or warrant any estimates or projects contained in this report.

DISCLAIMER- This report was prepared by NoiseAir Limited. The material in it contains NoiseAir Limited best judgment in light of the information available at the time of preparation of this report. Any use which a third party makes of this report, or any reliance on, or decisions based on it are the responsibility of such third parties. NoiseAir Limited accept no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report.

APPENDIX B – CLIENT PROPOSAL DRAWINGS


NOTES:
1. DONOT SCALE from the drawing
4. Refer to the following ASSOCIATED DRAWINGS:-
Revision Log
Rev Initials Date Description
BUNGALOW PHASE
MODULAR PHASE
JDDK Architects
DISCOVER DESIGN DELIVER
jddk.co.uk
Thirteen Group
Amberley and Harrogate Street
Proposed Site Plan
DRAWING No.
3997
Job Ref
JDDK1002
Type
Revision
B
SCALE:- 1:500
PAPER SIZE:- A1
DATE:- 30.03.21
CHECKED BY:- CS
DRG STATUS:-
PLANNING

APPENDIX C – TABLES

Table 16: Predicted Façade Receptor Noise Levels						
No.	Name	Facade	Floor	Predicted Levels (dB(A))		
				Day $L_{Aeq, 16hour}$	Night $L_{Aeq, 8hour}$	Max L_{Amax}
104	P1 and P2 - East	East	GF	45.3	39.8	60.9
104	P1 and P2 - East	East	1.Fl	45.3	39.8	60.8
105	P1 and P2 - North	North	GF	49.2	45.3	67.5
105	P1 and P2 - North	North	1.Fl	49.2	45.2	67.2
106	P1 and P2 - South	South	GF	48.3	45.0	68.3
106	P1 and P2 - South	South	1.Fl	48.2	44.8	68.0
107	P1 and P2 - West	West	GF	52.8	49.7	71.3
107	P1 and P2 - West	West	1.Fl	52.5	49.4	70.6
108	P3 and P4 - East	East	GF	45.0	34.8	50.5
108	P3 and P4 - East	East	1.Fl	45.1	34.8	51.2
109	P3 and P4 - North	North	GF	47.8	41.8	63.5
109	P3 and P4 - North	North	1.Fl	47.9	41.9	63.5
110	P3 and P4 - South	South	GF	45.0	41.3	64.1
110	P3 and P4 - South	South	1.Fl	45.0	41.3	64.1
111	P3 and P4 - West	West	GF	44.4	39.9	60.0
111	P3 and P4 - West	West	1.Fl	44.5	40.0	60.0
112	P5 and P6 - East	East	GF	47.2	36.7	48.7
112	P5 and P6 - East	East	1.Fl	47.3	36.8	48.9
113	P5 and P6 - North	North	GF	46.6	42.9	66.1
113	P5 and P6 - North	North	1.Fl	46.5	42.7	66.0
114	P5 and P6 - South	South	GF	47.7	44.4	66.1
114	P5 and P6 - South	South	1.Fl	47.7	44.3	65.9
115	P5 and P6 - West	West	GF	52.1	48.8	69.1
115	P5 and P6 - West	West	1.Fl	52.1	48.7	68.6
116	P7, P8 and P9 - East	East	GF	48.3	37.9	50.6
116	P7, P8 and P9 - East	East	1.Fl	48.4	37.9	50.5
117	P7, P8 and P9 - North	North	GF	46.5	42.6	66.2
117	P7, P8 and P9 - North	North	1.Fl	46.4	42.5	66.0
118	P7, P8 and P9 - South	South	GF	46.8	43.0	66.8
118	P7, P8 and P9 - South	South	1.Fl	46.8	42.9	66.6
119	P7, P8 and P9 - West	West	GF	52.4	49.0	69.7
119	P7, P8 and P9 - West	West	1.Fl	52.6	49.0	69.2
120	P10, P11, P12 and P13 - East	East	GF	50.9	40.5	53.7
120	P10, P11, P12 and P13 - East	East	1.Fl	51.0	40.5	53.6
121	P10, P11, P12 and P13 - North	North	GF	51.8	44.9	66.8
121	P10, P11, P12 and P13 - North	North	1.Fl	52.6	45.5	67.2
122	P10, P11, P12 and P13 - South	South	GF	46.5	42.8	66.1
122	P10, P11, P12 and P13 - South	South	1.Fl	46.5	42.6	65.8
123	P10, P11, P12 and P13 - West	West	GF	53.4	49.1	69.1
123	P10, P11, P12 and P13 - West	West	1.Fl	54.1	49.3	68.6
124	P14 and P15 - East	East	GF	55.1	44.5	59.2
124	P14 and P15 - East	East	1.Fl	55.0	44.4	58.9
125	P14 and P15 - North	North	GF	60.2	50.4	66.2

Table 16: Predicted Façade Receptor Noise Levels						
No.	Name	Facade	Floor	Predicted Levels (dB(A))		
				Day $L_{Aeq, 16hour}$	Night $L_{Aeq, 8hour}$	Max L_{Amax}
125	P14 and P15 - North	North	1.Fl	60.0	50.2	66.0
126	P14 and P15 - South	South	GF	51.1	44.7	67.3
126	P14 and P15 - South	South	1.Fl	51.3	44.9	67.2
127	P14 and P15 - West	West	GF	57.1	50.3	69.6
127	P14 and P15 - West	West	1.Fl	57.3	50.5	69.4
128	P16, P17 and P18 - East	East	GF	48.9	38.3	52.6
128	P16, P17 and P18 - East	East	1.Fl	49.1	38.4	52.5
129	P16, P17 and P18 - North	North	GF	47.1	37.5	56.3
129	P16, P17 and P18 - North	North	1.Fl	47.6	37.8	56.3
130	P16, P17 and P18 - South	South	GF	41.3	33.4	55.6
130	P16, P17 and P18 - South	South	1.Fl	41.3	33.4	55.6
131	P16, P17 and P18 - West	West	GF	50.6	40.8	56.9
131	P16, P17 and P18 - West	West	1.Fl	51.1	41.3	57.4
132	P19, P20 and P21 - East	East	GF	53.4	42.7	58.0
132	P19, P20 and P21 - East	East	1.Fl	53.5	42.8	57.9
133	P19, P20 and P21 - North	North	GF	59.3	48.7	61.9
133	P19, P20 and P21 - North	North	1.Fl	59.1	48.5	61.4
134	P19, P20 and P21 - South	South	GF	46.7	36.6	55.6
134	P19, P20 and P21 - South	South	1.Fl	46.8	36.8	55.6
135	P19, P20 and P21 - West	West	GF	54.6	44.4	58.2
135	P19, P20 and P21 - West	West	1.Fl	54.6	44.4	58.5
136	P22, P23, P24 and P25 - East	East	GF	53.2	42.5	59.5
136	P22, P23, P24 and P25 - East	East	1.Fl	53.7	43.2	59.3
137	P22, P23, P24 and P25 - North	North	GF	58.7	48	60.6
137	P22, P23, P24 and P25 - North	North	1.Fl	58.5	47.8	60.3
138	P22, P23, P24 and P25 - South	South	GF	44.3	34.6	51.7
138	P22, P23, P24 and P25 - South	South	1.Fl	44.7	34.9	52.7
139	P22, P23, P24 and P25 - West	West	GF	53.7	43.0	56.9
139	P22, P23, P24 and P25 - West	West	1.Fl	53.6	42.9	56.8
140	P26 and P27 - East	East	GF	55.7	45.2	60.5
140	P26 and P27 - East	East	1.Fl	56.5	46.1	62.1
141	P26 and P27 - North	North	GF	60.2	49.5	63.5
141	P26 and P27 - North	North	1.Fl	60.1	49.5	62.8
142	P26 and P27 - South	South	GF	46.7	36.5	49.5
142	P26 and P27 - South	South	1.Fl	51.5	41.2	55.8
143	P26 and P27 - West	West	GF	56.0	45.3	59.9
143	P26 and P27 - West	West	1.Fl	56.6	46.0	59.6
144	P28 - North East	North east	GF	57.8	47.6	64.9
144	P28 - North East	North east	1.Fl	58.4	48.3	66.0
145	P28 - North West	North west	GF	59.4	48.7	62.4
145	P28 - North West	North west	1.Fl	59.6	49.0	63.3

Table 16: Predicted Façade Receptor Noise Levels						
No.	Name	Facade	Floor	Predicted Levels (dB(A))		
				Day $L_{Aeq, 16hour}$	Night $L_{Aeq, 8hour}$	Max L_{Amax}
146	P28 - South East	South east	GF	50.8	41.3	61.6
146	P28 - South East	South east	1.Fl	54.2	44.5	63.2
147	P28 - South West	South west	GF	53.7	43.0	57.7
147	P28 - South West	South west	1.Fl	55.5	45.1	60.1
148	P28, P30 and P31 - East	East	GF	52.3	42.4	59.0
148	P28, P30 and P31 - East	East	1.Fl	54.3	44.6	60.2
149	P28, P30 and P31 - North	North	GF	52.7	43.3	62.6
149	P28, P30 and P31 - North	North	1.Fl	54.6	45.1	62.6
150	P28, P30 and P31 - South	South	GF	52.7	43.1	57.8
150	P28, P30 and P31 - South	South	1.Fl	54.5	44.9	58.6
151	P28, P30 and P31 - West	West	GF	48.4	38.1	54.2
151	P28, P30 and P31 - West	West	1.Fl	53.3	43.4	58.4
152	P32 and P33 - East	East	GF	58.0	48.7	68.8
152	P32 and P33 - East	East	1.Fl	58.3	49.0	68.8
153	P32 and P33 - North	North	GF	53.7	44.9	65.9
153	P32 and P33 - North	North	1.Fl	55.6	46.7	65.9
154	P32 and P33 - South	South	GF	49.1	39.8	59.3
154	P32 and P33 - South	South	1.Fl	53.9	44.4	61.9
155	P32 and P33 - West	West	GF	47.3	36.3	53.9
155	P32 and P33 - West	West	1.Fl	52.8	43.1	60.5
156	P34, P35 and P36 - East	East	GF	58.2	49.3	69.0
156	P34, P35 and P36 - East	East	1.Fl	58.6	49.6	69.0
157	P34, P35 and P36 - North	North	GF	53.4	44.0	65.4
157	P34, P35 and P36 - North	North	1.Fl	55.5	46.3	65.5
158	P34, P35 and P36 - South	South	GF	54.3	45.6	66.5
158	P34, P35 and P36 - South	South	1.Fl	56.2	47.3	66.5
159	P34, P35 and P36 - West	West	GF	47.8	36.1	52.8
159	P34, P35 and P36 - West	West	1.Fl	52.6	43.0	60.9
160	P37 and P38 - East	East	GF	50.6	40.6	60.6
160	P37 and P38 - East	East	1.Fl	52.0	42.4	61.3
161	P37 and P38 - North	North	GF	50.3	39.5	57.9
161	P37 and P38 - North	North	1.Fl	52.3	42.0	58.8
162	P37 and P38 - South	South	GF	46.4	36.0	59.7
162	P37 and P38 - South	South	1.Fl	50.3	40.6	60.6
163	P37 and P38 - West	West	GF	44.6	33.3	43.6
163	P37 and P38 - West	West	1.Fl	49.4	39.2	55.2
164	P39 and P40 - East	East	GF	50.2	40.4	58.8
164	P39 and P40 - East	East	1.Fl	52.1	42.5	59.8
165	P39 and P40 - North	North	GF	46.0	36.2	60.8
165	P39 and P40 - North	North	1.Fl	50.2	40.7	60.7
166	P39 and P40 - South	South	GF	49.0	39.3	57.9
166	P39 and P40 - South	South	1.Fl	51.4	41.9	58.5
167	P39 and P40 - West	West	GF	44.4	33.3	49.5
167	P39 and P40 - West	West	1.Fl	50.1	40.2	56.2
168	P41 and P42 - East	East	GF	51.8	41.8	59.6
168	P41 and P42 - East	East	1.Fl	52.8	43.0	59.8
169	P41 and P42 - North	North	GF	45.7	35.6	54.4

Table 16: Predicted Façade Receptor Noise Levels						
No.	Name	Facade	Floor	Predicted Levels (dB(A))		
				Day $L_{Aeq, 16hour}$	Night $L_{Aeq, 8hour}$	Max L_{Amax}
169	P41 and P42 - North	North	1.Fl	50.4	40.6	56.3
170	P41 and P42 - South	South	GF	50.6	41.2	58.5
170	P41 and P42 - South	South	1.Fl	52.7	43.1	58.2
171	P41 and P42 - West	West	GF	45.6	34.5	48.7
171	P41 and P42 - West	West	1.Fl	50.5	40.5	53.7
172	P43 and P44 - East	East	GF	52.9	43.2	59.6
172	P43 and P44 - East	East	1.Fl	54.1	44.4	59.6
173	P43 and P44 - North	North	GF	48.1	37.9	58.4
173	P43 and P44 - North	North	1.Fl	51.8	41.9	58.1
174	P43 and P44 - South	South	GF	48.1	38.3	58.8
174	P43 and P44 - South	South	1.Fl	52.5	42.6	59.2
175	P43 and P44 - West	West	GF	47.5	36.7	51.7
175	P43 and P44 - West	West	1.Fl	51.3	41.0	54.5
176	P45, P46 and P47 - East	East	GF	55.4	45.4	61.2
176	P45, P46 and P47 - East	East	1.Fl	56.2	46.2	61.1
177	P45, P46 and P47 - North	North	GF	46.4	36.4	59.3
177	P45, P46 and P47 - North	North	1.Fl	51.8	41.9	59.2
178	P45, P46 and P47 - South	South	GF	60.8	50.2	64.3
178	P45, P46 and P47 - South	South	1.Fl	60.6	50.0	63.2
179	P45, P46 and P47 - West	West	GF	53.1	42.3	58.1
179	P45, P46 and P47 - West	West	1.Fl	54.7	44.2	58.0
180	P48 and P49 - East	East	GF	55.4	44.7	59.3
180	P48 and P49 - East	East	1.Fl	55.8	45.2	59.0
181	P48 and P49 - North	North	GF	44.8	34.4	52.4
181	P48 and P49 - North	North	1.Fl	47.6	36.9	51.9
182	P48 and P49 - South	South	GF	60.5	49.8	63.6
182	P48 and P49 - South	South	1.Fl	60.1	49.4	62.6
183	P48 and P49 - West	West	GF	54.3	43.5	59.2
183	P48 and P49 - West	West	1.Fl	54.2	43.4	58.8
184	P50 and P51 - East	North east	GF	54.3	43.5	59.6
184	P50 and P51 - East	North east	1.Fl	54.2	43.4	59.3
185	P50 and P51 - North	North west	GF	44.8	34.4	54.5
185	P50 and P51 - North	North west	1.Fl	46.3	35.7	54.5
186	P50 and P51 - South	South east	GF	60.1	49.4	62.7
186	P50 and P51 - South	South east	1.Fl	59.7	49.0	61.9
187	P50 and P51 - West	South west	GF	55.5	44.8	59.3
187	P50 and P51 - West	South west	1.Fl	55.4	44.7	59.0
188	P52, P53, P54 and P55 - East	East	GF	49.3	39.0	55.7
188	P52, P53, P54 and P55 - East	East	1.Fl	50.8	40.7	55.1
189	P52, P53, P54 and P55 - North	North	GF	44.1	33.7	51.4
189	P52, P53, P54 and P55 - North	North	1.Fl	46.7	35.9	52.0
190	P52, P53, P54 and P55 - South	South	GF	50.6	40.0	53.9

Table 16: Predicted Façade Receptor Noise Levels						
No.	Name	Facade	Floor	Predicted Levels (dB(A))		
				Day $L_{Aeq, 16hour}$	Night $L_{Aeq, 8hour}$	Max L_{Amax}
190	P52, P53, P54 and P55 - South	South	1.Fl	51.2	40.7	53.9
191	P52, P53, P54 and P55 - West	West	GF	47.7	36.9	51.4
191	P52, P53, P54 and P55 - West	West	1.Fl	48.3	37.4	51.7
192	P56, P57,and P58 - East	East	GF	48.2	38.0	56.0
192	P56, P57,and P58 - East	East	1.Fl	50.0	39.8	55.6
193	P56, P57,and P58 - North	North	GF	44.8	34.2	52.2
193	P56, P57,and P58 - North	North	1.Fl	46.5	35.6	52.8
194	P56, P57,and P58 - South	South	GF	46.6	36.3	51.6
194	P56, P57,and P58 - South	South	1.Fl	47.9	37.9	52.1
195	P56, P57,and P58 - West	West	GF	44.3	33.8	52.1
195	P56, P57,and P58 - West	West	1.Fl	45.0	34.4	52.1
196	P59, P60, P61 and P62 - East	East	GF	49.2	38.3	56.4
196	P59, P60, P61 and P62 - East	East	1.Fl	50.6	40.1	56.8
197	P59, P60, P61 and P62 - North	North	GF	45.3	34.9	56.1
197	P59, P60, P61 and P62 - North	North	1.Fl	46.2	35.9	56.4
198	P59, P60, P61 and P62 - South	South	GF	46.8	36.5	51.4
198	P59, P60, P61 and P62 - South	South	1.Fl	47.6	37.6	52.4
199	P59, P60, P61 and P62 - West	West	GF	43.5	32.3	41.6
199	P59, P60, P61 and P62 - West	West	1.Fl	43.4	32.3	42.8
200	P63 and P64 - East	East	GF	48.1	37.7	56.2
200	P63 and P64 - East	East	1.Fl	49.5	39.6	56.8
201	P63 and P64 - North	North	GF	47.3	36.6	58.5
201	P63 and P64 - North	North	1.Fl	47.7	37.1	57.7
202	P63 and P64 - South	South	GF	44.6	33.8	51.5
202	P63 and P64 - South	South	1.Fl	45.2	34.9	52.0
203	P63 and P64 - West	West	GF	44.3	32.9	50.9
203	P63 and P64 - West	West	1.Fl	44.3	33.1	53.2
204	P65 and P66 - East	East	GF	47.4	37.3	60.3
204	P65 and P66 - East	East	1.Fl	47.3	37.2	59.1
205	P65 and P66 - North	North	GF	46.5	37.3	58.9
205	P65 and P66 - North	North	1.Fl	46.2	37.1	58.1
206	P65 and P66 - South	South	GF	44.7	34.8	54.7
206	P65 and P66 - South	South	1.Fl	44.3	34.7	54.7
207	P65 and P66 - West	West	GF	44.9	35.6	55.4
207	P65 and P66 - West	West	1.Fl	45.0	36.5	55.6
208	P67, P68, P69 and P70 - East	East	GF	45.8	35.0	54.4
208	P67, P68, P69 and P70 - East	East	1.Fl	46.1	35.5	53.3
209	P67, P68, P69 and P70 - North	North	GF	46.4	36.6	56.9

Table 16: Predicted Façade Receptor Noise Levels						
No.	Name	Facade	Floor	Predicted Levels (dB(A))		
				Day $L_{Aeq, 16hour}$	Night $L_{Aeq, 8hour}$	Max L_{Amax}
209	P67, P68, P69 and P70 - North	North	1.Fl	46.2	36.8	55.7
210	P67, P68, P69 and P70 - South	South	GF	43.2	32.9	57.2
210	P67, P68, P69 and P70 - South	South	1.Fl	42.6	32.6	57.3
211	P67, P68, P69 and P70 - West	West	GF	44.2	34.8	57.2
211	P67, P68, P69 and P70 - West	West	1.Fl	44.1	35.0	57.1
212	P71, P72, P73 and P74 - East	East	GF	45.2	34.6	46.4
212	P71, P72, P73 and P74 - East	East	1.Fl	45.8	35.4	47.1
213	P71, P72, P73 and P74 - North	North	GF	43.0	34.1	57.0
213	P71, P72, P73 and P74 - North	North	1.Fl	43.2	34.4	56.9
214	P71, P72, P73 and P74 - South	South	GF	42.9	33.6	56.2
214	P71, P72, P73 and P74 - South	South	1.Fl	42.6	33.6	56.6
215	P71, P72, P73 and P74 - West	West	GF	43.8	33.8	55.9
215	P71, P72, P73 and P74 - West	West	1.Fl	43.7	33.7	55.8
216	P75 and P76 - East	East	GF	45.6	35.1	50.4
216	P75 and P76 - East	East	1.Fl	46.7	36.1	50.0
217	P75 and P76 - North	North	GF	42.5	32.3	56.8
217	P75 and P76 - North	North	1.Fl	43.1	32.7	56.7
218	P75 and P76 - South	South	GF	44.8	36.0	56.7
218	P75 and P76 - South	South	1.Fl	45.3	36.3	56.6
219	P75 and P76 - West	West	GF	44.3	35.9	57.8
219	P75 and P76 - West	West	1.Fl	44.3	36.0	57.8
220	P77, P78 and P79 - East	East	GF	47.2	36.4	49.4
220	P77, P78 and P79 - East	East	1.Fl	48.1	37.2	49.7
221	P77, P78 and P79 - North	North	GF	43.5	34.4	57.2
221	P77, P78 and P79 - North	North	1.Fl	44.4	35.2	57.2
222	P77, P78 and P79 - South	South	GF	43.6	32.9	49.3
222	P77, P78 and P79 - South	South	1.Fl	43.8	33.3	48.5
223	P77, P78 and P79 - West	West	GF	45.2	36.6	56.4
223	P77, P78 and P79 - West	West	1.Fl	45.5	36.7	56.4
224	P80 and P81 - East	East	GF	49.8	39.1	53.1
224	P80 and P81 - East	East	1.Fl	50.3	39.7	53.3
225	P80 and P81 - North	North	GF	41.5	33.0	57.8
225	P80 and P81 - North	North	1.Fl	41.7	33.1	57.8
226	P80 and P81 - South	South	GF	50.7	40.3	57.1
226	P80 and P81 - South	South	1.Fl	51.0	40.7	57.7
227	P80 and P81 - West	West	GF	46.2	36.7	56.9
227	P80 and P81 - West	West	1.Fl	46.5	36.8	56.9
228	P82 and P83 - East	East	GF	55.7	45.0	59.0
228	P82 and P83 - East	East	1.Fl	55.6	44.9	58.6

Table 16: Predicted Façade Receptor Noise Levels						
No.	Name	Facade	Floor	Predicted Levels (dB(A))		
				Day $L_{Aeq, 16hour}$	Night $L_{Aeq, 8hour}$	Max L_{Amax}
229	P82 and P83 - North	North	GF	43.8	33.4	50.8
229	P82 and P83 - North	North	1.Fl	44.9	34.4	50.2
230	P82 and P83 - South	South	GF	59.6	49.0	62.6
230	P82 and P83 - South	South	1.Fl	59.3	48.6	61.8
231	P82 and P83 - West	West	GF	53.9	43.1	59.6
231	P82 and P83 - West	West	1.Fl	53.6	42.9	59.2
232	P84 and P85 - East	North east	GF	53.6	42.8	59.0
232	P84 and P85 - East	North east	1.Fl	53.5	42.7	58.7
233	P84 and P85 - North	North west	GF	44.5	35.8	59.3
233	P84 and P85 - North	North west	1.Fl	45.3	36.5	59.9
234	P84 and P85 - South	South east	GF	60.3	49.7	63.6
234	P84 and P85 - South	South east	1.Fl	59.9	49.3	62.5
235	P84 and P85 - West	South west	GF	55.4	45.4	60.2
235	P84 and P85 - West	South west	1.Fl	55.3	45.4	60.2
236	P86 and P87 - East	East	GF	55.6	45.1	59.8
236	P86 and P87 - East	East	1.Fl	55.5	45	59.5
237	P86 and P87 - North	North	GF	50.1	45.1	67.0
237	P86 and P87 - North	North	1.Fl	50.4	45.2	67.0
238	P86 and P87 - South	South	GF	60.1	50.2	66.1
238	P86 and P87 - South	South	1.Fl	59.8	50.0	65.9
239	P86 and P87 - West	West	GF	56.5	50.3	69.6
239	P86 and P87 - West	West	1.Fl	56.7	50.3	69.2
240	P88, P89 and P90 - East	East	GF	49.8	39.1	54.3
240	P88, P89 and P90 - East	East	1.Fl	50.0	39.4	54.4
241	P88, P89 and P90 - North	North	GF	46.3	42.3	65.9
241	P88, P89 and P90 - North	North	1.Fl	46.4	42.3	65.8
242	P88, P89 and P90 - South	South	GF	52.7	45.3	66.1
242	P88, P89 and P90 - South	South	1.Fl	52.9	45.4	66.1
243	P88, P89 and P90 - West	West	GF	53.8	49.0	68.4
243	P88, P89 and P90 - West	West	1.Fl	54.1	49.1	68.2
244	P91, P92 and P93 - East	East	GF	46.7	36.4	53.4
244	P91, P92 and P93 - East	East	1.Fl	47.1	36.8	53.4
245	P91, P92 and P93 - East	South	GF	47.6	42.7	65.9
245	P91, P92 and P93 - East	South	1.Fl	47.6	42.7	65.8
246	P91, P92 and P93 - North	North	GF	46.2	42.3	64.9
246	P91, P92 and P93 - North	North	1.Fl	46.3	42.2	64.7
247	P91, P92 and P93 - West	West	GF	52.8	48.6	68.0
247	P91, P92 and P93 - West	West	1.Fl	52.9	48.6	67.8
248	P94 and P95 - East	East	GF	44.5	34.0	53.0
248	P94 and P95 - East	East	1.Fl	45.0	34.5	53.0
249	P94 and P95 - North	North	GF	47.0	43.0	64.5
249	P94 and P95 - North	North	1.Fl	47.1	43.1	64.3
250	P94 and P95 - South	South	GF	46.4	42.1	64.7
250	P94 and P95 - South	South	1.Fl	46.3	42.0	64.5
251	P94 and P95 - West	West	GF	52.0	48.2	67.2

Table 16: Predicted Façade Receptor Noise Levels						
No.	Name	Facade	Floor	Predicted Levels (dB(A))		
				Day $L_{Aeq, 16hour}$	Night $L_{Aeq, 8hour}$	Max L_{Amax}
251	P94 and P95 - West	West	1.Fl	52.2	48.2	66.9
252	P96 and P97 - East	East	GF	43.9	33.6	53.1
252	P96 and P97 - East	East	1.Fl	44.3	34.1	53.1
253	P96 and P97 - North	North	GF	46.3	42.3	65.3
253	P96 and P97 - North	North	1.Fl	46.2	42.2	65.1
254	P96 and P97 - South	South	GF	47.5	43.4	65.0
254	P96 and P97 - South	South	1.Fl	47.4	43.4	64.8
255	P96 and P97 - West	West	GF	51.9	48.3	67.8
255	P96 and P97 - West	West	1.Fl	52.2	48.3	67.6
256	P98, P99, P100 and P101 - East	East	GF	43.6	33.1	52.0
256	P98, P99, P100 and P101 - East	East	1.Fl	43.8	33.4	52.0
257	P98, P99, P100 and P101 - North	North	GF	46.3	41.9	65.6
257	P98, P99, P100 and P101 - North	North	1.Fl	46.2	41.8	65.5
258	P98, P99, P100 and P101 - South	South	GF	46.4	42.0	65.1
258	P98, P99, P100 and P101 - South	South	1.Fl	46.3	42.0	65.1
259	P98, P99, P100 and P101 - West	West	GF	52.1	48.5	68.1
259	P98, P99, P100 and P101 - West	West	1.Fl	52.1	48.4	67.8
260	P102 and P103 - East	East	GF	43.7	34.0	53.4
260	P102 and P103 - East	East	1.Fl	44.0	34.1	53.4
261	P102 and P103 - North	North	GF	47.8	43.8	66.8
261	P102 and P103 - North	North	1.Fl	47.7	43.7	66.5
262	P102 and P103 - South	South	GF	47.4	43.2	66.8
262	P102 and P103 - South	South	1.Fl	47.3	43.1	66.6
263	P102 and P103 - West	West	GF	53.0	49.5	70.0
263	P102 and P103 - West	West	1.Fl	53.0	49.3	69.5

Table 17: Predicted Amenity Areas Noise Levels							
Rec Number	Receiver	Garden Level	OK?	Excess (dB) above WHO 50 dB L_{Aeq} guidance value for people being moderately annoyed	Excess (dB) above WHO 55 dB L_{Aeq} guidance value for people being seriously annoyed	Above WHO 50 dB L_{Aeq} guidance value for people being moderately annoyed	Above WHO 55 dB L_{Aeq} guidance value for people being seriously annoyed
1	Garden P1	51.7	Above	2	-	Yes	-
2	Garden P2	50.0	Above	-	-	-	-
3	Garden P3	47.7	OK	-	-	-	-
4	Garden P4	46.9	OK	-	-	-	-
5	Garden P5	49.1	OK	-	-	-	-
6	Garden P6	48.9	OK	-	-	-	-
7	Garden P7	49.1	OK	-	-	-	-
8	Garden P8	49.3	OK	-	-	-	-
9	Garden P9	50.6	Above	1	-	Yes	-
10	Garden P10	51.4	Above	1	-	Yes	-
11	Garden P11	52.3	Above	2	-	Yes	-
12	Garden P12	53.2	Above	3	-	Yes	-
13	Garden P13	54.4	Above	4	-	Yes	-
14	Garden P14	56.9	Above	-	2	-	Yes
15	Garden P15	58.6	Above	-	4	-	Yes
16	Garden P16	49.5	OK	-	-	-	-
17	Garden P17	50.7	Above	1	-	Yes	-
18	Garden P18	52.4	Above	2	-	Yes	-
19	Garden P19	54.3	Above	4	-	Yes	-
20	Garden P20	56.0	Above	-	1	-	Yes
21	Garden P21	57.7	Above	-	3	-	Yes
22	Garden P22	44.7	OK	-	-	-	-
23	Garden P23	44.6	OK	-	-	-	-
24	Garden P24	45.3	OK	-	-	-	-
25	Garden P25	46.9	OK	-	-	-	-
26	Garden P26	49.2	OK	-	-	-	-
27	Garden P27	50.3	Above	0.3	-	Yes	-
28	Garden P28	55.8	Above	-	1	-	Yes
29	Garden P29	52.6	Above	3	-	Yes	-
30	Garden P30	54.4	Above	4	-	Yes	-
31	Garden P31	54.8	Above	5	-	Yes	-
32	Garden P32	58.9	Above	-	4	-	Yes
33	Garden P33	60.3	Above	-	5	-	Yes
34	Garden P34	60.3	Above	-	5	-	Yes
35	Garden P35	60.3	Above	-	5	-	Yes
36	Garden P36	60.1	Above	-	5	-	Yes
37	Garden P37	49.6	OK	-	-	-	-
38	Garden P38	46.8	OK	-	-	-	-
39	Garden P39	46.2	OK	-	-	-	-
40	Garden P40	46.5	OK	-	-	-	-
41	Garden P41	46.6	OK	-	-	-	-
42	Garden P42	47.7	OK	-	-	-	-
43	Garden P43	48.5	OK	-	-	-	-
44	Garden P44	49.9	OK	-	-	-	-

Table 17: Predicted Amenity Areas Noise Levels							
Rec Number	Receiver	Garden Level	OK?	Excess (dB) above WHO 50 dB L_{Aeq} guidance value for people being moderately annoyed	Excess (dB) above WHO 55 dB L_{Aeq} guidance value for people being seriously annoyed	Above WHO 50 dB L_{Aeq} guidance value for people being moderately annoyed	Above WHO 55 dB L_{Aeq} guidance value for people being seriously annoyed
45	Garden P45	52.1	Above	2	-	Yes	-
46	Garden P46	55.4	Above	-	0	-	Yes
47	Garden P47	59.0	Above	-	4	-	Yes
48	Garden P48	51.8	Above	2	-	Yes	-
49	Garden P49	50.4	Above	0.4	-	Yes	-
50	Garden P50	50.3	Above	0.3	-	Yes	-
51	Garden P51	51.9	Above	2	-	Yes	-
52	Garden P52	50.8	Above	1	-	Yes	-
53	Garden P53	50.2	Above	0.2	-	Yes	-
54	Garden P54	50.3	Above	0.3	-	Yes	-
55	Garden P55	49.7	OK	-	-	-	-
56	Garden P56	48.9	OK	-	-	-	-
57	Garden P57	49.0	OK	-	-	-	-
58	Garden P58	49.2	OK	-	-	-	-
59	Garden P59	49.6	OK	-	-	-	-
60	Garden P60	49.7	OK	-	-	-	-
61	Garden P61	50.0	Above	-	-	-	-
62	Garden P62	50.7	Above	1	-	Yes	-
63	Garden P63	51.0	Above	1	-	Yes	-
64	Garden P64	50.2	Above	0.2	-	Yes	-
65	Garden P65	46.9	OK	-	-	-	-
66	Garden P66	45.9	OK	-	-	-	-
67	Garden P67	45.5	OK	-	-	-	-
68	Garden P68	45.6	OK	-	-	-	-
69	Garden P69	45.4	OK	-	-	-	-
70	Garden P70	45.6	OK	-	-	-	-
71	Garden P71	45.0	OK	-	-	-	-
72	Garden P72	44.6	OK	-	-	-	-
73	Garden P73	44.5	OK	-	-	-	-
74	Garden P74	44.8	OK	-	-	-	-
75	Garden P75	45.2	OK	-	-	-	-
76	Garden P76	45.4	OK	-	-	-	-
77	Garden P77	46.2	OK	-	-	-	-
78	Garden P78	46.1	OK	-	-	-	-
79	Garden P79	47.1	OK	-	-	-	-
80	Garden P80	47.7	OK	-	-	-	-
81	Garden P81	50.5	Above	1	-	Yes	-
82	Garden P82	52.2	Above	2	-	Yes	-
83	Garden P83	50.6	Above	1	-	Yes	-
84	Garden P84	51.1	Above	1	-	Yes	-
85	Garden P85	51.5	Above	2	-	Yes	-
86	Garden P86	58.9	Above	-	4	-	Yes
87	Garden P87	56.5	Above	-	2	-	Yes
88	Garden P88	53.8	Above	4	-	Yes	-
89	Garden P89	51.2	Above	1	-	Yes	-

Table 17: Predicted Amenity Areas Noise Levels							
Rec Number	**Receiver**	**Garden Level**	**OK?**	**Excess (dB) above WHO 50 dB L_{Aeq} guidance value for people being moderately annoyed**	**Excess (dB) above WHO 55 dB L_{Aeq} guidance value for people being seriously annoyed**	**Above WHO 50 dB L_{Aeq} guidance value for people being moderately annoyed**	**Above WHO 55 dB L_{Aeq} guidance value for people being seriously annoyed**
90	Garden P90	49.8	OK	-	-	-	-
91	Garden P91	48.9	OK	-	-	-	-
92	Garden P92	48.2	OK	-	-	-	-
93	Garden P93	47.4	OK	-	-	-	-
94	Garden P94	45.9	OK	-	-	-	-
95	Garden P95	45.9	OK	-	-	-	-
96	Garden P96	45.6	OK	-	-	-	-
97	Garden P97	45.0	OK	-	-	-	-
98	Garden P98	45.2	OK	-	-	-	-
99	Garden P99	44.8	OK	-	-	-	-
100	Garden P100	44.8	OK	-	-	-	-
101	Garden P101	44.8	OK	-	-	-	-
102	Garden P102	45.1	OK	-	-	-	-
103	Garden P103	45.7	OK	-	-	-	-

Table 18: Predicted Amenity Areas Noise Levels with a 1.8 m Acoustic Barrier Installed around each External Amenity Space							
Rec Number	**Receiver**	**Garden Level**	**OK?**	**Excess (dB) above WHO 50 dB L_{Aeq} guidance value for people being moderately annoyed**	**Excess (dB) above WHO 55 dB L_{Aeq} guidance value for people being seriously annoyed**	**Above WHO 50 dB L_{Aeq} guidance value for people being moderately annoyed**	**Above WHO 55 dB L_{Aeq} guidance value for people being seriously annoyed**
1	Garden P1	47.2	OK	-	-	-	-
2	Garden P2	44.8	OK	-	-	-	-
3	Garden P3	42.4	OK	-	-	-	-
4	Garden P4	41.4	OK	-	-	-	-
5	Garden P5	45.4	OK	-	-	-	-
6	Garden P6	44.7	OK	-	-	-	-
7	Garden P7	44.9	OK	-	-	-	-
8	Garden P8	44.8	OK	-	-	-	-
9	Garden P9	46	OK	-	-	-	-
10	Garden P10	46.6	OK	-	-	-	-
11	Garden P11	47.3	OK	-	-	-	-
12	Garden P12	49.2	OK	-	-	-	-
13	Garden P13	50.0	OK	-	-	Yes	-
14	Garden P14	53.9	Above	4	-	Yes	-
15	Garden P15	58.1	Above	-	3	-	Yes
16	Garden P16	44.3	OK	-	-	-	-
17	Garden P17	44.5	OK	-	-	-	-
18	Garden P18	46.1	OK	-	-	-	-
19	Garden P19	48.4	OK	-	-	-	-
20	Garden P20	50.5	Above	1	-	Yes	-
21	Garden P21	53.1	Above	3	-	Yes	-
22	Garden P22	42.4	OK	-	-	-	-
23	Garden P23	42	OK	-	-	-	-
24	Garden P24	42	OK	-	-	-	-
25	Garden P25	42.6	OK	-	-	-	-
26	Garden P26	45.5	OK	-	-	-	-
27	Garden P27	46.8	OK	-	-	-	-
28	Garden P28	51.7	Above	2	-	Yes	-
29	Garden P29	48.4	OK	-	-	-	-
30	Garden P30	49.3	OK	-	-	-	-
31	Garden P31	49	OK	-	-	-	-
32	Garden P32	54.1	Above	4	-	Yes	-
33	Garden P33	55.3	Above	-	0.3	-	Yes
34	Garden P34	55.4	Above	-	0.4	-	Yes
35	Garden P35	55.3	Above	-	0.3	-	Yes
36	Garden P36	55.1	Above	-	0.1	-	Yes
37	Garden P37	48.9	OK	-	-	-	-
38	Garden P38	44.9	OK	-	-	-	-
39	Garden P39	44.2	OK	-	-	-	-
40	Garden P40	44.3	OK	-	-	-	-
41	Garden P41	43.7	OK	-	-	-	-
42	Garden P42	44.7	OK	-	-	-	-

Table 18: Predicted Amenity Areas Noise Levels with a 1.8 m Acoustic Barrier Installed around each External Amenity Space							
Rec Number	Receiver	Garden Level	OK?	Excess (dB) above WHO 50 dB L_{Aeq} guidance value for people being moderately annoyed	Excess (dB) above WHO 55 dB L_{Aeq} guidance value for people being seriously annoyed	Above WHO 50 dB L_{Aeq} guidance value for people being moderately annoyed	Above WHO 55 dB L_{Aeq} guidance value for people being seriously annoyed
43	Garden P43	44.5	OK	-	-	-	-
44	Garden P44	45.3	OK	-	-	-	-
45	Garden P45	47.1	OK	-	-	-	-
46	Garden P46	50.2	Above	0.2	-	Yes	-
47	Garden P47	54.8	Above	5	-	Yes	-
48	Garden P48	47.7	OK	-	-	-	-
49	Garden P49	46.2	OK	-	-	-	-
50	Garden P50	46.5	OK	-	-	-	-
51	Garden P51	49.4	OK	-	-	-	-
52	Garden P52	47.1	OK	-	-	-	-
53	Garden P53	46.1	OK	-	-	-	-
54	Garden P54	46.2	OK	-	-	-	-
55	Garden P55	46	OK	-	-	-	-
56	Garden P56	46.4	OK	-	-	-	-
57	Garden P57	46.5	OK	-	-	-	-
58	Garden P58	46.7	OK	-	-	-	-
59	Garden P59	48	OK	-	-	-	-
60	Garden P60	47.5	OK	-	-	-	-
61	Garden P61	48.8	OK	-	-	-	-
62	Garden P62	47.8	OK	-	-	-	-
63	Garden P63	48.8	OK	-	-	-	-
64	Garden P64	48	OK	-	-	-	-
65	Garden P65	46.4	OK	-	-	-	-
66	Garden P66	45.2	OK	-	-	-	-
67	Garden P67	44.5	OK	-	-	-	-
68	Garden P68	45	OK	-	-	-	-
69	Garden P69	44.1	OK	-	-	-	-
70	Garden P70	43.9	OK	-	-	-	-
71	Garden P71	43.4	OK	-	-	-	-
72	Garden P72	43.1	OK	-	-	-	-
73	Garden P73	42.9	OK	-	-	-	-
74	Garden P74	42.8	OK	-	-	-	-
75	Garden P75	42.7	OK	-	-	-	-
76	Garden P76	43	OK	-	-	-	-
77	Garden P77	42.3	OK	-	-	-	-
78	Garden P78	42.1	OK	-	-	-	-
79	Garden P79	42.3	OK	-	-	-	-
80	Garden P80	42.7	OK	-	-	-	-
81	Garden P81	45.4	OK	-	-	-	-
82	Garden P82	49.3	OK	-	-	-	-
83	Garden P83	45.6	OK	-	-	-	-
84	Garden P84	45.9	OK	-	-	-	-
85	Garden P85	45.4	OK	-	-	-	-
86	Garden P86	49.7	OK	-	-	-	-

Table 18: Predicted Amenity Areas Noise Levels with a 1.8 m Acoustic Barrier Installed around each External Amenity Space							
Rec Number	**Receiver**	**Garden Level**	**OK?**	**Excess (dB) above WHO 50 dB L_{Aeq} guidance value for people being moderately annoyed**	**Excess (dB) above WHO 55 dB L_{Aeq} guidance value for people being seriously annoyed**	**Above WHO 50 dB L_{Aeq} guidance value for people being moderately annoyed**	**Above WHO 55 dB L_{Aeq} guidance value for people being seriously annoyed**
87	Garden P87	47.9	OK	-	-	-	-
88	Garden P88	45.6	OK	-	-	-	-
89	Garden P89	43.7	OK	-	-	-	-
90	Garden P90	43.3	OK	-	-	-	-
91	Garden P91	43.1	OK	-	-	-	-
92	Garden P92	43	OK	-	-	-	-
93	Garden P93	42.6	OK	-	-	-	-
94	Garden P94	42.3	OK	-	-	-	-
95	Garden P95	42.3	OK	-	-	-	-
96	Garden P96	43.2	OK	-	-	-	-
97	Garden P97	42.4	OK	-	-	-	-
98	Garden P98	42.4	OK	-	-	-	-
99	Garden P99	42.4	OK	-	-	-	-
100	Garden P100	42.6	OK	-	-	-	-
101	Garden P101	42.9	OK	-	-	-	-
102	Garden P102	43.3	OK	-	-	-	-
103	Garden P103	43.6	OK	-	-	-	-

Table 19: Summary of Facades of development where rooms are likely to achieve acceptable internal noise levels with windows partially open providing min 15 dB attenuation									
Receptor Number	Receiver	Floor	Internal level with window partially open			Excess (dB)			
			Daytime	Night Time	Night Max	Daytime	Night Time	Night Max	Yes / No
104	P1 and P2 - East	GF	30	25	46	-5	-5	1	No
104	P1 and P2 - East	1.FI	30	25	46	-5	-5	1	No
105	P1 and P2 - North	GF	34	30	53	-1	0	8	No
105	P1 and P2 - North	1.FI	34	30	52	-1	0	7	No
106	P1 and P2 - South	GF	33	30	53	-2	0	8	No
106	P1 and P2 - South	1.FI	33	30	53	-2	0	8	No
107	P1 and P2 - West	GF	38	35	56	3	5	11	No
107	P1 and P2 - West	1.FI	38	34	56	3	4	11	No
108	P3 and P4 - East	GF	30	20	36	-5	-10	-10	Yes
108	P3 and P4 - East	1.FI	30	20	36	-5	-10	-9	Yes
109	P3 and P4 - North	GF	33	27	49	-2	-3	4	No
109	P3 and P4 - North	1.FI	33	27	49	-2	-3	4	No
110	P3 and P4 - South	GF	30	26	49	-5	-4	4	No
110	P3 and P4 - South	1.FI	30	26	49	-5	-4	4	No
111	P3 and P4 - West	GF	29	25	45	-6	-5	0	Yes
111	P3 and P4 - West	1.FI	30	25	45	-6	-5	0	Yes
112	P5 and P6 - East	GF	32	22	34	-3	-8	-11	Yes
112	P5 and P6 - East	1.FI	32	22	34	-3	-8	-11	Yes
113	P5 and P6 - North	GF	32	28	51	-3	-2	6	No
113	P5 and P6 - North	1.FI	32	28	51	-4	-2	6	No
114	P5 and P6 - South	GF	33	29	51	-2	-1	6	No
114	P5 and P6 - South	1.FI	33	29	51	-2	-1	6	No
115	P5 and P6 - West	GF	37	34	54	2	4	9	No
115	P5 and P6 - West	1.FI	37	34	54	2	4	9	No
116	P7, P8 and P9 - East	GF	33	23	36	-2	-7	-9	Yes
116	P7, P8 and P9 - East	1.FI	33	23	36	-2	-7	-10	Yes
117	P7, P8 and P9 - North	GF	32	28	51	-4	-2	6	No
117	P7, P8 and P9 - North	1.FI	31	28	51	-4	-3	6	No
118	P7, P8 and P9 - South	GF	32	28	52	-3	-2	7	No
118	P7, P8 and P9 - South	1.FI	32	28	52	-3	-2	7	No
119	P7, P8 and P9 - West	GF	37	34	55	2	4	10	No
119	P7, P8 and P9 - West	1.FI	38	34	54	3	4	9	No
120	P10, P11, P12 and P13 - East	GF	36	26	39	1	-5	-6	No
120	P10, P11, P12 and P13 - East	1.FI	36	26	39	1	-5	-6	No

Table 19: Summary of Facades of development where rooms are likely to achieve acceptable internal noise levels with windows partially open providing min 15 dB attenuation									
Receptor Number	Receiver	Floor	Internal level with window partially open			Excess (dB)			
			Daytime	Night Time	Night Max	Daytime	Night Time	Night Max	Yes / No
121	P10, P11, P12 and P13 - North	GF	37	30	52	2	0	7	No
121	P10, P11, P12 and P13 - North	1.FI	38	31	52	3	1	7	No
122	P10, P11, P12 and P13 - South	GF	32	28	51	-4	-2	6	No
122	P10, P11, P12 and P13 - South	1.FI	32	28	51	-4	-2	6	No
123	P10, P11, P12 and P13 - West	GF	38	34	54	3	4	9	No
123	P10, P11, P12 and P13 - West	1.FI	39	34	54	4	4	9	No
124	P14 and P15 - East	GF	40	30	44	5	-1	-1	No
124	P14 and P15 - East	1.FI	40	29	44	5	-1	-1	No
125	P14 and P15 - North	GF	45	35	51	10	5	6	No
125	P14 and P15 - North	1.FI	45	35	51	10	5	6	No
126	P14 and P15 - South	GF	36	30	52	1	0	7	No
126	P14 and P15 - South	1.FI	36	30	52	1	0	7	No
127	P14 and P15 - West	GF	42	35	55	7	5	10	No
127	P14 and P15 - West	1.FI	42	36	54	7	6	9	No
128	P16, P17 and P18 - East	GF	34	23	38	-1	-7	-7	Yes
128	P16, P17 and P18 - East	1.FI	34	23	38	-1	-7	-8	Yes
129	P16, P17 and P18 - North	GF	32	23	41	-3	-8	-4	Yes
129	P16, P17 and P18 - North	1.FI	33	23	41	-2	-7	-4	Yes
130	P16, P17 and P18 - South	GF	26	18	41	-9	-12	-4	Yes
130	P16, P17 and P18 - South	1.FI	26	18	41	-9	-12	-4	Yes
131	P16, P17 and P18 - West	GF	36	26	42	1	-4	-3	No
131	P16, P17 and P18 - West	1.FI	36	26	42	1	-4	-3	No
132	P19, P20 and P21 - East	GF	38	28	43	3	-2	-2	No
132	P19, P20 and P21 - East	1.FI	39	28	43	4	-2	-2	No
133	P19, P20 and P21 - North	GF	44	34	47	9	4	2	No

Table 19: Summary of Facades of development where rooms are likely to achieve acceptable internal noise levels with windows partially open providing min 15 dB attenuation									
Receptor Number	Receiver	Floor	Internal level with window partially open			Excess (dB)			
			Daytime	Night Time	Night Max	Daytime	Night Time	Night Max	Yes / No
133	P19, P20 and P21 - North	1.Fl	44	34	46	9	4	1	**No**
134	P19, P20 and P21 - South	GF	32	22	41	-3	-8	-4	**Yes**
134	P19, P20 and P21 - South	1.Fl	32	22	41	-3	-8	-4	**Yes**
135	P19, P20 and P21 - West	GF	40	29	43	5	-1	-2	**No**
135	P19, P20 and P21 - West	1.Fl	40	29	44	5	-1	-2	**No**
136	P22, P23, P24 and P25 - East	GF	38	28	45	3	-3	-1	**No**
136	P22, P23, P24 and P25 - East	1.Fl	39	28	44	4	-2	-1	**No**
137	P22, P23, P24 and P25 - North	GF	44	33	46	9	3	1	**No**
137	P22, P23, P24 and P25 - North	1.Fl	44	33	45	9	3	0	**No**
138	P22, P23, P24 and P25 - South	GF	29	20	37	-6	-10	-8	**Yes**
138	P22, P23, P24 and P25 - South	1.Fl	30	20	38	-5	-10	-7	**Yes**
139	P22, P23, P24 and P25 - West	GF	39	28	42	4	-2	-3	**No**
139	P22, P23, P24 and P25 - West	1.Fl	39	28	42	4	-2	-3	**No**
140	P26 and P27 - East	GF	41	30	46	6	0	1	**No**
140	P26 and P27 - East	1.Fl	42	31	47	7	1	2	**No**
141	P26 and P27 - North	GF	45	35	49	10	5	4	**No**
141	P26 and P27 - North	1.Fl	45	35	48	10	5	3	**No**
142	P26 and P27 - South	GF	32	22	35	-3	-9	-11	**Yes**
142	P26 and P27 - South	1.Fl	37	26	41	2	-4	-4	**No**
143	P26 and P27 - West	GF	41	30	45	6	0	0	**No**
143	P26 and P27 - West	1.Fl	42	31	45	7	1	0	**No**
144	P28 - North East	GF	43	33	50	8	3	5	**No**
144	P28 - North East	1.Fl	43	33	51	8	3	6	**No**
145	P28 - North West	GF	44	34	47	9	4	2	**No**
145	P28 - North West	1.Fl	45	34	48	10	4	3	**No**
146	P28 - South East	GF	36	26	47	1	-4	2	**No**
146	P28 - South East	1.Fl	39	30	48	4	-1	3	**No**
147	P28 - South West	GF	39	28	43	4	-2	-2	**No**

Table 19: Summary of Facades of development where rooms are likely to achieve acceptable internal noise levels with windows partially open providing min 15 dB attenuation									
Receptor Number	Receiver	Floor	Internal level with window partially open			Excess (dB)			
			Daytime	Night Time	Night Max	Daytime	Night Time	Night Max	Yes / No
147	P28 - South West	1.Fl	41	30	45	6	0	0	No
148	P28, P30 and P31 - East	GF	37	27	44	2	-3	-1	No
148	P28, P30 and P31 - East	1.Fl	39	30	45	4	0	0	No
149	P28, P30 and P31 - North	GF	38	28	48	3	-2	3	No
149	P28, P30 and P31 - North	1.Fl	40	30	48	5	0	3	No
150	P28, P30 and P31 - South	GF	38	28	43	3	-2	-2	No
150	P28, P30 and P31 - South	1.Fl	40	30	44	5	0	-1	No
151	P28, P30 and P31 - West	GF	33	23	39	-2	-7	-6	Yes
151	P28, P30 and P31 - West	1.Fl	38	28	43	3	-2	-2	No
152	P32 and P33 - East	GF	43	34	54	8	4	9	No
152	P32 and P33 - East	1.Fl	43	34	54	8	4	9	No
153	P32 and P33 - North	GF	39	30	51	4	0	6	No
153	P32 and P33 - North	1.Fl	41	32	51	6	2	6	No
154	P32 and P33 - South	GF	34	25	44	-1	-5	-1	Yes
154	P32 and P33 - South	1.Fl	39	29	47	4	-1	2	No
155	P32 and P33 - West	GF	32	21	39	-3	-9	-6	Yes
155	P32 and P33 - West	1.Fl	38	28	46	3	-2	1	No
156	P34, P35 and P36 - East	GF	43	34	54	8	4	9	No
156	P34, P35 and P36 - East	1.Fl	44	35	54	9	5	9	No
157	P34, P35 and P36 - North	GF	38	29	50	3	-1	5	No
157	P34, P35 and P36 - North	1.Fl	41	31	51	6	1	6	No
158	P34, P35 and P36 - South	GF	39	31	52	4	1	7	No
158	P34, P35 and P36 - South	1.Fl	41	32	52	6	2	7	No
159	P34, P35 and P36 - West	GF	33	21	38	-2	-9	-7	Yes
159	P34, P35 and P36 - West	1.Fl	38	28	46	3	-2	1	No
160	P37 and P38 - East	GF	36	26	46	1	-4	1	No

Table 19: Summary of Facades of development where rooms are likely to achieve acceptable internal noise levels with windows partially open providing min 15 dB attenuation									
Receptor Number	Receiver	Floor	Internal level with window partially open			Excess (dB)			
			Daytime	Night Time	Night Max	Daytime	Night Time	Night Max	Yes / No
160	P37 and P38 - East	1.FI	37	27	46	2	-3	1	**No**
161	P37 and P38 - North	GF	35	25	43	0	-6	-2	**No**
161	P37 and P38 - North	1.FI	37	27	44	2	-3	-1	**No**
162	P37 and P38 - South	GF	31	21	45	-4	-9	0	**Yes**
162	P37 and P38 - South	1.FI	35	26	46	0	-4	1	**No**
163	P37 and P38 - West	GF	30	18	29	-5	-12	-16	**Yes**
163	P37 and P38 - West	1.FI	34	24	40	-1	-6	-5	**Yes**
164	P39 and P40 - East	GF	35	25	44	0	-5	-1	**No**
164	P39 and P40 - East	1.FI	37	28	45	2	-3	0	**No**
165	P39 and P40 - North	GF	31	21	46	-4	-9	1	**No**
165	P39 and P40 - North	1.FI	35	26	46	0	-4	1	**No**
166	P39 and P40 - South	GF	34	24	43	-1	-6	-2	**Yes**
166	P39 and P40 - South	1.FI	36	27	44	1	-3	-2	**No**
167	P39 and P40 - West	GF	29	18	35	-6	-12	-11	**Yes**
167	P39 and P40 - West	1.FI	35	25	41	0	-5	-4	**No**
168	P41 and P42 - East	GF	37	27	45	2	-3	0	**No**
168	P41 and P42 - East	1.FI	38	28	45	3	-2	0	**No**
169	P41 and P42 - North	GF	31	21	39	-4	-9	-6	**Yes**
169	P41 and P42 - North	1.FI	35	26	41	0	-4	-4	**No**
170	P41 and P42 - South	GF	36	26	44	1	-4	-2	**No**
170	P41 and P42 - South	1.FI	38	28	43	3	-2	-2	**No**
171	P41 and P42 - West	GF	31	20	34	-4	-11	-11	**Yes**
171	P41 and P42 - West	1.FI	36	26	39	1	-5	-6	**No**
172	P43 and P44 - East	GF	38	28	45	3	-2	0	**No**
172	P43 and P44 - East	1.FI	39	29	45	4	-1	0	**No**

Table 19: Summary of Facades of development where rooms are likely to achieve acceptable internal noise levels with windows partially open providing min 15 dB attenuation									
Receptor Number	Receiver	Floor	Internal level with window partially open			Excess (dB)			
			Daytime	Night Time	Night Max	Daytime	Night Time	Night Max	Yes / No
173	P43 and P44 - North	GF	33	23	43	-2	-7	-2	**Yes**
173	P43 and P44 - North	1.FI	37	27	43	2	-3	-2	**No**
174	P43 and P44 - South	GF	33	23	44	-2	-7	-1	**Yes**
174	P43 and P44 - South	1.FI	38	28	44	3	-2	-1	**No**
175	P43 and P44 - West	GF	33	22	37	-3	-8	-8	**Yes**
175	P43 and P44 - West	1.FI	36	26	40	1	-4	-6	**No**
176	P45, P46 and P47 - East	GF	40	30	46	5	0	1	**No**
176	P45, P46 and P47 - East	1.FI	41	31	46	6	1	1	**No**
177	P45, P46 and P47 - North	GF	31	21	44	-4	-9	-1	**Yes**
177	P45, P46 and P47 - North	1.FI	37	27	44	2	-3	-1	**No**
178	P45, P46 and P47 - South	GF	46	35	49	11	5	4	**No**
178	P45, P46 and P47 - South	1.FI	46	35	48	11	5	3	**No**
179	P45, P46 and P47 - West	GF	38	27	43	3	-3	-2	**No**
179	P45, P46 and P47 - West	1.FI	40	29	43	5	-1	-2	**No**
180	P48 and P49 - East	GF	40	30	44	5	0	-1	**No**
180	P48 and P49 - East	1.FI	41	30	44	6	0	-1	**No**
181	P48 and P49 - North	GF	30	19	37	-5	-11	-8	**Yes**
181	P48 and P49 - North	1.FI	33	22	37	-2	-8	-8	**Yes**
182	P48 and P49 - South	GF	46	35	49	11	5	4	**No**
182	P48 and P49 - South	1.FI	45	34	48	10	4	3	**No**
183	P48 and P49 - West	GF	39	29	44	4	-2	-1	**No**
183	P48 and P49 - West	1.FI	39	28	44	4	-2	-1	**No**
184	P50 and P51 - East	GF	39	29	45	4	-2	0	**No**
184	P50 and P51 - East	1.FI	39	28	44	4	-2	-1	**No**
185	P50 and P51 - North	GF	30	19	40	-5	-11	-6	**Yes**

Table 19: Summary of Facades of development where rooms are likely to achieve acceptable internal noise levels with windows partially open providing min 15 dB attenuation									
Receptor Number	Receiver	Floor	Internal level with window partially open			Excess (dB)			
			Daytime	Night Time	Night Max	Daytime	Night Time	Night Max	Yes / No
185	P50 and P51 - North	1.FI	31	21	40	-4	-9	-6	**Yes**
186	P50 and P51 - South	GF	45	34	48	10	4	3	**No**
186	P50 and P51 - South	1.FI	45	34	47	10	4	2	**No**
187	P50 and P51 - West	GF	41	30	44	6	0	-1	**No**
187	P50 and P51 - West	1.FI	40	30	44	5	0	-1	**No**
188	P52, P53, P54 and P55 - East	GF	34	24	41	-1	-6	-4	**Yes**
188	P52, P53, P54 and P55 - East	1.FI	36	26	40	1	-4	-5	**No**
189	P52, P53, P54 and P55 - North	GF	29	19	36	-6	-11	-9	**Yes**
189	P52, P53, P54 and P55 - North	1.FI	32	21	37	-3	-9	-8	**Yes**
190	P52, P53, P54 and P55 - South	GF	36	25	39	1	-5	-6	**No**
190	P52, P53, P54 and P55 - South	1.FI	36	26	39	1	-4	-6	**No**
191	P52, P53, P54 and P55 - West	GF	33	22	36	-2	-8	-9	**Yes**
191	P52, P53, P54 and P55 - West	1.FI	33	22	37	-2	-8	-8	**Yes**
192	P56, P57,and P58 - East	GF	33	23	41	-2	-7	-4	**Yes**
192	P56, P57,and P58 - East	1.FI	35	25	41	0	-5	-4	**Yes**
193	P56, P57,and P58 - North	GF	30	19	37	-5	-11	-8	**Yes**
193	P56, P57,and P58 - North	1.FI	32	21	38	-4	-9	-7	**Yes**
194	P56, P57,and P58 - South	GF	32	21	37	-3	-9	-8	**Yes**
194	P56, P57,and P58 - South	1.FI	33	23	37	-2	-7	-8	**Yes**
195	P56, P57,and P58 - West	GF	29	19	37	-6	-11	-8	**Yes**
195	P56, P57,and P58 - West	1.FI	30	19	37	-5	-11	-8	**Yes**
196	P59, P60, P61 and P62 - East	GF	34	23	41	-1	-7	-4	**Yes**
196	P59, P60, P61 and P62 - East	1.FI	36	25	42	1	-5	-3	**No**
197	P59, P60, P61 and P62 - North	GF	30	20	41	-5	-10	-4	**Yes**
197	P59, P60, P61 and P62 - North	1.FI	31	21	41	-4	-9	-4	**Yes**

Table 19: Summary of Facades of development where rooms are likely to achieve acceptable internal noise levels with windows partially open providing min 15 dB attenuation									
Receptor Number	Receiver	Floor	Internal level with window partially open			Excess (dB)			
			Daytime	Night Time	Night Max	Daytime	Night Time	Night Max	Yes / No
198	P59, P60, P61 and P62 - South	GF	32	22	36	-3	-9	-9	**Yes**
198	P59, P60, P61 and P62 - South	1.Fl	33	23	37	-2	-7	-8	**Yes**
199	P59, P60, P61 and P62 - West	GF	29	17	27	-7	-13	-18	**Yes**
199	P59, P60, P61 and P62 - West	1.Fl	28	17	28	-7	-13	-17	**Yes**
200	P63 and P64 - East	GF	33	23	41	-2	-7	-4	**Yes**
200	P63 and P64 - East	1.Fl	35	25	42	-1	-5	-3	**Yes**
201	P63 and P64 - North	GF	32	22	44	-3	-8	-2	**Yes**
201	P63 and P64 - North	1.Fl	33	22	43	-2	-8	-2	**Yes**
202	P63 and P64 - South	GF	30	19	37	-5	-11	-9	**Yes**
202	P63 and P64 - South	1.Fl	30	20	37	-5	-10	-8	**Yes**
203	P63 and P64 - West	GF	29	18	36	-6	-12	-9	**Yes**
203	P63 and P64 - West	1.Fl	29	18	38	-6	-12	-7	**Yes**
204	P65 and P66 - East	GF	32	22	45	-3	-8	0	**No**
204	P65 and P66 - East	1.Fl	32	22	44	-3	-8	-1	**Yes**
205	P65 and P66 - North	GF	32	22	44	-4	-8	-1	**Yes**
205	P65 and P66 - North	1.Fl	31	22	43	-4	-8	-2	**Yes**
206	P65 and P66 - South	GF	30	20	40	-5	-10	-5	**Yes**
206	P65 and P66 - South	1.Fl	29	20	40	-6	-10	-5	**Yes**
207	P65 and P66 - West	GF	30	21	40	-5	-9	-5	**Yes**
207	P65 and P66 - West	1.Fl	30	22	41	-5	-9	-4	**Yes**
208	P67, P68, P69 and P70 - East	GF	31	20	39	-4	-10	-6	**Yes**
208	P67, P68, P69 and P70 - East	1.Fl	31	21	38	-4	-10	-7	**Yes**
209	P67, P68, P69 and P70 - North	GF	31	22	42	-4	-8	-3	**Yes**
209	P67, P68, P69 and P70 - North	1.Fl	31	22	41	-4	-8	-4	**Yes**
210	P67, P68, P69 and P70 - South	GF	28	18	42	-7	-12	-3	**Yes**

Table 19: Summary of Facades of development where rooms are likely to achieve acceptable internal noise levels with windows partially open providing min 15 dB attenuation									
Receptor Number	Receiver	Floor	Internal level with window partially open			Excess (dB)			
			Daytime	Night Time	Night Max	Daytime	Night Time	Night Max	Yes / No
210	P67, P68, P69 and P70 - South	1.FI	28	18	42	-7	-12	-3	**Yes**
211	P67, P68, P69 and P70 - West	GF	29	20	42	-6	-10	-3	**Yes**
211	P67, P68, P69 and P70 - West	1.FI	29	20	42	-6	-10	-3	**Yes**
212	P71, P72, P73 and P74 - East	GF	30	20	31	-5	-10	-14	**Yes**
212	P71, P72, P73 and P74 - East	1.FI	31	20	32	-4	-10	-13	**Yes**
213	P71, P72, P73 and P74 - North	GF	28	19	42	-7	-11	-3	**Yes**
213	P71, P72, P73 and P74 - North	1.FI	28	19	42	-7	-11	-3	**Yes**
214	P71, P72, P73 and P74 - South	GF	28	19	41	-7	-11	-4	**Yes**
214	P71, P72, P73 and P74 - South	1.FI	28	19	42	-7	-11	-3	**Yes**
215	P71, P72, P73 and P74 - West	GF	29	19	41	-6	-11	-4	**Yes**
215	P71, P72, P73 and P74 - West	1.FI	29	19	41	-6	-11	-4	**Yes**
216	P75 and P76 - East	GF	31	20	35	-4	-10	-10	**Yes**
216	P75 and P76 - East	1.FI	32	21	35	-3	-9	-10	**Yes**
217	P75 and P76 - North	GF	28	17	42	-8	-13	-3	**Yes**
217	P75 and P76 - North	1.FI	28	18	42	-7	-12	-3	**Yes**
218	P75 and P76 - South	GF	30	21	42	-5	-9	-3	**Yes**
218	P75 and P76 - South	1.FI	30	21	42	-5	-9	-3	**Yes**
219	P75 and P76 - West	GF	29	21	43	-6	-9	-2	**Yes**
219	P75 and P76 - West	1.FI	29	21	43	-6	-9	-2	**Yes**
220	P77, P78 and P79 - East	GF	32	21	34	-3	-9	-11	**Yes**
220	P77, P78 and P79 - East	1.FI	33	22	35	-2	-8	-10	**Yes**
221	P77, P78 and P79 - North	GF	29	19	42	-7	-11	-3	**Yes**
221	P77, P78 and P79 - North	1.FI	29	20	42	-6	-10	-3	**Yes**
222	P77, P78 and P79 - South	GF	29	18	34	-6	-12	-11	**Yes**
222	P77, P78 and P79 - South	1.FI	29	18	34	-6	-12	-12	**Yes**

Table 19: Summary of Facades of development where rooms are likely to achieve acceptable internal noise levels with windows partially open providing min 15 dB attenuation									
Receptor Number	Receiver	Floor	Internal level with window partially open			Excess (dB)			
			Daytime	Night Time	Night Max	Daytime	Night Time	Night Max	Yes / No
223	P77, P78 and P79 - West	GF	30	22	41	-5	-8	-4	**Yes**
223	P77, P78 and P79 - West	1.FI	31	22	41	-5	-8	-4	**Yes**
224	P80 and P81 - East	GF	35	24	38	0	-6	-7	**Yes**
224	P80 and P81 - East	1.FI	35	25	38	0	-5	-7	**No**
225	P80 and P81 - North	GF	27	18	43	-9	-12	-2	**Yes**
225	P80 and P81 - North	1.FI	27	18	43	-8	-12	-2	**Yes**
226	P80 and P81 - South	GF	36	25	42	1	-5	-3	**No**
226	P80 and P81 - South	1.FI	36	26	43	1	-4	-2	**No**
227	P80 and P81 - West	GF	31	22	42	-4	-8	-3	**Yes**
227	P80 and P81 - West	1.FI	32	22	42	-4	-8	-3	**Yes**
228	P82 and P83 - East	GF	41	30	44	6	0	-1	**No**
228	P82 and P83 - East	1.FI	41	30	44	6	0	-1	**No**
229	P82 and P83 - North	GF	29	18	36	-6	-12	-9	**Yes**
229	P82 and P83 - North	1.FI	30	19	35	-5	-11	-10	**Yes**
230	P82 and P83 - South	GF	45	34	48	10	4	3	**No**
230	P82 and P83 - South	1.FI	44	34	47	9	4	2	**No**
231	P82 and P83 - West	GF	39	28	45	4	-2	0	**No**
231	P82 and P83 - West	1.FI	39	28	44	4	-2	-1	**No**
232	P84 and P85 - East	GF	39	28	44	4	-2	-1	**No**
232	P84 and P85 - East	1.FI	39	28	44	4	-2	-1	**No**
233	P84 and P85 - North	GF	30	21	44	-6	-9	-1	**Yes**
233	P84 and P85 - North	1.FI	30	22	45	-5	-9	0	**Yes**
234	P84 and P85 - South	GF	45	35	49	10	5	4	**No**
234	P84 and P85 - South	1.FI	45	34	48	10	4	3	**No**
235	P84 and P85 - West	GF	40	30	45	5	0	0	**No**

Table 19: Summary of Facades of development where rooms are likely to achieve acceptable internal noise levels with windows partially open providing min 15 dB attenuation									
Receptor Number	Receiver	Floor	Internal level with window partially open			Excess (dB)			
			Daytime	Night Time	Night Max	Daytime	Night Time	Night Max	Yes / No
235	P84 and P85 - West	1.FI	40	30	45	5	0	0	**No**
236	P86 and P87 - East	GF	41	30	45	6	0	0	**No**
236	P86 and P87 - East	1.FI	41	30	45	6	0	-1	**No**
237	P86 and P87 - North	GF	35	30	52	0	0	7	**No**
237	P86 and P87 - North	1.FI	35	30	52	0	0	7	**No**
238	P86 and P87 - South	GF	45	35	51	10	5	6	**No**
238	P86 and P87 - South	1.FI	45	35	51	10	5	6	**No**
239	P86 and P87 - West	GF	42	35	55	7	5	10	**No**
239	P86 and P87 - West	1.FI	42	35	54	7	5	9	**No**
240	P88, P89 and P90 - East	GF	35	24	39	0	-6	-6	**Yes**
240	P88, P89 and P90 - East	1.FI	35	24	39	0	-6	-6	**Yes**
241	P88, P89 and P90 - North	GF	31	27	51	-4	-3	6	**No**
241	P88, P89 and P90 - North	1.FI	31	27	51	-4	-3	6	**No**
242	P88, P89 and P90 - South	GF	38	30	51	3	0	6	**No**
242	P88, P89 and P90 - South	1.FI	38	30	51	3	0	6	**No**
243	P88, P89 and P90 - West	GF	39	34	53	4	4	8	**No**
243	P88, P89 and P90 - West	1.FI	39	34	53	4	4	8	**No**
244	P91, P92 and P93 - East	GF	32	21	38	-3	-9	-7	**Yes**
244	P91, P92 and P93 - East	1.FI	32	22	38	-3	-8	-7	**Yes**
245	P91, P92 and P93 - East	GF	33	28	51	-2	-2	6	**No**
245	P91, P92 and P93 - East	1.FI	33	28	51	-2	-2	6	**No**
246	P91, P92 and P93 - North	GF	31	27	50	-4	-3	5	**No**
246	P91, P92 and P93 - North	1.FI	31	27	50	-4	-3	5	**No**
247	P91, P92 and P93 - West	GF	38	34	53	3	4	8	**No**
247	P91, P92 and P93 - West	1.FI	38	34	53	3	4	8	**No**

Table 19: Summary of Facades of development where rooms are likely to achieve acceptable internal noise levels with windows partially open providing min 15 dB attenuation									
Receptor Number	Receiver	Floor	Internal level with window partially open			Excess (dB)			
			Daytime	Night Time	Night Max	Daytime	Night Time	Night Max	Yes / No
248	P94 and P95 - East	GF	30	19	38	-6	-11	-7	**Yes**
248	P94 and P95 - East	1.Fl	30	20	38	-5	-11	-7	**Yes**
249	P94 and P95 - North	GF	32	28	50	-3	-2	5	**No**
249	P94 and P95 - North	1.Fl	32	28	49	-3	-2	4	**No**
250	P94 and P95 - South	GF	31	27	50	-4	-3	5	**No**
250	P94 and P95 - South	1.Fl	31	27	50	-4	-3	5	**No**
251	P94 and P95 - West	GF	37	33	52	2	3	7	**No**
251	P94 and P95 - West	1.Fl	37	33	52	2	3	7	**No**
252	P96 and P97 - East	GF	29	19	38	-6	-11	-7	**Yes**
252	P96 and P97 - East	1.Fl	29	19	38	-6	-11	-7	**Yes**
253	P96 and P97 - North	GF	31	27	50	-4	-3	5	**No**
253	P96 and P97 - North	1.Fl	31	27	50	-4	-3	5	**No**
254	P96 and P97 - South	GF	33	28	50	-3	-2	5	**No**
254	P96 and P97 - South	1.Fl	32	28	50	-3	-2	5	**No**
255	P96 and P97 - West	GF	37	33	53	2	3	8	**No**
255	P96 and P97 - West	1.Fl	37	33	53	2	3	8	**No**
256	P98, P99, P100 and P101 - East	GF	29	18	37	-6	-12	-8	**Yes**
256	P98, P99, P100 and P101 - East	1.Fl	29	18	37	-6	-12	-8	**Yes**
257	P98, P99, P100 and P101 - North	GF	31	27	51	-4	-3	6	**No**
257	P98, P99, P100 and P101 - North	1.Fl	31	27	51	-4	-3	6	**No**
258	P98, P99, P100 and P101 - South	GF	31	27	50	-4	-3	5	**No**
258	P98, P99, P100 and P101 - South	1.Fl	31	27	50	-4	-3	5	**No**
259	P98, P99, P100 and P101 - West	GF	37	34	53	2	4	8	**No**
259	P98, P99, P100 and P101 - West	1.Fl	37	33	53	2	3	8	**No**
260	P102 and P103 - East	GF	29	19	38	-6	-11	-7	**Yes**

Table 19: Summary of Facades of development where rooms are likely to achieve acceptable internal noise levels with windows partially open providing min 15 dB attenuation									
Receptor Number	Receiver	Floor	Internal level with window partially open			Excess (dB)			
			Daytime	Night Time	Night Max	Daytime	Night Time	Night Max	Yes / No
260	P102 and P103 - East	1.Fl	29	19	38	-6	-11	-7	**Yes**
261	P102 and P103 - North	GF	33	29	52	-2	-1	7	**No**
261	P102 and P103 - North	1.Fl	33	29	52	-2	-1	7	**No**
262	P102 and P103 - South	GF	32	28	52	-3	-2	7	**No**
262	P102 and P103 - South	1.Fl	32	28	52	-3	-2	7	**No**
263	P102 and P103 - West	GF	38	35	55	3	5	10	**No**
263	P102 and P103 - West	1.Fl	38	34	55	3	4	10	**No**

APPENDIX D – BS 12354-3:2000 CALCULATIONS

Living Room / Bungalow

Room type:	Living Room	Ground area:	12.70 m²
L2,nT valid:	35.0 dB	L2,nT existent / improved:	29.5 / 29.5 dB

All Facades

Facade geometry:	3.90 m x 2.40 m = 9.36 m²
L2,nTi existent / improved:	29.5 / 29.5 dB

Assessment level Day:	61.0 dB(A)
Correction for facade structure by EN 12354-3	0.0 dB
Correction by user:	0.0 dB
Exterior level:	61.0 dB

ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]		Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	Wall	1	5.96	50	-	=	Wall	1	5.96	50	-	-
2	Window	1	3.20	30	-	=	Window	1	3.20	30	-	-
3	Air Vent	2	0.10	-	37	=	Air Vent	2	0.10	-	37	-

Bedroom / Bungalow

Room type:	Bedroom	Ground area:	7.50 m²
L2,nT valid:	30.0 dB	L2,nT existent / improved:	24.9 / 24.9 dB

All Facades

Facade geometry:	3.70 m x 2.40 m = 8.88 m²
L2,nTi existent / improved:	24.9 / 24.9 dB

Assessment level Day:	51.0 dB(A)
Correction for facade structure by EN 12354-3	0.0 dB
Correction by user:	0.0 dB
Exterior level:	51.0 dB

ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]		Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	Wall	1	6.58	50	-	=	Wall	1	6.58	50	-	-
2	Window	1	2.10	30	-	=	Window	1	2.10	30	-	-
3	Air Vent	2	0.10	-	32	=	Air Vent	2	0.10	-	32	-

Bedroom Max / Bungalow

Room type:	Bedroom Max	Ground area:	7.50 m²
L2,nT valid:	45.0 dB	L2,nT existent / improved:	39.9 / 39.9 dB

All Facades

Facade geometry:	3.70 m x 2.40 m = 8.88 m²
L2,nTi existent / improved:	39.9 / 39.9 dB

Assessment level Day:	71.0 dB(A)
Correction for facade structure by EN 12354-3	0.0 dB
Correction by user:	0.0 dB
Exterior level:	71.0 dB

ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]		Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	Wall	1	6.58	50	-	=	Wall	1	6.58	50	-	-
2	Window	1	2.10	30	-	=	Window	1	2.10	30	-	-
3	Air Vent	2	0.10	-	39	=	Air Vent	2	0.10	-	39	-

APPENDIX E - GLOSSARY

A-weighted sound pressure, p_A	Value of overall sound pressure, measured in pascals (Pa), after the electrical signal derived from a microphone has been passed through an A-weighting network. *NOTE: The A-weighting network modifies the electrical response of a sound level meter with frequency in approximately the same way as the sensitivity of the human hearing system.*
A-weighted sound pressure level, L_{pA}	Quantity of A-weighted sound pressure in decibels (dBA).
Acoustic environment	Sound from all sound sources as modified by the environment [BS ISO 12913-1:2013].
Ambient sound	Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far. *NOTE: The ambient sound comprises the residual sound and the specific sound when present.*
Ambient sound level, $L_a = L_{Aeq,T}$ (BS 4142:2014)	Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T *NOTE: The ambient sound level is a measure of the residual sound and the specific sound when present.*
Background sound	Underlying level of sound over a period, *T*, which might in part be an indication of relative quietness at a given location.
Background sound level, $L_{A90,T}$ (BS 4142:2014)	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.
Break-in	Noise transmission into a structure from outside.
Break-out	Noise transmission from inside a structure to the outside.
Cross-talk	Noise transmission between one room and another room or space via a duct or other path.
C_{tr}	Correction term applied against the sound insulation single-number values (R_w, D_w, and $D_{nT,w}$) to provide a weighting against low frequency performance. *NOTE: The reference values used within the C_{tr} calculation are based on urban traffic noise.*
Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$	Value of the A-weighted sound pressure level in decibels (dB) of a continuous, steady sound that, within a specified time interval, T, has the same mean-squared sound pressure as the sound under consideration that varies with time.
Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$ (BS 4142:2014)	Value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, $T = t_2 - t_1$, has the same mean-squared sound pressure as a sound that varies with time.
Equivalent sound absorption area of a room, A	Hypothetical area of a totally absorbing surface without diffraction effects, expressed in square metres (m2), which, if it were the only absorbing element in the room, would give the same reverberation time as the room under consideration
Facade level	Sound pressure level 1 m in front of the façade. *NOTE: Facade level measurements of L_{pA} are typically 1 dB to 2 dB higher than corresponding free-field measurements because of the reflection from the facade.*
Free-field level	Sound pressure level away from reflecting surfaces. *NOTE: Measurements made 1.2 m to 1.5 m above the ground and at least 3.5 m away from other reflecting surfaces are usually regarded as free-field. To minimize the effect of reflections the measuring position has to be at least 3.5 m to the side of the reflecting surface (i.e., not 3.5 m from the reflecting surface in the direction of the source). Estimates of noise from aircraft overhead usually include a correction of 2 dB to allow for reflections from the ground.*

Impact sound pressure level, L_i	Average sound pressure level in a specific frequency band in a room below a floor when it is excited by a standard tapping machine or equivalent.
Indoor ambient noise	Noise in a given situation at a given time, usually composed of noise from many sources, inside and outside the building, but excluding noise from activities of the occupants. *NOTE: The location(s) within the room at which the ambient indoor noise is to be measured or calculated ought to be considered.*
Measurement time interval, T_m (BS 4142:2014)	Total time over which measurements are taken. *NOTE: This may consist of the sum of a number of non-contiguous, short-term measurement time intervals.*
Noise criteria	Numerical indices used to define design goals in a given space.
Noise rating, NR	Graphical method for rating a noise by comparing the noise spectrum with a family of noise rating curves.
Normalised impact sound pressure level, L_n	Impact sound pressure level normalized for a standard absorption area in the receiving room. *NOTE: Normalised impact sound pressure level is usually used to characterize the insulation of a floor in a laboratory against impact sound in a stated frequency band.*
Octave band	Band of frequencies in which the upper limit of the band is twice the frequency of the lower limit.
Percentile level, $L_{AN,T}$	A-weighted sound pressure level obtained using time-weighting “F”, which is exceeded for *N*% of a specified time interval.
Reference time interval, T_r (BS 4142:2014)	Specified interval over which the specific sound level is determined. *NOTE: This is 1 h during the day from 07:00 h to 23:00 h and a shorter period of 15 min at night from 23:00 h to 07:00 h.*
Residual sound (BS 4142:2014)	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
Residual sound level, $L_r = L_{Aeq,T}$ (BS 4142:2014)	Equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T.
Rating level, $L_{Ar,Tr}$	Equivalent continuous A-weighted sound pressure level of the noise, plus any adjustment for the characteristic features of the noise. *NOTE: This is used in BS 7445 and BS 4142 for rating industrial noise, where the noise is the specific noise from the source under investigation.*
Reverberation time, *T*	Time that would be required for the sound pressure level to decrease by 60 dB after the sound source has stopped.
Sound exposure level, *L*AE	Level of a sound, of 1 s duration, that has the same sound energy as the actual noise event considered.
Sound level difference, *D*	Difference between the sound pressure level in the source room and the sound pressure level in the receiving room.
Sound pressure, *p*	Root-mean-square value of the variation in air pressure, measured in pascals (Pa) above and below atmospheric pressure, caused by the sound.
Sound pressure level, L_p	Quantity of sound pressure, in decibels (dB).
Sound reduction index, *R*	Laboratory measure of the sound insulating properties of a material or building element in a stated frequency band.

Specific sound level, $L_s = L_{Aeq,Tr}$ (BS 4142:2014)	Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r.
Specific sound source (BS 4142:2014)	Sound source being assessed.
Standardised impact sound pressure level, L'_{nT}	Impact sound pressure level normalized to a reverberation time in the receiving room of 0.5 s.
Standardised level difference, D_{nT}	Difference in sound level between a pair of rooms, in a stated frequency band, normalized to a reference reverberation time of 0.5 s for dwellings.
Groundborne noise	Audible noise caused by the vibration of elements of a structure, for which the vibration propagation path from the source is partially or wholly through the ground. *NOTE Common sources of ground-borne noise include railways and heavy construction work on adjacent construction sites.*
Structure-borne noise	Audible noise caused by the vibration of elements of a structure, the source of which is within a building or structure with common elements. *NOTE Common sources of structure-borne noise include building services plant, manufacturing machinery and construction or demolition of the structure.*
Third octave band	Band of frequencies in which the upper limit of the band is 2% times the frequency of the lower limit.
Weighted level difference, D_w	Single-number quantity that characterizes airborne sound insulation between rooms, but which is not adjusted to reference conditions. *NOTE Weighted level difference is used to characterize the insulation between rooms in a building as they are. Values cannot normally be compared with measurements made under other conditions (see BS EN ISO 717-1).*
Weighted normalised impact sound pressure level, $L'_{n,w}$	Single-number quantity used to characterize the impact sound insulation of floors over a range of frequencies.
Weighted sound reduction index, R_w	Single-number quantity which characterizes the airborne sound insulating properties of a material or
Weighted standardised impact sound pressure level $L'_{nT,w}$	Single-number quantity used to characterize the impact sound insulation of floors over a range of frequencies.
Weighted standardised level difference, $D_{nT,w}$	Single-number quantity that characterizes the airborne sound insulation between rooms.

Symbols

D_w	Weighted level difference (dB)
D_{nT}	Standardized level difference (dB)
$D_{nT,w}$	Weighted standardized level difference (dB)
L_{Amax}	Maximum noise level (dB)
$L_{Ar,Tr}$	Rating level (dB)
L_n	Normalised impact sound pressure level (dB)
L'_{nT}	Standardised impact sound pressure level (dB)
$L'_{nT,w}$	Weighted standardised impact sound pressure level (dB)
$L'_{n,w}$	Weighted normalised impact sound pressure level (dB)
L_p	Sound pressure level (dB)
L_{pA}	A-weighted sound pressure level (dB)
$L_{AN,T}$	Percentile level (dB)
L_{AE}	Sound exposure level (dB)
$LAeq,T$	Equivalent continuous A-weighted sound pressure level (dB)
p	Sound pressure (Pa)
p_A	A-weighted sound pressure (dB)
$p_{A(t)}$	Instantaneous A-weighted sound pressure (Pa)

R	Sound reduction index (dB)
R_w	Weighted sound reduction index (dB)
T	Time interval (also used for reverberation time) (s)
t_0	Reference time interval (s)

NoiseAir Limited

Specialist acoustics and air quality consultants providing a fast, professional, cost-effective service across the UK.

Over 35 years of experience in the field.

Contact us now for a free, no obligation quote or to discuss your requirements.

THE COUNTING HOUSE, HIGH STREET, LUTTERWORTH. LE17 4AY

UNIT 14, CHAPEL COURT, WERVIN, CHESTER. CH2 4BT

TEL. 0116 272 5908

EMAIL. INFO@NOISEAIR.CO.UK

NoiseAir
ACOUSTICS & AIR QUALITY