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Churchill Retirement Living Limited

Worthing Road, Southwater

Acoustics Assessment



PUBLIC

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1. Introduction

1.1. Introduction

Peninsular Acoustics have been commissioned by Churchill Retirement Living Limited (hereafter referred to as 'the Client') to undertake an Acoustics Assessment to discharge condition 8 of planning application (ref: DC/22/0096, Horsham District Council) for a proposed retirement living complex comprising 36 apartments and 6no. retirement cottages at Roundstone Park, Worthing Road, Southwater (hereafter referred to as 'the Site').

A glossary of acoustic terminology is provided in Appendix A and for conciseness the acoustic mark ups are overlaid to the site layout in Appendix C.

1.2. Project Background

Previous Noise Impact Assessment

A noise impact assessment was completed by '24 Acoustics' in January 2023 (ref: R9862-1 Rev 0) which demonstrated that sound levels at the Site were dominated by road traffic along Worthing Road resulting in assessment sound levels of:

- 66 dB $L_{Aeq, 16hr}$ during the daytime (07:00 – 23:00);
- 57 dB $L_{Aeq, 8hr}$ during the night-time (23:00 – 07:00; and
- A typical maximum night-time level of 75 dB $L_{AFmax, 5mins}$.

Planning Permission and Condition No. 8

Planning permission was granted by Horsham District Council (hereafter referred to as 'the Local Authority') with condition 8 relating to acoustics:

"No development above ground floor slab level of any part of the development hereby permitted shall take place until a revised Noise Assessment has been submitted, with details of appropriate ventilation, has been submitted to and approved by the Local Planning Authority in writing. The approved details hereby permitted shall be implemented prior to occupation and thereafter retained as such."

1.3. Scope of Works

The following scope of works has been undertaken:

- Using the acoustic data from the '24 Acoustics' previous noise impact assessment, a detailed acoustic model of the Site and nearby environs has been created using the detailed architectural drawings;
- Sound levels have been predicted at all habitable room façades and a selection of break-in calculations has been undertaken giving due consideration to the ventilation requirements of AD-F[1];
- Drawing on the previously submitted mitigation strategy, where necessary, amendments have been suggested such that internal acoustic criteria is still satisfied in accordance with the requirements of planning condition 8.

[1] The Building Regulations 2010, Ventilation, Approved Document 'F'.

1.4. Standards and Guidance

1.4.1. BS 8233

For residential dwellings, internal acoustic criteria can be sought from BS 8233[2]. It is assumed that the reader has an understanding of this document and therefore, for conciseness, the numerical criteria is summarised below. As BS 8233 does not define maximum internal noise levels for bedrooms at night-time, guidance has been sought from the WHO Guidelines[3] and ProPG[4].

Table 1.1: Project Criteria

	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)	
Location	**Ambient Sound Level**	**Ambient Sound Level**	**Maximum Sound Level**
Living Room	35 dB $L_{Aeq, 16hr}$	-	-
Dining Room	40 dB $L_{Aeq, 16hr}$	-	-
Bedroom	35 dB $L_{Aeq, 16hr}$	30 dB $L_{Aeq, 16hr}$	45 dB $L_{AFmax, T}$

1.4.2. Approved Document F

Condition 8 states that 'appropriate ventilation' should be considered within the updated acoustics assessment, as such, guidance can be sought from AD-F whereby there are 3no. 'types' of ventilation considerations for dwellings:

- Purge Ventilation: Manually controlled ventilation of rooms at a relatively high rate to rapidly dilute pollutants and/or disperse water vapour.
  - Purge ventilation should not have any acoustic requirements due to the fact that it is limited to brief periods of time during which there may be a requirement to remove air from a property (i.e., during cooking etc). This should not be confused with overheating ventilation which is now an obligation under AD-O[5].
- Extract Ventilation: The removal of air directly from an internal space, typically found in kitchens and bathrooms whereby an extract fan or central fan system is operational.
  - The client is utilising a continuous mechanical extract system and as such, the whole dwelling ventilation calculations account for the minimum free area per habitable room based upon the guidance contained within AD-F.
- Whole-dwelling Ventilation: Continuous ventilation of rooms at a relatively low rate.
  - This is considered to be the "appropriate ventilation" stated in planning condition 8 as it relates to elements such as window mounted or through wall trickle ventilators which are typically kept in an "open" position all year round and, along with glazing, are the dominant airpath through a façade and require acoustic considerations to satisfy BS 8233.

[2] BS 8233:2014 *'Guidance on sound insulation and noise reduction for buildings.'*
[3] World Health Organisation, Guidelines for Community Noise, 1999.
[4] Professional Practice Guidance on Planning & Noise, May 2017
[5] The Building Regulations 2010, Overheating, Approved Document 'O'.

2. Assessment Methodology

2.1. Source Sound Levels

As aforementioned, a previous noise survey was undertaken which showed prevailing sound levels of:

- 66 dB $L_{Aeq, 16hr}$ during the daytime (07:00 – 23:00);
- 57 dB $L_{Aeq, 8hr}$ during the night-time (23:00 – 07:00; and
- A typical maximum night-time level of 75 dB $L_{AFmax, 5mins}$.

The survey notes indicated that the dominant source of noise at the monitoring location, and across the Site, was road traffic using Worthing Road.

Based upon the above, an acoustic model has been created to predict sound levels across the Site and at each façade of the proposed development.

2.2. Acoustic Modelling

An acoustic model of the Site and environs was generated using Datakustik CadnaA® acoustic modelling software. The model was generated to determine sound levels emanating from the Site with and without the inclusion of proposed mitigation measures.

The modelling assumptions pertinent to the assessment are:

- Global ground absorption set to 0 (accounts for reflective hard ground only); and
- Building heights based upon architectural drawings with buildings set to be reflective and first order reflections included in the acoustic modelling.

The model outputs for daytime ambient and night-time ambient sound levels are shown in Appendix B. As the proposed building(s) are in close proximity to the dominant noise source, the change from ground floor to second floor is negligible, as such, the highest modelled sound level is used to inform break-in calculations at all floors.

For night-time maximum sound levels, a point source has been modelled and calibrated to the measurement position. As the L_{AFmax} is variable depending on where the point source is, the sound level used for assessment will be based upon the most exposed element for that façade which is shown in Appendix B.

3. Noise and Ventilation

3.1. Modelled Sound Levels

For conciseness, two break-in examples are provided within this report for a typical bedroom within the apartment block and a bedroom within the self-contained cottage. Both examples are considered to be the most exposed receptors in the west of the Site.

Using the acoustic model and images outlined in Section 2.2, the following sound levels have been used to inform the assessment.

Table 3.1: Modelled Sound Levels

Parameter	Apartment	Cottage
Daytime Ambient $L_{Aeq,\ 16hr}$ dB	69	70
Night-time Ambient $L_{Aeq,\ 8hr}$ dB	59	60
Night-time Maximum $L_{AFmax,\ 5mins}$ dB	82	83

3.2. Ventilation Strategy

The ventilation strategy for Approved Document F is for continuous mechanical extract ventilation in kitchens and bathrooms, as such, the calculations have been based upon whole-dwelling ventilators to achieve a minimum free area of 4,000 mm^2.

3.3. Example Break-In Calculation

An example break-in calculation for the apartment and cottage are provided in Table 3.2 and Table 3.3 respectively.

Table 3.2: Apartment Break-In Calculation Example

Parameter	Data	Comments
Room Dimensions	2.9m x 4.4m x 2.5m w x d x h	Based upon architectural drawings
Glazing Area	2.4m^2	Based upon architectural drawings
Façade Composition	58 dB $R_w + C_{tr}$	Sound insulation provided by blockwork wall and plasterboard.
Ceiling Composition (2F only)	44 dB $R_w + C_{tr}$	Existing roof tiles, 100mm acoustic insulation between joists, 2no. layers of 12.5mm plasterboard.
Proposed Glazing	36 dB $R_w + C_{tr}$	Acoustically rated glazing to achieve higher levels of sound reduction.
Proposed Ventilation	37 dB $D_{n,e,w} + C_{tr}$	Acoustically rated ventilator to comply with the requirements of AD-F.

The results of the break-in calculation show with the modelled sound levels outlined in Table 3.1, the internal predicted levels are:

- 29 dB $L_{Aeq, 16hr}$;
- 19 dB $L_{Aeq, 8hr}$; and
- 45 dB $L_{AFmax, 5mins}$.

Table 3.3: Cottage Break-In Calculation Example

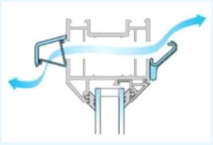
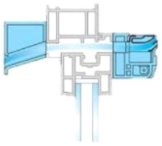
Parameter	Data	Comments
Room Dimensions	3.2m x 4.0m x 2.5m w x d x h	Based upon architectural drawings
Glazing Area	1.5m^2	Based upon architectural drawings
Façade Composition	58 dB $R_w + C_{tr}$	Sound insulation provided by blockwork wall and plasterboard.
Ceiling Composition	44 dB $R_w + C_{tr}$	Existing roof tiles, 100mm acoustic insulation between joists, 2no. layers of 12.5mm plasterboard.
Proposed Glazing	36 dB $R_w + C_{tr}$	Acoustically rated glazing to achieve higher levels of sound reduction.
Proposed Ventilation	37 dB $D_{n,e,w} + C_{tr}$	Acoustically rated ventilator to comply with the requirements of AD-F.

The results of the break-in calculation show with the modelled sound levels outlined in Table 3.1, the internal predicted levels are:

- 30 dB $L_{Aeq, 16hr}$;
- 20 dB $L_{Aeq, 8hr}$; and
- 45 dB $L_{AFmax, 5mins}$.

3.4. Mitigation Strategy Summary

Table 3.4: Mitigation Strategy Performance

Reference	Glazing Solution	Ventilation Solution
A	4mm glass 20mm air gap 4mm glass **Min. 27 dB $R_w + C_{tr}$**	Direct Airpath Window Mounted Non-acoustic Trickle Ventilator  **Min. 32 dB $D_{n,e,w} + C_{tr}$**
B	10mm float glass 18mm cavity 8.8mm laminated glass **Min. 36 dB $R_w + C_{tr}$**	Acoustically Rated Window Mounted Trickle Ventilator Example: 2x Greenwood EAQ42W window mounted, 2x Titon ACO Vents window mounted.  **Min. 37 dB $D_{n,e,w} + C_{tr}$**

This table should be read in conjunction with drawings presented in Appendix C which show the corresponding colour coded mitigation references.

The ventilator acoustic performance represents the performance of one ventilator providing 4,000mm^2 Equivalent Area. Where two ventilators are required to meet the airflow performance, the acoustic performance of each shall be increased by 3dB.

For the proposed cottages, only the bedrooms fronting Worthing Road require Reference C, all other habitable rooms within the cottages comply with BS 8233 with Reference A (i.e., standard double glazing and trickle ventilators).

For each reference in Table 3.4, the sound reduction performance requirements in octave band and weighted reduction format are presented in Appendix D.

4. Noise and Overheating

4.1. Purpose

Following submission of revision P01 of this acoustics report, comments were received from the EHO at the Local Authority as follows:

- Due to high noise levels dwellings facing Worthing Road won't be able to rely on open windows to achieve sufficient ventilation;
- Trickle ventilators do not allow sufficient ventilation of dwellings, particularly those with west facing façades where solar gain will be higher and may not prevent overheating;
- Internal noise levels will be compromised if windows/patio doors are opened; and
- Thermal comfort should be maintained to prevent overheating and an appropriate assessment should be presented against current technical guidance.

4.2. Noise Criteria

Peninsular Acoustics' sister company, UK Overheating, have conducted an overheating assessment for the Site for the purposes of satisfying the Building Regulation requirements of AD-O (ref: UKO0110-R01-P02).

This report considers the requirements of AD-O from a noise perspective which are for sound levels not to exceed 40 dB $L_{Aeq,\ 8hr}$ or 55 dB $L_{AFmax,\ 2mins}$ more than 10 times between 23:00 – 07:00.

4.3. Overheating Assessment Results

Section 4.2 and 4.3 of the aforementioned UK Overheating report uses the sound level contour maps presented in the appendices of this report to define window opening constraints. For example, along the west façade, a 25 dB outside to inside sound level difference is required due to the fact that noise levels reach 82 dB $L_{AFmax,\ 2mins}$ during the night-time.

Using apartment 6 as an example, the overheating assessment shows that there will be a mechanical ventilation system capable of providing flow rates of 20 l/s in the bedroom and 37 l/s in the living room during periods of overheating. This provides compliance with both the thermal criteria of AD-O and the noise criteria.

Therefore, it is considered that providing this report is read in conjunction with the accompanying overheating report, the points raised by the EHO above are satisfied and the Site provides appropriate ventilation systems in accordance with both AD-F and AD-O.

5. Conclusions

Peninsular Acoustics have been commissioned by Churchill Retirement Living Limited to undertake an Acoustics Assessment to discharge condition 8 of planning application DC/22/0096 for a proposed retirement living complex at Roundstone Park, Southwater.

Using sound levels measured in 2023, an updated acoustics assessment has been presented using acoustic modelling to determine sound levels at each relevant façade.

Break-in calculations in accordance with relevant British standards have demonstrated the need for 2no. acoustic strategies across the Site.

Using the proposed strategies, internal acoustic conditions will satisfy the relevant internal acoustic criteria during typical periods and periods of overheating.

It is therefore considered that planning condition 8 can be discharged.

The limitations of this report are presented in Appendix E.

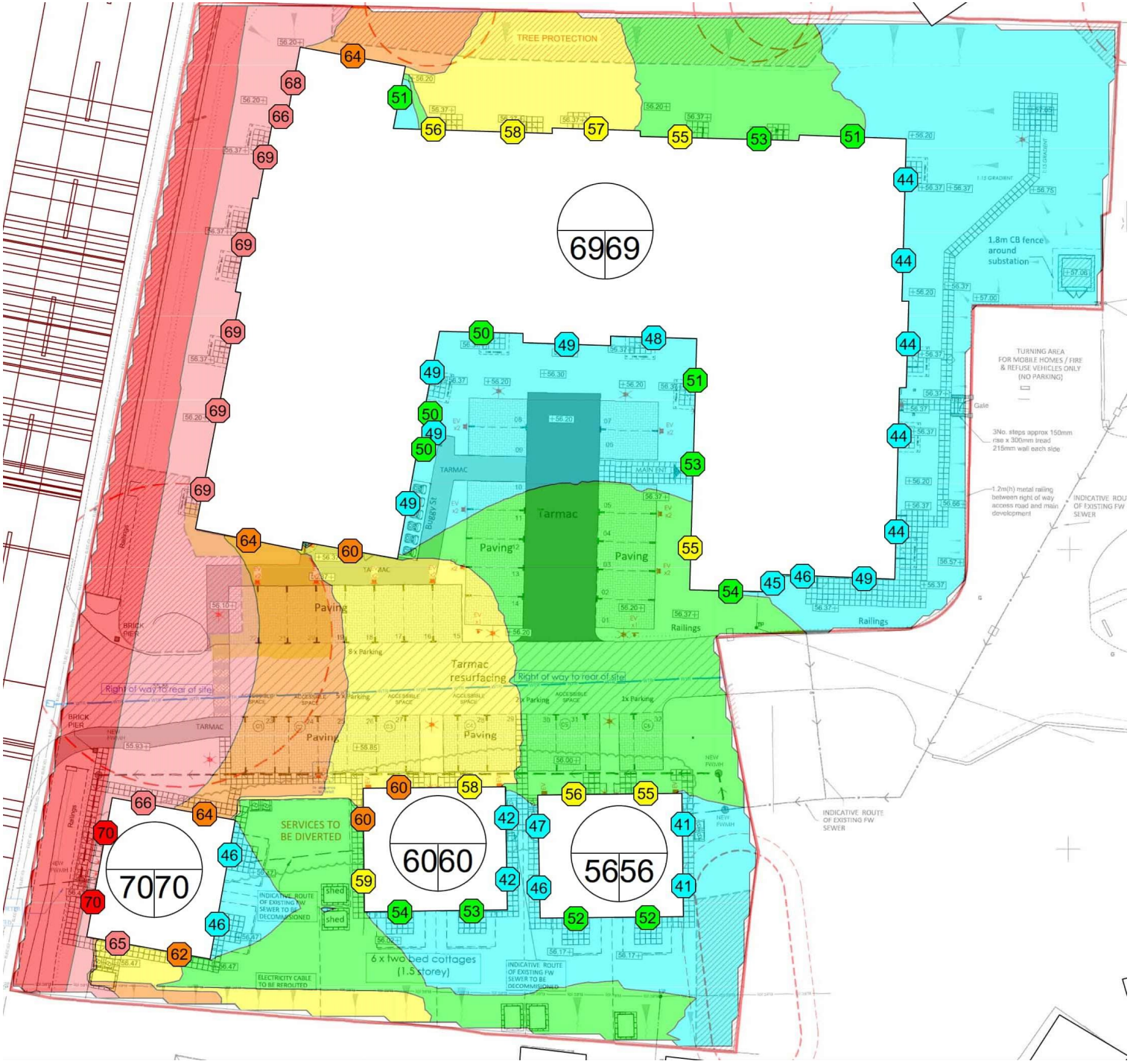
Appendix A

Technical Terminology

Noise	Typically defined as unwanted, unpleasant or disturbing sound
Frequency (Hz)	The number of oscillations in acoustic pressure per second. It represents the 'tone' of the sound. Often determined in octave bands
Maximum sound pressure level (L_{Fmax})	The maximum or highest sound pressure level measured with a 'fast' time weighting
Equivalent continuous sound pressure level ($L_{eq,T}$)	The average of the total sound energy over a specified time period (T). L_{eq} represents the equivalent sound level that a fluctuating source would have compared to a steady source with the same total sound energy over a specific time period. Commonly used as a descriptor of human perception of sound over time.
'A' weighting	Frequency-dependent weighting based on the response of the human auditory system which has been found to correlate well with the subjective response to sound. Denoted by the use of the letter 'A'. For example, dBA denotes an 'A' weighted sound level in decibels, or L_{Amax} denotes an 'A' weighted maximum sound pressure level.
Internal Ambient Noise Level (IANL)	The noise level within a room or enclosed space. Usually determined as an equivalent continuous sound pressure level over a specific time period ($L_{Aeq,T}$, dB)
Purge ventilation	Ventilation to aid removal of high concentrations of pollutants and water vapour released from occasional activities such as painting and decorating or accidental releases such as smoke from burnt food or spillage of water.
$D_{n,e}$ / $D_{n,e,w}$	The laboratory tested sound insulation of small building elements, normalised to an equivalent absorption area of 10m2.
Façade level	The sound pressure level measured close to a building façade that includes contribution from both the incident sound and the sound reflected from the façade. Normally taken to be 3dB higher than the equivalent free-field level, when located at 1 metre from a façade.
Free-field level	A measured sound pressure level that is independent of any contributions due to reflections from nearby surfaces and is therefore representative of the direct path only.
R / R_w	The laboratory tested airborne sound insulation of a building element
Sound insulation	The capacity of a structure to prevent sound from reaching a receiving location. Sound energy is not necessarily absorbed; impedance mismatch, or reflection back toward the source, is often the principal mechanism

Appendix B

Sound Level Contour Maps



Sound Level Contour Maps

- < 50 dB(A)
- 50 - 55 dB(A)
- 55 - 60 dB(A)
- 60 - 65 dB(A)
- 65 - 70 dB(A)
- 70 - 75 dB(A)
- 75 - 80 dB(A)
- > 80 dB(A)

DATE	REV	DESCRIPTION	BY
30/04/24	P01	PLANNING	AW

Project: Southwater
Ref.: Daytime Sound Level Contours
DWG.: PA0316-ACO-001-P01

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Notes
1. Do not scale this drawing.
2. Sound levels presented as $L_{Aeq,\ 16hr}$ values.



Sound Level Contour Maps

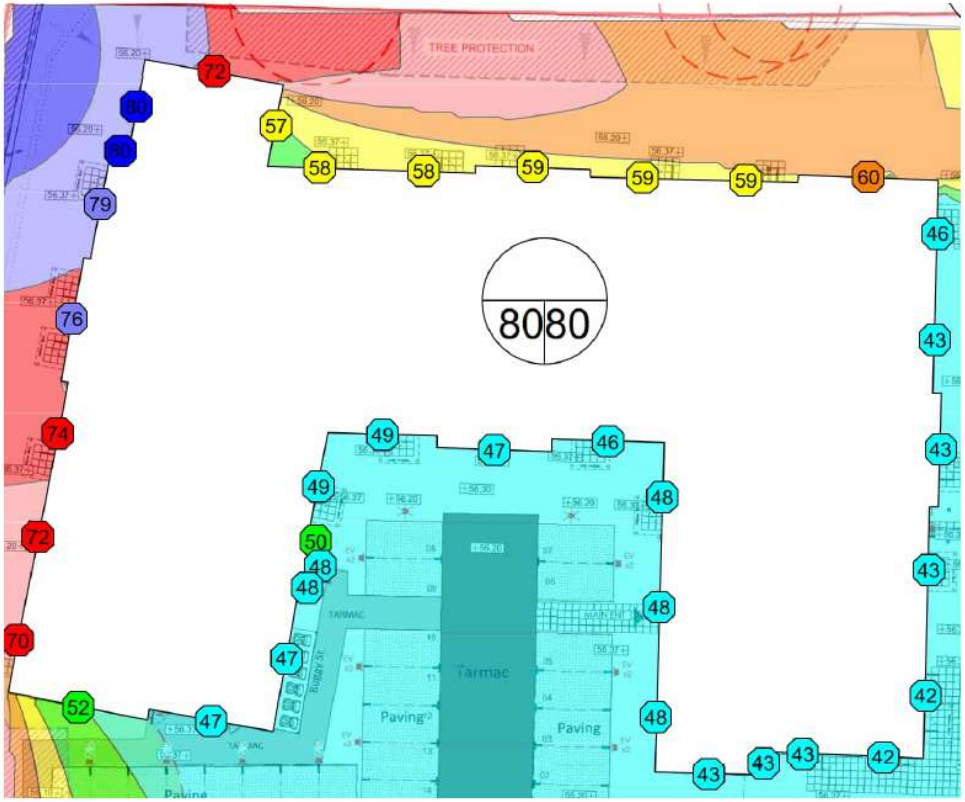
	< 50 dB(A)
	50 - 55 dB(A)
	55 - 60 dB(A)
	60 - 65 dB(A)
	65 - 70 dB(A)
	70 - 75 dB(A)
	75 - 80 dB(A)
	> 80 dB(A)

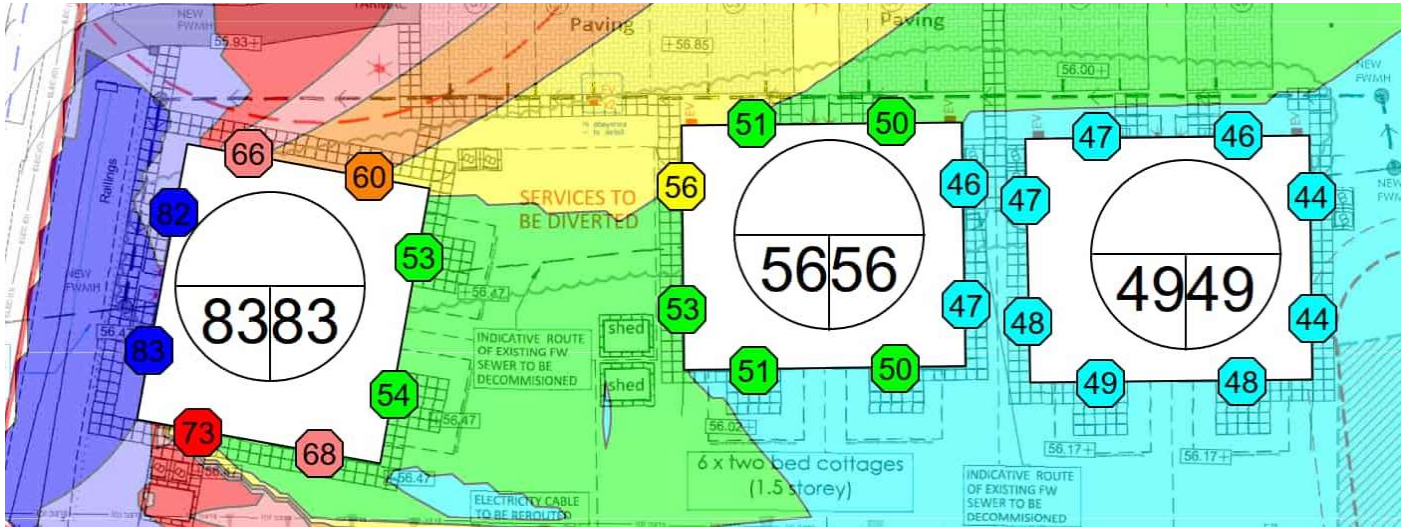
30/04/24	P01	PLANNING	AW
DATE	REV	DESCRIPTION	BY

Project: Southwater
Ref.: Night-time Sound Level Contours
DWG.: PA0316-ACO-002-P01

PENINSULAR ACOUSTICS

Notes
1. Do not scale this drawing.
2. Sound levels presented as $L_{Aeq,\ 8hr}$ values.





Sound Level Contour Maps

- < 50 dB(A)
- 50 - 55 dB(A)
- 55 - 60 dB(A)
- 60 - 65 dB(A)
- 65 - 70 dB(A)
- 70 - 75 dB(A)
- 75 - 80 dB(A)
- > 80 dB(A)

DATE	REV	DESCRIPTION	BY
30/04/24	P01	PLANNING	AW

Project: Southwater
Ref.: Maximum Sound Level Contours
DWG.: PA0316-ACO-003-P01

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Notes
1. Do not scale this drawing.
2. Sound levels presented as $L_{AFmax,\ 2mins}$ values.

Appendix C

Mitigation Locations



Mitigation Reference Drawing

Reference A

Reference B

Reference	Glazing	Ventilator
Reference A	27 dB $R_w + C_{tr}$	32 dB $D_{n,e,w} + C_{tr}$
Reference B	36 dB $R_w + C_{tr}$	37 dB $D_{n,e,w} + C_{tr}$

04/07/24	P02	PLANNING	AW
30/04/24	P01	PLANNING	AW
DATE	REV	DESCRIPTION	BY

Project: Southwater
Ref.: Ground Floor Mitigation
DWG.: PA0316-ACO-004-P02

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Notes
1. Do not scale this drawing.
2. Please refer to report PA0316-R01-P01 for the details on the proposed glazing and ventilation requirements per reference.



Mitigation Reference Drawing

Reference A

Reference B

Reference	Glazing	Ventilator
Reference A	27 dB $R_w + C_{tr}$	32 dB $D_{n,e,w} + C_{tr}$
Reference B	36 dB $R_w + C_{tr}$	37 dB $D_{n,e,w} + C_{tr}$

04/07/24	P02	PLANNING	AW
30/04/24	P01	PLANNING	AW
DATE	REV	DESCRIPTION	BY

Project: Southwater
Ref.: First Floor Mitigation
DWG.: PA0316-ACO-005-P02

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Notes
1. Do not scale this drawing.
2. Please refer to report PA0316-R01-P01 for the details on the proposed glazing and ventilation requirements per reference.

Appendix D

Mitigation References

Glazing Requirements

Glazing Reference	Sound Insulation Performance Requirements (dB) in Octave Band Centre Frequencies (Hz)						$R_w + C_{tr}$ (dB)	Example Configuration
	125	250	500	1k	2k	4k		
Reference A	22	20	26	36	39	31	27	4 / 20 / 4 / 20 / 4
Reference B	29	33	40	42	46	58	36	10 / 18 / 8.8(44.2)

Ventilation Requirements

Glazing Reference	Sound Insulation Performance Requirements (dB) in Octave Band Centre Frequencies (Hz)						$D_{n,e,w} + C_{tr}$ (dB)	Example Product
	125	250	500	1k	2k	4k		
Reference A	32	32	31	33	31	31	32	Any standard non-acoustic 4,000mm^2 trickle vent
Reference B	38	35	32	40	46	60	37	TA5235 (V75) + TA5236 (C75) 5000EA

It is appreciated that each octave band requirement may not be achievable, therefore, the focus should be achieving the overall weighted single figure ($R_w + C_{tr}$ or $D_{n,e,w} + C_{tr}$) value for each reference.

Appendix E

Report Limitations

This report has been prepared for the titled project or named part thereof and should not be used in whole or part and relied upon for any other project without the written authorisation of Peninsular Acoustics Limited. Peninsular Acoustics Limited accept no responsibility or liability for the consequences of this document if it is used for a purpose other than that for which it was commissioned. Persons wishing to use or rely upon this report for other purposes must seek written authority to do so from the owner of this report and/ or Peninsular Acoustics Limited and agree to indemnify Peninsular Acoustics Limited for any and all loss or damage resulting therefrom. Peninsular Acoustics Limited accepts no responsibility or liability for this document to any other party other than the person by whom it was commissioned.

The findings and opinions expressed are relevant to the dates of the site works and design drawings/specifications and should not be relied upon to represent conditions at substantially later dates. Opinions included therein are based on information gathered during the study and from our experience. If additional information becomes available which may affect our comments, conclusions or recommendations Peninsular Acoustics Limited reserve the right to review the information, reassess any new potential concerns and modify our opinions accordingly.



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