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1-3 Broadwater West Worthing, BN14 9BT

Noise Impact Assessment

January 2024

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ii. Document History

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AC20084.01.00	0	Noise Impact Assessment	25/01/24	BG	DG
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iii. Credentials

Acoustic survey and assessments were undertaken by Ben Groves BSc (Hons) MSc MIOA. Ben has been involved with acoustic consultancy for over ten years and has a Masters degree in environmental acoustics and is a corporate member of the Institute of Acoustics (MIOA).

The report was authorised by David Gnanaseharam BSc (Hons) MSc MIOA. David has been involved with acoustic consultancy (including sound insulation testing and noise impact assessments) for over fifteen years and has a Masters degree in Acoustics from the University of Surrey and is a corporate member of the Institute of Acoustics (MIOA).

In addition, they are both is fully accredited under the Sound Insulation Testing and Measurement Association (SITMA) scheme. SITMA is a professional association for the Acoustic Consultancy industry and operates a registered testers scheme providing 3rd party accreditation to testing companies, ensuring that all companies operate to a high standard.

SITMA also holds UKAS Accreditation to ISO 17024:2012.

1. Introduction

Trace has been appointed by Ganco Assets to provide acoustic consultancy services to assist in the development of residential property a 1-3 Broadwater Roar, West Worthing (The Property).

An assessment is required at The Property to establish the suitability of the land for residential development. Particular to this report, external noise levels impinging upon the property will be measured and used to assess the impact on prospective residents. These noise levels will be used to establish the need for acousticly rated façade elements and will dictate the requirement for mechanical ventilation in the event that passive systems may lead to excessive internal ambient noise levels, in accordance with national standards.

2. Relevant Standards and Guidance

The primary standards used in the preparation of this document are as follows:

- British Standard (BS) 7445: 2003 *Part 1 Description and measurement of environmental noise. Guide to quantities and procedures*
- British Standard (BS) 8233:2014 *Guidance on sound insulation and noise reduction for buildings*
- Noise Policy Statement for England (NPSE)
- Professional Practice Guidance on Planning & Noise (ProPG)

3. Site Description

3.1. Site Description

The Properties are in the administrative region of Worthing Borough Council. The area immediately around The Property is predominetly commercial with local shops bard and resteraunts along Broadwater Road. The local noise climate is dominated by noise from traffic on Broadwater Road.

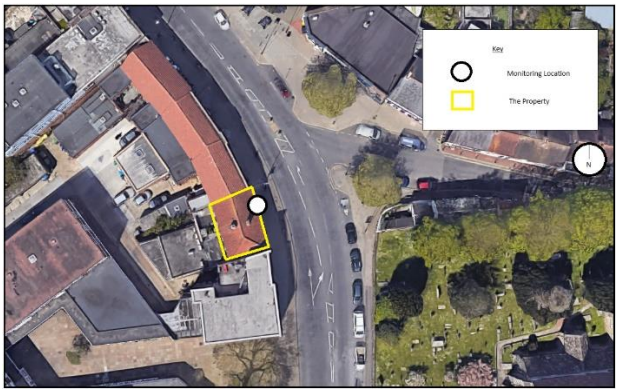

Figure 3.1: Site Location

4. Environmental Noise Survey

4.1. Survey Details

An unattended acoustic survey was carried out by Trace between 13:45 on Monday 8 and 13:45 on Tuesday 9 January 2024. A figure showing the exact location of of the sound level meter can be seen in Appendix A.

The purpose of the survey was to establish the prevailing noise levels surrounding the site. In particular noise levels will be incident upon the worst effect façade of the The Propery will be used to establish the required acoustic performance of façade building elements.

The sound level meter was set to log and store consecutive 15-minute L_{Aeq}, L_{Amax}, and L_{A90} sound levels. During the noise survey, the microphone was protected with a windshield and positioned out of a first-floor window. Measurements were undertaken in general accordance with BS 7445-2:2003 '*Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use'*. Levels have been measured in free-field conditions and are expected to be representative of the worst affected façades.

Weather conditions during the day survey were generally cold and overcast however there was no precipitation for the 24 hour duration of the survey. The wind speeds varied but were less than 5m/s. Weather is not expected to have had a detrimental effect on the collection of acoustical data. The location of the sound level meter relative to the dominant noise source can be seen below in Figure 4.1.

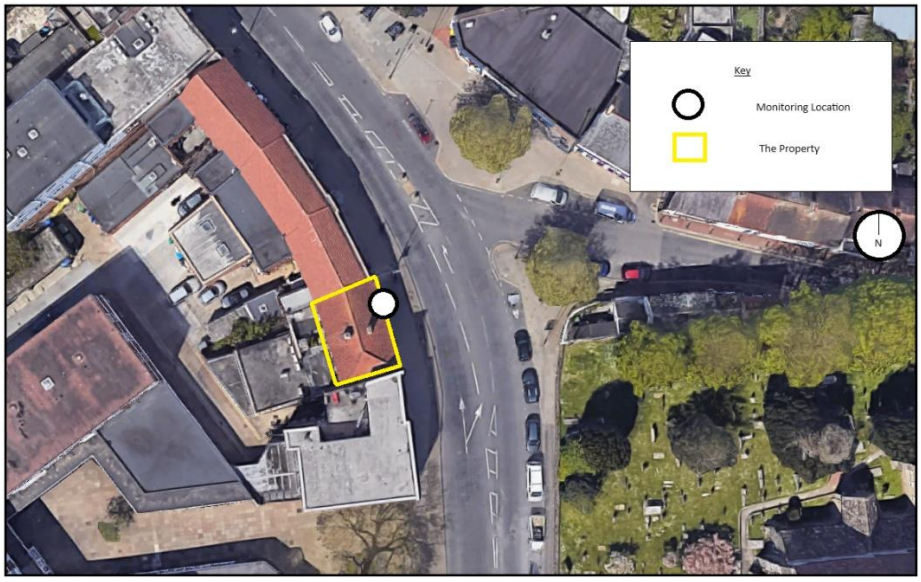

Figure 4.1: Site Plan

The sound level meter had calibration checks before and after the measurement surveys to generate a calibration level of 94 dB at 1 kHz. The equipment calibration was verified before and after the survey and no significant calibration drift was observed (<0.5dB). The microphone was fitted with a windshield. The sound level meter used during the survey was compliant with the Class 1 standard as required by BS EN 61672-1:2013 *Electroacoustics. Sound level meters. Specifications*.

The equipment used is shown in Table 4.1.

Description	Name	Serial Number	Calibration Due
Sound Level Meter	Norsonic 131	1312729	18/11/2024
Microphone	GRAS 40AE	159619	18/11/2024
Preamplifier	Norsonic 1207	12151	18/11/2024
Calibrator	Rion NC-75	34935217	01/12/2024

Table 4.1 – Equipment Details

All noise equipment has been calibrated to traceable standards within the preceding two years and the acoustic calibrator within the preceding 12 months. Calibration certificates for all equipment used in the survey are available upon request.

4.2. Survey Results

The results of the unattended survey are presented in Table 4.2 below. The L_{A90} background sound level has been established using the most commonly occurring $L_{A90,15min}$ sound level during nighttime, and the most commonly occurring $L_{A90,1hr}$ period during the daytime. The L_{Amax} level is the 90th percentile of the measured $L_{Amax,15min}$ sound levels over the full monitoring period.

	Measured Noise Levels (dB re 2.0 x 10^{-5} Pa)			
Measurement period	**L_{Aeq}**	**L_{Afmax}**	**L_{A10}**	**L_{A90}**
Daytime (07:00 - 23:00)	69	95	71	62
Night-time (23:00 - 07:00)	63	82	61	32

Table 4.2 Summary of measurement results

As shown above, the prevailing daytime $L_{Aeq,16hour}$ sound level has been measured to be 69 dB. The nighttime sound level impacting the property was measured to be 63 dB $L_{Aeq,8hr}$ while nighttime typical maximum sound levels were dB $L_{Amax,15min}$

4.3. Façade Noise Levels

Based on the measurements above, the following octave band sound levels will be used to specify façade building elements. The levels measured on Broadwater Road are expected to be representative of the worst affected façade. Levels at the rear of the property have been calculated based on these

measured sound levels, the location of the rear façade relative to the dominant noise source, and loss attributable to screening provided by The Property.

Measurement period	Octave Band Centre Frequency (Hz)								dB	
	63	125	250	500	1k	2k	4k	8k	L_{Aeq}	L_{Afmax}
Daytime $L_{Aeq, 16hrs}$ (07:00-23:00)	70	64	59	61	66	63	56	50	69	N/A
Night-time $L_{Aeq, 8hrs}$ (23:00-07:00)	65	56	55	56	60	57	48	43	63	82

Table 4.3 Noise data to be used in façade sound insulation assessments - Broadwater façade

Details of the screening calculations can be seen in Appendix C. These calculations show that the level at the rear façade resulting from road traffic on Broadwater Road is likely to be reduced by around 26 dB.

To apply caution to the calculations shown in Appendix C, a maximum reduction of 10 dB has been used in each octave band. The resulting levels used to establish suitable façade building elements to the rear of The Property are shown below.

Measurement period	Octave Band Centre Frequency (Hz)								dB	
	63	125	250	500	1k	2k	4k	8k	L_{Aeq}	L_{Afmax}
Daytime $L_{Aeq, 16hrs}$ (07:00-23:00)	60	54	49	51	56	53	46	40	59	N/A
Night-time $L_{Aeq, 8hrs}$ (23:00-07:00)	55	46	45	46	50	47	38	33	53	72

Table 4.4 Noise data to be used in façade sound insulation assessments - Rear façade

5. Project criteria

5.1. External Façade Requirements

British Standard 8233:2014 *Guidance on sound insulation and noise reduction for buildings* (BS8233:2014) provides guidance on the acceptable levels of noise within buildings of different types, these levels are based on World Health Organisation (WHO) guidelines.

In the case of residential developments, BS 8233:2014 recommends ambient noise levels in living accommodations. The document states that "*in general, for steady external noise sources, the internal ambient noise level shouldn't exceed the guideline values…"* recommendations from BS8233 are reproduced in Table 5.1 below.

Activity	Location	Day-time 07:00-23:00	Night-time 23:00-07:00
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 $L_{Aeq, 8hour}$

Table 5.1 Indoor ambient noise levels for dwellings

A specific maximum L_{AFmax} value is not given by BS 8233:2014. Based on commonly applied criteria, we propose that for bedrooms at night, individual noise events should not normally exceed 45 dB L_{AFmax}.

6. External Façade Assessments

6.1. External Noise Levels – Level 1 Assessment

This section provides an assessment of the suitability of the site for residential use with respect to noise.

The Association of Noise Consultants and the Institute of Acoustics have produced a residential design guide relating to acoustics ventilation and overheating. To complete an initial site risk assessment externally measured free field sound levels can be assessed using Figure 6.1.

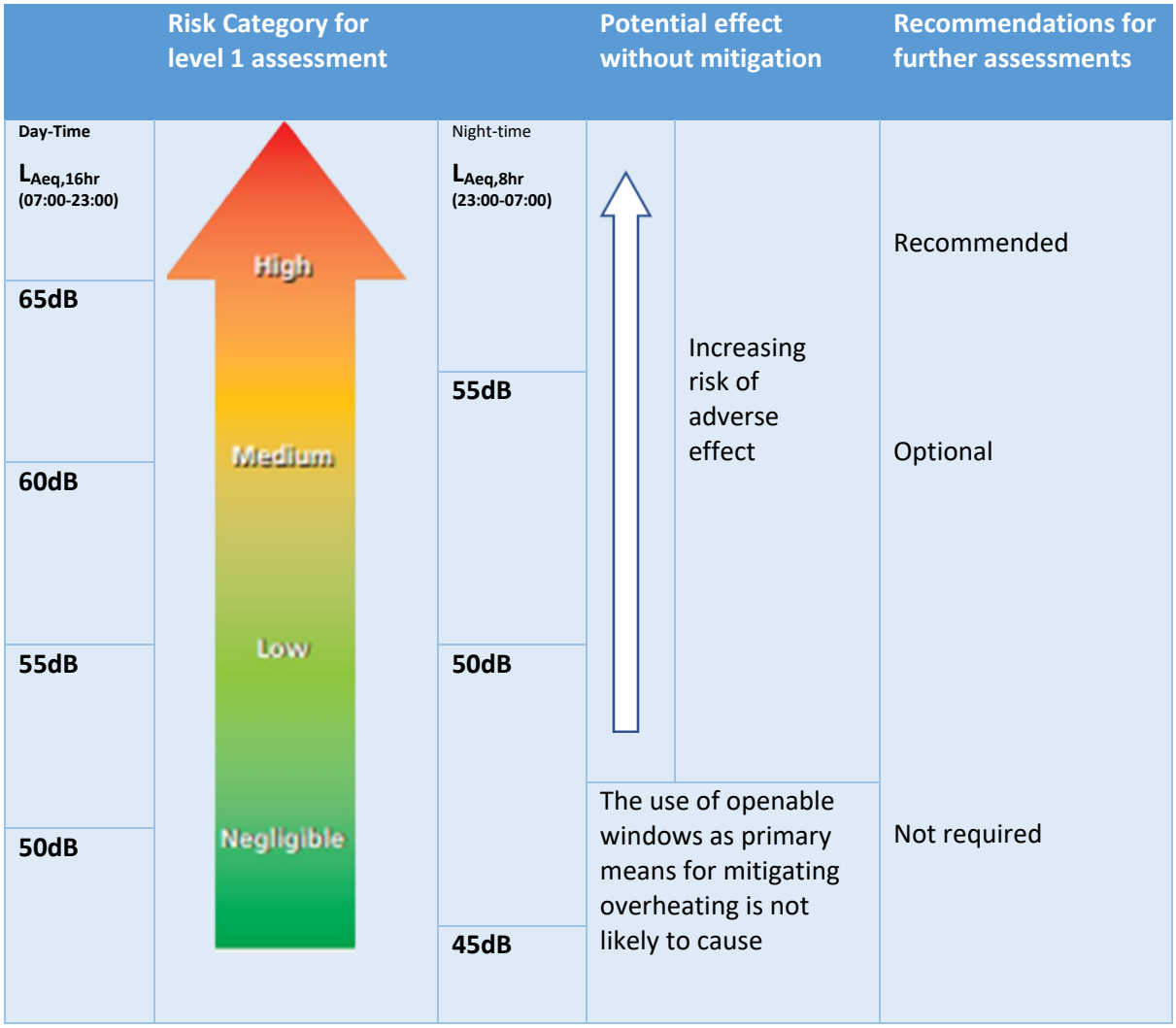

Figure 6.1 Guidance for level 1 site risk assessment

Based on the measured sound levels presented in Section 4 a level 1 risk assessment can be completed. It can be seen that noise levels impinging on the façade of the proposed development present a high risk of noise resulting in an adverse effect.

6.2. Façade (and Glazing) specification

Using the façade noise levels, presented in Table 4.3 and 4.4, calculations have been completed to allow the selection of both glazing and ventilation for the whole development. The calculations take into consideration the free-field equivalent sound level, the sound reduction index of the glazing and ventilation elements, the sound reduction of the façade, and the internal acoustics of a typical domestic room. Based on these calculations, presented in Appendix B of this report, façade elements and ventilation can be specified.

It is assumed that the non-glazed areas of any façade systems may incorporate sufficient acoustic treatment such that the glazing remains the weakest path for external noise intrusion. As such, the acoustic performance of the glazing will be the most critical element in determining the overall sound insulation performance of the external façade.

Details of the internal noise level calculations can be found in Appendix B of this report.

Broadwater Façade

Table 6.1 presents the sound insulation performance specifications recommended for elements of the external building fabric system for all room types on the Broadwater Road façade. Typical constructions that achieve the internal ambient noise criteria in BS8233:2014 are also provided.

	Living rooms and Bedrooms	
Façade Element	**Sound Insulation Performance, dB R_W**	**Example Constructions**
External wall Fabric	50	Brick and block external wall (BS8233 - 2014)
Glazing	35	10/6/4 Glazing Pilikington
These values have been based on: Ventilation – System 4 mechanical ventilation Living room - 100m^3 room volume with 15m^2 external façade and a 1.5m^2 window. Calculations were carried out using a reverberation time (RT60) of 0.5 seconds across all frequency bands.		

Table 6.1 Building envelope proposed construction – Broadwater Façade Façade

As can be seen from Table 6.1, to meet the requirements of BS8233:2014, a glazing system achieving a rating of not less than R_w 35 dB will be required on the façade overlooking Broadwater Road.

The ventilation requirements of Approved Document F will need to be satisfied vis mechanical ventilation, as a passive strategy is likely to lead to unacceptable internal noise levels.

Rear Façade

Table 6.2 presents the sound insulation performance specifications recommended for elements of the external building fabric system for all room types on the rear façade of The Property.

Façade Element	Living rooms and Bedrooms	
	Sound Insulation Performance, dB R_w	**Example Constructions**
External wall Fabric	50	Brick and block external wall (BS8233 - 2014)
Glazing	35	10/6/4 Glazing Pilikington
These values have been based on: Ventilation – 'hit and miss' trickle ventilation Living room - 100m^3 room volume with 15m^2 external façade and a 1.5m^2 window. Calculations were carried out using a reverberation time (RT60) of 0.5 seconds across all frequency bands.		

Table 6.2 Building envelope proposed construction – Broadwater Façade Façade

As can be seen from Table 6.1, to meet the requirements of BS8233:2014, a glazing system achieving a rating of not less than R_w 35 dB will be required on the façade overlooking Broadwater Road.

The requirements for whole dwelling ventilation for properties on this façade could be met via the use of 'hit and miss' trickle ventilation.

7. Conclusions

Trace has been appointed by Ganco Assets to provide acoustic consultancy services to assist in the development of residential property a 1-3 Broadwater Roar, West Worthing (The Property).

An assessment was required at The Property to establish the suitability of the land for residential development. External noise levels impinging upon the property have been measured and used to assess the impact on prospective residents. These noise levels have established the need for acoustically rated façade elements and dictate mechanical ventilation requirements in properties overlooking Broadwater Road.

An unattended acoustic survey was carried out by Trace between 13:45 on Monday 8 and 13:45 on Tuesday 9 January 2024. The prevailing daytime $L_{Aeq,16hour}$ sound level has been measured to be 69 dB. The nighttime sound level impacting the property on the Broadwater Road façade was measured to be 63 dB $L_{Aeq,8hr,}$ while nighttime typical maximum sound levels were 82 dB $L_{Amax,15min.}$ Levels to the rear from road traffic have been calculated by considering the screening effect of The Property, this can be seen in Appendix C. The reduction in level is expected to be 26 dB. In order to calculate a worst-case scenario, a maximum reduction of 10 dB was used for each octave band. This will provide headroom to ensure that building elements to the rear were not under-specified.

As can be seen from Table 6.1 to meet the requirements of BS8233:2014 within properties overlooking Broadwater Road, a glazing system achieving a rating of not less than R_w 35 dB will be required. For example, a 10/6/4 Glazing Pilkington glazing system.

To the rear of the property, while the same glazing systems are proposed, calculations indicate that velitation requirements may be satisfied via the use of ‘hit and miss’ trickle ventilation.

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Appendix A Figures

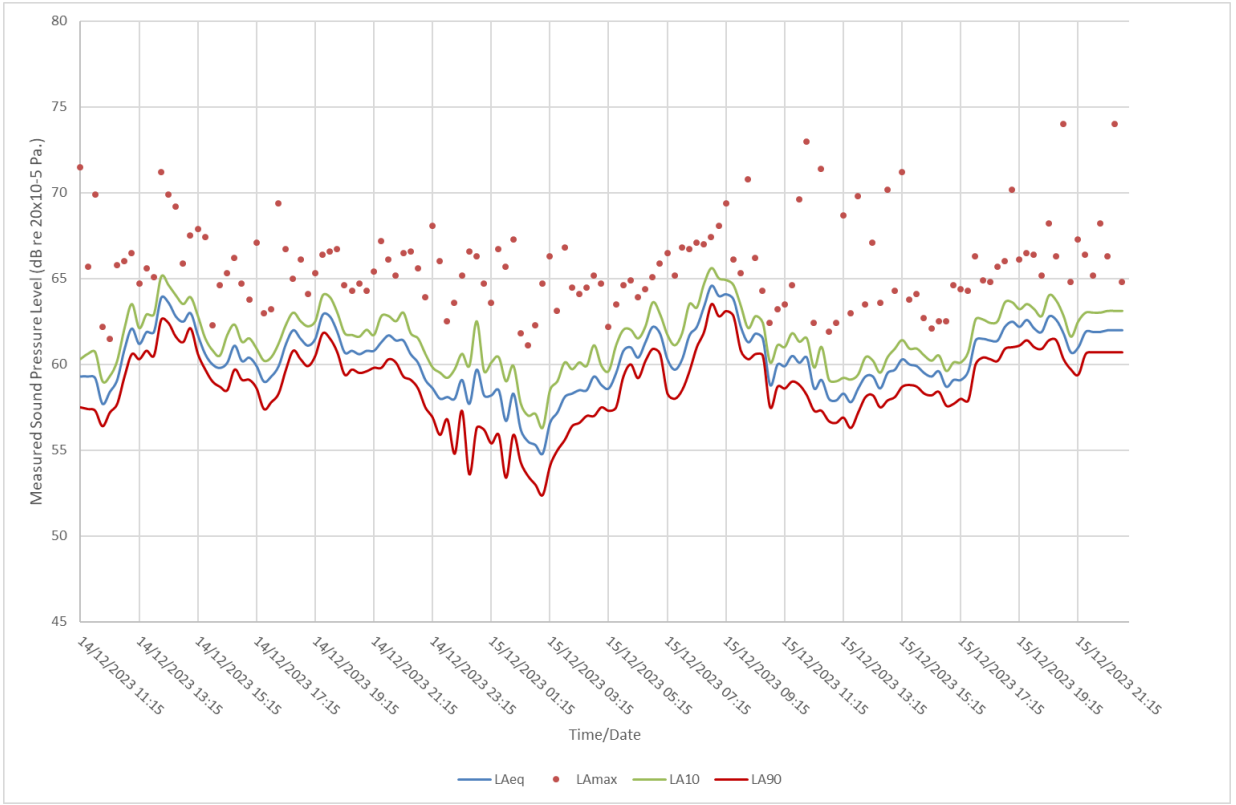


Figure A.1 Survey Results



Figure A.2 Noise Monitoring Location

Appendix B Tables

Project	1-3 Broadwater Road	Date	24-Jan-2024
Façade	Broadwater Road	By	BG
Room	All	Checked	DG

Symbol	Description	Ref	Units	Single Figure Rating	Octace Band Centre Frequency, Hz				
					125	250	500	1000	2000
S_f	Total façade area of room		m^2	15.0					
S_{wi}	Area of windows in façade		m^2	3.0					
S_{ew}	Area of external wall in façade		m^2	12.0					
S_{rr}	Area of ceiling exposed to external noise		m^2	0.0					
S	Total area of elements through which sound enters room		m^2	15.0					
A_0	Reference absorption area given in BS EN 20140-10		m^2	10.0					
	A-weighted free-field equivilent sound pressure level at measurement position		dB						
	Total propogation and angle of view correction from measurement to façade		dB	0.0					
$L_{Aq,ff}$	A-weighted free-field equivilent sound pressure level outside façade		dB	**69.0**					
$L_{TRAFFIC}$	Normalised road traffic noise spectrum derived from BS1793-3		dB						
$L_{eq,ff}$	Linear free-field equivilent sound pressure level outside façade		dB	**72.4**	**66**	**62**	**64**	**68**	**65**
$D_{n,e}$	Brick and block external wall (BS8233 - 2014)	9	dB		40	44	45	51	56
R_{wi}	Sound reduction index of windows - 10/6/4 Glazing Pilikington	115	dB		24	21	32	39	42
R_{ew}	Sound reduction index of the external wall - Brick and block external wall (BS82	9	dB		40	44	45	51	56
R_{rr}	Sound reduction index of the roof/ceiling	94	dB		28	34	40	45	49
α	Room average alpha co-efficients (acoustically hard room)		-						
S_{room}	Room surface area		m2						
A	Equivilent absorption area of room		m^2		9	9	9	9	9
$L_{eq,2}$	Linear Internal reverberant sound pressure level in room		dB	43.4	41	39	31	29	23
	A-weighting Network				-16	-9	-3	0	1
$L_{eq,3}$	A-weighted internal reverberant sound pressure level in room		dB(A)	34.6	24.8	29.8	28.1	28.8	23.7
	Internal Criteria		dB(A)	**35.0**					
	Excess over criteria		dB(A)						

Table B.1 Daytime internal ambient sound levels – Broadwater Façade

Project	1-3 Broadwater Road	Date	24-Jan-2024
Façade	Broadwater Road	By	BG
Room	All	Checked	DG

Symbol	Description	Ref	Units	Single Figure Rating	Octace Band Centre Frequency, Hz				
					125	250	500	1000	2000
S_f	Total façade area of room		m^2	12.0					
S_{wi}	Area of windows in façade		m^2	4.0					
S_{ew}	Area of external wall in façade		m^2	8.0					
S_{rr}	Area of ceiling exposed to external noise		m^2	0.0					
S	Total area of elements through which sound enters room		m^2	12.0					
A_0	Reference absorption area given in BS EN 20140-10		m^2	10.0					
	A-weighted free-field equivilent sound pressure level at measurement position		dB						
	Total propogation and angle of view correction from measurement to façade		dB	0.0					
$L_{Aq,ff}$	A-weighted free-field equivilent sound pressure level outside façade		dB	**63.0**					
$L_{TRAFFIC}$	Normalised road traffic noise spectrum derived from BS1793-3		dB						
$L_{eq,ff}$	Linear free-field equivilent sound pressure level outside façade		dB	**64.0**	**56**	**55**	**56**	**60**	**57**
$D_{n,e}$	Brick and block external wall (BS8233 - 2014)	9	dB		40	44	45	51	56
R_{wi}	Sound reduction index of windows - 10/6/4 Glazing Pilikington	115	dB		24	21	32	39	42
R_{ew}	Sound reduction index of the external wall - Brick and block external wall (BS82	9	dB		40	44	45	51	56
R_{rr}	Sound reduction index of the roof/ceiling	94	dB		28	34	40	45	49
α	Room average alpha co-efficients (acoustically hard room)		-						
S_{room}	Room surface area		m2						
A	Equivilent absorption area of room		m^2		9	9	9	9	9
$L_{eq,2}$	Linear Internal reverberant sound pressure level in room		dB	36.3	32	34	24	22	15
	A-weighting Network				-16	-9	-3	0	1
$L_{eq,3}$	A-weighted internal reverberant sound pressure level in room		dB(A)	28.0	15.9	24.5	21.3	21.5	16.1
	Internal Criteria		dB(A)	**30.0**					
	Excess over criteria		dB(A)						

Table B.2 Nighttime internal ambient sound levels – Broadwater Façade

Project	1-3 Broadwater Road					Date		24-Jan-2024	
Façade	Broadwater Road					By		BG	
Room	Bedroom					Checked		DG	

Symbol	Description	Ref	Units	Single Figure Rating					
S_f	Total façade area of room		m^2	12.0					
S_{wi}	Area of windows in façade		m^2	4.0					
S_{ew}	Area of external wall in façade		m^2	8.0					
S_{rr}	Area of ceiling exposed to external noise		m^2	0.0					
S	Total area of elements through which sound enters room		m^2	12.0					
A_0	Reference absorption area given in BS EN 20140-10		m^2	10.0					
	A-weighted free-field equivilent sound pressure level at measurement position		dB						
	Total propogation and angle of view correction from measurement to façade		dB	0.0	Octace Band Centre Frequency, Hz				
$L_{Aq,ff}$	A-weighted free-field equivilent sound pressure level outside façade		dB	**82.0**	**125**	**250**	**500**	**1000**	**2000**
$L_{TRAFFIC}$	Normalised road traffic noise spectrum derived from BS1793-3		dB						
$L_{eq,ff}$	Linear free-field equivilent sound pressure level outside façade		dB	**81.2**	**73**	**72**	**73**	**77**	**74**
$D_{n,e}$	Brick and block external wall (BS8233 - 2014)	9	dB		40	44	45	51	56
R_{wi}	Sound reduction index of windows - 10/6/4 Glazing Pilikington	115	dB		24	21	32	39	42
R_{ew}	Sound reduction index of the external wall - Brick and block external wall (BS82	9	dB		40	44	45	51	56
R_{rr}	Sound reduction index of the roof/ceiling	94	dB		28	34	40	45	49
α	Room average alpha co-efficients (acoustically hard room)		-						
S_{room}	Room surface area		m2						
A	Equivilent absorption area of room		m^2		9	9	9	9	9
$L_{eq,2}$	Linear Internal reverberant sound pressure level in room		dB	53.3	49	51	41	39	32
	A-weighting Network				-16	-9	-3	0	1
$L_{eq,3}$	A-weighted internal reverberant sound pressure level in room		dB(A)	45.0	32.9	41.5	38.3	38.5	33.1
	Internal Criteria		dB(A)	**45.0**					
	Excess over criteria		dB(A)	**0.0**					

Table B.3 Nighttime internal L_{Amax} Levels – Broadwater Façade

Project	1-3 Broadwater Road					Date		24-Jan-2024	
Façade	Rear Façade					By		BG	
Room	Living Room					Checked		DG	

Symbol	Description	Ref	Units	Single Figure Rating					
S_f	Total façade area of room		m^2	15.0					
S_{wi}	Area of windows in façade		m^2	3.0					
S_{ew}	Area of external wall in façade		m^2	12.0					
S_{rr}	Area of ceiling exposed to external noise		m^2	0.0					
S	Total area of elements through which sound enters room		m^2	15.0					
A_0	Reference absorption area given in BS EN 20140-10		m^2	10.0					
	A-weighted free-field equivilent sound pressure level at measurement position		dB						
	Total propogation and angle of view correction from measurement to façade		dB	0.0	Octace Band Centre Frequency, Hz				
$L_{Aq,ff}$	A-weighted free-field equivilent sound pressure level outside façade		dB	**59.0**	**125**	**250**	**500**	**1000**	**2000**
$L_{TRAFFIC}$	Normalised road traffic noise spectrum derived from BS1793-3		dB						
$L_{eq,ff}$	Linear free-field equivilent sound pressure level outside façade		dB	**60.2**	**54**	**49**	**51**	**56**	**53**
$D_{n,e}$	Vent: "hit and miss" trickle (4000mm2)	80	dB		34	27	37	35	34
R_{wi}	Sound reduction index of windows - 10/6/4 Glazing Pilikington	115	dB		24	21	32	39	42
R_{ew}	Sound reduction index of the external wall - Brick and block external wall (BS82	9	dB		40	44	45	51	56
R_{rr}	Sound reduction index of the roof/ceiling	94	dB		28	34	40	45	49
α	Room average alpha co-efficients (acoustically hard room)		-						
S_{room}	Room surface area		m2						
A	Equivilent absorption area of room		m^2		9	9	9	9	9
$L_{eq,2}$	Linear Internal reverberant sound pressure level in room		dB	33.6	30	29	21	25	23
	A-weighting Network				-16	-9	-3	0	1
$L_{eq,3}$	A-weighted internal reverberant sound pressure level in room		dB(A)	28.6	13.7	19.8	17.7	25.0	23.6
	Internal Criteria		dB(A)	**35.0**					
	Excess over criteria		dB(A)						

Table B.4 Daytime internal ambient sound levels – Rear Façade

Project	1-3 Broadwater Road					Date		24-Jan-2024		
Façade	Rear Façade					By		BG		
Room	Bed Room					Checked		DG		

Symbol	Description	Ref	Units	Single Figure Rating					
S_f	Total façade area of room		m^2	12.0					
S_{wi}	Area of windows in façade		m^2	4.0					
S_{ew}	Area of external wall in façade		m^2	8.0					
S_{rr}	Area of ceiling exposed to external noise		m^2	0.0					
S	Total area of elements through which sound enters room		m^2	12.0					
A_0	Reference absorption area given in BS EN 20140-10		m^2	10.0					
	A-weighted free-field equivilent sound pressure level at measurement position		dB						
	Total propogation and angle of view correction from measurement to façade		dB	0.0	Octace Band Centre Frequency, Hz				
$L_{Aq,ff}$	A-weighted free-field equivilent sound pressure level outside façade		dB	**53.0**	**125**	**250**	**500**	**1000**	**2000**
$L_{TRAFFIC}$	Normalised road traffic noise spectrum derived from BS1793-3		dB						
$L_{eq,ff}$	Linear free-field equivilent sound pressure level outside façade		dB	**54.0**	**46**	**45**	**46**	**50**	**47**
$D_{n,e}$	Vent: "hit and miss" trickle (4000mm2)	80	dB		34	27	37	35	34
R_{wi}	Sound reduction index of windows - 10/6/4 Glazing Pilikington	115	dB		24	21	32	39	42
R_{ew}	Sound reduction index of the external wall - Brick and block external wall (BS82	9	dB		40	44	45	51	56
R_{rr}	Sound reduction index of the roof/ceiling	94	dB		28	34	40	45	49
α	Room average alpha co-efficients (acoustically hard room)		-						
S_{room}	Room surface area		m2						
A	Equivilent absorption area of room		m^2		9	9	9	9	9
$L_{eq,2}$	Linear Internal reverberant sound pressure level in room		dB	28.5	23	26	16	19	17
	A-weighting Network				-16	-9	-3	0	1
$L_{eq,3}$	A-weighted internal reverberant sound pressure level in room		dB(A)	23.2	6.5	16.5	13.2	19.1	17.7
	Internal Criteria		dB(A)	**30.0**					
	Excess over criteria		dB(A)						

Table B.5 Nighttime internal ambient sound levels – Rear Façade

Project	1-3 Broadwater Road					Date		24-Jan-2024		
Façade	Rear Façade					By		BG		
Room	Bed Room					Checked		DG		

Symbol	Description	Ref	Units	Single Figure Rating					
S_f	Total façade area of room		m^2	12.0					
S_{wi}	Area of windows in façade		m^2	4.0					
S_{ew}	Area of external wall in façade		m^2	8.0					
S_{rr}	Area of ceiling exposed to external noise		m^2	0.0					
S	Total area of elements through which sound enters room		m^2	12.0					
A_0	Reference absorption area given in BS EN 20140-10		m^2	10.0					
	A-weighted free-field equivilent sound pressure level at measurement position		dB						
	Total propogation and angle of view correction from measurement to façade		dB	0.0	Octace Band Centre Frequency, Hz				
$L_{Aq,ff}$	A-weighted free-field equivilent sound pressure level outside façade		dB	**72.0**	**125**	**250**	**500**	**1000**	**2000**
$L_{TRAFFIC}$	Normalised road traffic noise spectrum derived from BS1793-3		dB						
$L_{eq,ff}$	Linear free-field equivilent sound pressure level outside façade		dB	**71.2**	**63**	**62**	**63**	**67**	**64**
$D_{n,e}$	Vent: "hit and miss" trickle (4000mm2)	80	dB		34	27	37	35	34
R_{wi}	Sound reduction index of windows - 10/6/4 Glazing Pilikington	115	dB		24	21	32	39	42
R_{ew}	Sound reduction index of the external wall - Brick and block external wall (BS82	9	dB		40	44	45	51	56
R_{rr}	Sound reduction index of the roof/ceiling	94	dB		28	34	40	45	49
α	Room average alpha co-efficients (acoustically hard room)		-						
S_{room}	Room surface area		m2						
A	Equivilent absorption area of room		m^2		9	9	9	9	9
$L_{eq,2}$	Linear Internal reverberant sound pressure level in room		dB	45.5	40	43	33	36	34
	A-weighting Network				-16	-9	-3	0	1
$L_{eq,3}$	A-weighted internal reverberant sound pressure level in room		dB(A)	40.2	23.5	33.5	30.2	36.1	34.7
	Internal Criteria		dB(A)	**45.0**					
	Excess over criteria		dB(A)						

Table B.6 Nighttime internal L_{Amax} Levels – Rear Façade

Appendix C Rear Façade Noise Level Calculation

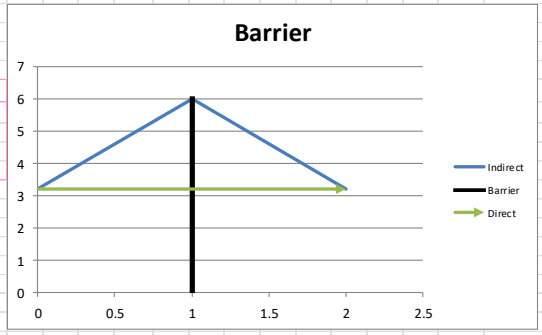
To the rear of the property, noise levels were dominated by low-level road traffic noise from Broadwater Road. Noise levels to the property's rear have been calculated by correcting the measured noise level, assuming a correction for an acoustic barrier. In this case the barrier is The Property itself.

Frequency,Hz	63	125	250	500	1000	2000	4000	8000	dB(A)
1/1 Road Traffic Noise	70	64	59	61	66	63	56	50	***69.0***
Screened Level to Rear of Property	54.9	46.1	38.2	37.3	39.3	33.3	23.3	14.3	***42.3***
									26.8

Source to screen (m)	1	Direct path	2.000
Receiver to screen (m)	1	Sreened path	5.946
Source height (m)	3.2	Path difference	3.946
Receiver height (m)	3.2		
Screen height (m)	6		

LINE OF SIGHT PROTECTION :
PROVIDED

CALCULATIONS			ANGLE	
Reciever height - source height	0	0 <	Rec	0
Source to screen + Rec to screen	2	2.8	Scr	70
Screen height - Source height	2.8			
Screen height - Rec height	2.8			



Basic screening calculations show that the level at the rear façade resulting from road traffic on Broadwater Road is likely to be reduced by around 26 dB.

To apply caution to these calculations a maximum reduction of 10 dB has been used in each octave band in the calculation of façade building elements to the rear of The Property.