ARDENT CONSULTING ENGINEERS

EAST MALLING TRUST

PROPOSED RESIDENTIAL DEVELOPMENT: EAST MALLING TRUST, SITE B – DITTON EDGE

NOISE ASSESSMENT

REPORT REF. NO 182600-08
PROJECT NO. 182600
DECEMBER 2018

PROPOSED RESIDENTIAL DEVELOPMENT:
EAST MALLING TRUST, SITE B – DITTON EDGE

NOISE ASSESSMENT

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DOCUMENT CONTROL SHEET

REV	ISSUE PURPOSE	AUTHOR	CHECKED	APPROVED	DATE
-	Draft	AS	LD	Draft only	October 2018
-	Final	AS	LD	MNR	December 2018

DISTRIBUTION

1.0 INTRODUCTION

1.1 Ardent Consulting Engineers has been appointed by East Malling Trust to advise on noise aspect of the proposed residential development located near East Malling to the south of Ditton. This Noise Impact Assessment has been undertaken to support an outline planning application to Tonbridge and Malling Borough Council.

Site Location

1.2 The site is currently used by The National Institute of Agricultural Botany, East Malling Trust, who control the land around the site.

1.3 The site is circa 11.5ha and is located to the south of Ditton, west of Kiln Barn Road. Quarry Wood retail park is approximately 800m to the east of the site and further away to the south west, beyond an area of farmland, is East Malling train station. An existing residential area is immediately to the north of the site. Development Site C is situated approximately 500m to the west. The A20 and M20 are approximately 500m and 1km to the north respectively and both run in an east to west direction.

1.4 The site is centred approximately at Ordnance Survey grid co-ordinates 571106E, 157667N comprising mainly a greenfield. The site location is shown on **Figure 1.1**.

Figure 1.1: Site Location Plan

Development Proposals

1.5 It is proposed to redevelop the site to provide a scheme of up to 300 residential properties, together with associated parking and external amenity space. An extract of the indicative proposals plan is shown on **Figure 1.2**.

Figure 1.2: Indicative Development Proposals (Extract)

2.0 RELEVANT POLICY AND GUIDANCE

National Planning Policy Framework (NPPF) – July 2018

2.1 Under the NPPF: *paragraph 180 of Section 15*, with regard to environmental noise; Planning policies and decisions should aim to: -

- 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;
- identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

Noise Policy Statement for England (NPSE)

2.2 To avoid and mitigate adverse noise effects on health arising from and impacting on new development, the NPPF makes reference to NPSE. The NPSE was published in March 2010 and covers all forms of noise, other than occupational noise. For the purposes of this report, "Neighbourhood Noise" is most relevant as NPSE defined at paragraph 2.5:

"*neighbourhood noise which includes noise arising from within the community such as industrial and entertainment premises, trade and business premises, construction sites and noise in the street.*"

Calculation of Road Traffic Noise – 1988

2.3 For new developments, road traffic noise levels should be predicted in accordance with *CRTN*. This prediction method uses the traffic flow, vehicle speed, and percentage of heavy duty vehicles (HDVs, over 3.5 tonnes), road gradient and other factors to calculate noise levels at receptor points.

World Health Organisation

2.4 The WHO document *Guidance on Community Noise* specifies additional information for noise affecting noise sensitive receptors and forms the basis of many noise limitations and design ranges for internal and external ambient noise levels. It defines noise as *'a class of sounds that are considered unwanted'* (by the listener), *'that adversely affects, or may affect the physiological and psychological wellbeing of people.'* Much of the research around this study is based on transportation noise.

2.5 Further guidance on the recommended levels is given in the World Health Organisation (WHO) Guidelines for Community Noise. In this document it is stated that:

2.6 "*To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55 dB LAeq on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50 dB LAeq."*

2.7 WHO also states the following paragraph with regard to the effects of L_{Amax} events in a night-time period:

"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dB L_{Amax} more than 10-15 times per night (Vallet & Vernet 1991)."

2.8 WHO guidance *'Night Noise Guidelines for Europe'* is concerned with the longer-term average noise levels that are covered by the EU Directive on Environmental Noise, although this does appear to suggest external maximum noise levels of around 57dBA outside bedrooms during the night to achieve internal maximum levels of 42dBA.

2.9 The World Health Organisation has recently published Environmental Noise Guidelines – for the European Region (2018) to provide recommendations for protecting human health from exposure to noise sources such as transportation (road traffic, railway and aircraft), wind turbine noise and leisure noise.

2.10 The guidance document defines the 'strength' of recommendation (for protecting against noise exposure) as either 'strong' or conditional', outlined below.

Strength of Recommendation

*"A **strong** recommendation can be adopted as policy in most situations. The guideline is based on the confidence that the desirable effects of adherence to the recommendation outweigh the undesirable consequences. The quality of evidence for a net benefit – combined with information about values, preference and resources – inform this recommendation, which should be implemented in most circumstances."*

*"A **conditional** recommendation requires a policy-making process with substantial debate and involvement of various stakeholders. There is less certainty of its efficacy owing to lower quality of evidence of a net benefit, opposing values and preferences of individuals and populations affected or the high resource implications*

of the recommendation, meaning there may be circumstances or settings in which it will not apply."

2.11 External (free-field) recommendations included in the Environmental Noise Guidelines for the European Region are presented in **Table 2.1** for specific noise sources.

Noise source	dB L_{den}	dB L_{night}	dB $L_{Aeq,\ 24hr}$ (yearly average)	Recommendation
Road Traffic	53	45	-	Strong
Railway	54	44	-	Strong
Aircraft	45	40	-	Strong
Wind Turbine	45	-	-	Conditional
Entertainment	-	-	70	Strong/Conditional

Table 2.1: Extract from Environmental Noise Guidelines for the European Region

BS8233:2014 – Guidance on Sound Insulation and Noise Reduction for Buildings

2.12 Formerly a Code of Practice, the 2014 revision of BS8233 is now presented and intended as a guidance document. The standard is mainly concerned with building design from an acoustic standpoint. It does however, contain information relevant to environmental noise more specifically by stating guidance for desirable internal noise levels for dwellings and other buildings. An extract of Table 4 of the document relevant for residential development is reproduced in **Table 2.2**.

Activity	Location	07:00 to 23:00 dB LAeq, 16hour	23:00 to 07:00 LAeq, 8hour
Resting	Living room	35	-
Dining	Dining room / area	40	-
Sleeping (daytime resting)	Bedroom	35	30

Table 2.2: Extract from Table 4 – Indoor ambient noise levels in dwellings

2.13 The guidance of BS8233:2014 with regards to external amenity spaces is as follows:

"*For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB LAeq,T, with an upper guideline value of 55 dB LAeq,T which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited*."

ProPG: Planning and Noise - May 2017

2.14 Guidance in ProPG Planning and Noise provides an approach which aims to inform developers, practitioners and local authorities on how potential residential sites should be assessed. The guidance also builds upon government planning policy that noise should not be treated in isolation and there should be a holistic approach to good acoustic design.

2.15 ProPG sets out a 2-stage approach; the first of which is a risk assessment to identify the likelihood of significant adverse impact, then depending on the outcome of this risk assessment the extent of the acoustic design statement required. The graphic in Figure 2.1 is an extract from ProPG and indicates the level of risk associated with ranges of sound levels and provides some guidance on the likely extent of work associated with progressing a development exposed to these sound levels.

2.16 In relation to maximum noise levels, ProPG states that:

"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."

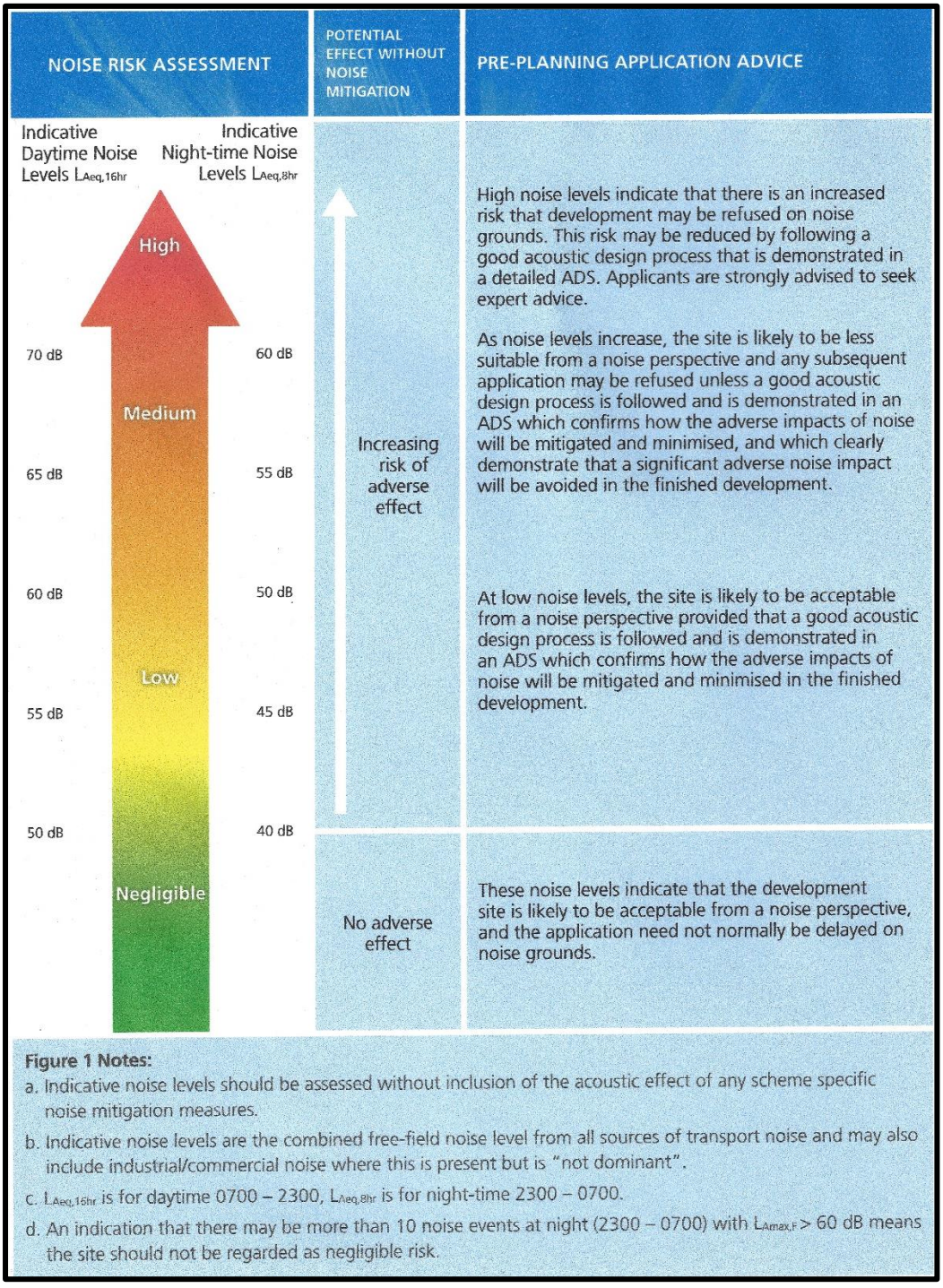


Figure 2.1: Extract from Figure 1 in ProPG – Initial Site Noise Risk Assessment

Local Authority Guidance

2.17 Discussions were held with Mr Peter Thomason, Environmental Health officer (EHO) of Tonbridge & Malling Borough Council to agree on a suitable noise assessment methodology for the proposed development. Ardent proposed an assessment in line with the above guidance, which was deemed acceptable by the Local Authority.

2.18 During the early morning period, levels were somewhat elevated due dawn chorus. This was discussed with Mr Thomason, EHO and it was agreed that for the purpose of façade specifications, this source would not be considered as noise and the period would be excluded from the calculations. This is to avoid over-specifying attenuation when selecting glazing and ventilation.

3.0 ENVIRONMENTAL NOISE SURVEY

3.1 The environmental noise survey was undertaken between the 18th and 20th June 2018. Locations were chosen in order to obtain representative baseline noise levels due to the main observed noise sources within the vicinity of the development site.

3.2 Continuous automated monitoring was undertaken at 2 positions on site as shown in **Figure 3.1**. Position 1 is closest to Kiln Barn Road to the east of the site and Position 2 is to the north near to Brampton Field. The locations were selected to represent exposed areas and in areas that equipment could be securely positioned.

Figure 3.1: Monitoring Positions

3.3 Noise measurements presented as time histories can be found in **Appendix A** and are summarised in the following paragraphs.

Measurement Procedures

3.4 To avoid the occurrence of instrument over or under-loading at all measurement points, noise levels were observed prior to measurement to determine the dynamic measurement range for the instrument for each measurement scenario.

3.5 Staff involved with the measurements and observations are fully competent with regard to the requirements of environmental noise measurement. Measurement procedures used within this assessment conformed to relevant guidance within *BS 7445* and *CRTN* where appropriate.

Instrumentation

3.6 The equipment used was as follows:

- 2 x No Norsonic NOR140 Sound Level Meters
- B&K 4231 Class 1 Calibrator

3.7 All equipment used has been professionally calibrated. Field calibration of the sound level meters was undertaken before and after measurement to ensure no drifting of the calibration signal. Calibration certificates are available on request.

Observations

3.8 The main noise sources observed on site were distant and local road, rail traffic, bird song – particularly dawn chorus, and occasional foliage movement.

3.9 All measurements used within the calculations, mitigation recommendations and conclusions were taken during times of appropriate weather and representative traffic conditions.

Results

3.10 The L_{Aeq}, L_{Aeq} and L_{Amax} acoustic parameters, including octave data, were measured. The results of the measured noise surveys are shown in **Appendix A**.

3.11 As mentioned previously, measurements taken during the night were significantly influenced by dawn chorus at both monitoring locations from around 03:00. This may be typical of the acoustic environment during the height of summer but is not considered representative of other times of the year. For the purpose of the assessment and to assist with specifying the appropriate glazing and ventilation for the proposed residential properties, the night-time period will be assessed using measurements taken between 23:00 – 03:00 in absence of dawn chorus. As noted this approach was agreed with the Local Authority.

3.12 **Table 3.1** provides a summary of the measured noise levels, in absence of dawn chorus.

Monitoring location	Ambient Noise Level dB $L_{Aeq, T}$		Representative night-time L_{AMax} dB(A)
	Daytime [07:00 - 23:00]	Night-time [23:00 - 07:00]	
Position 1	53 - 58	24	59
Position 2	47 - 61	35	54

Table 3.1: Site average noise levels for daytime and night-time (in absence of dawn chorus)

3.13 The representative L_{Amax} level is the value which has been exceeded less than 15 times in the 8-hour night-time period, i.e. one which can be considered to be 'not normally exceeded' as per the WHO guidelines.

3.14 Average sound levels are around 53dB$L_{Aeq,16hour}$ to 61dB$L_{Aeq,16hour}$ during the day and 24dB$L_{Aeq,8hour}$ to 35dB$L_{Aeq,8hour}$ at night. This would be considered a 'low risk' development site for residential use when compared with Figure 1 included in Section 2 of ProPG. A low risk site is summarised as:

"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 (acoustic design statement) which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development."

3.15 Representative octave band levels are provided in **Table 3.2**. These are used in glazing calculations to ensure a robust calculation of internal noise levels.

		Octave band centre frequency dB							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
P1	$L_{Aeq:16hr}$ (day)	60	57	57	51	50	47	47	40
	$L_{Aeq:8hr}$ (night)	49	41	35	34	33	29	23	18
	$L_{Amax:T}$ (night)	73	60	56	54	55	52	44	39
P2	$L_{Aeq:16hr}$ (day)	56	57	60	54	51	47	44	38
	$L_{Aeq:8hr}$ (night)	45	38	33	33	30	25	23	20
	$L_{Amax:T}$ (night)	59	54	50	54	46	45	38	34

Table 3.2: Octave band data for noise monitoring locations

4.0 TRAFFIC NOISE

4.1 The Transport Consultants have provided current 2018 baseline AAWT traffic flow data for Kiln Barn Road and predicted baseline and with development flows in the year 2031. The data shows that the majority of vehicles will travel north from the development towards Ditton town centre and the A20.

4.2 The measured 2018 baseline AAWT traffic flow along Kiln Barn Road is 1267. The predicted baseline AAWT in the year 2031 is 1493 (in absence of the development). It is anticipated that the change to the predicted 2031 flow as a result of the development is an increase of 1395 vehicles travelling north (towards Ditton and the A20 and M20) along from the development site. This results in a cumulative traffic flow of 2888 vehicles travelling north.

4.3 The predicted flows are considered 'worst-case' as it takes the maximum number of vehicles travelling north along Kiln Barn Road at the site access. As vehicles travel north along Kiln Barn Road into Ditton, traffic from the development site will become less significant as vehicles from other local surrounding roads will contribute to the overall traffic flows into Ditton towards the A20 and M20.

4.4 DMRB notes that 1dB change is the threshold criteria, a 1dB change is imperceptible and therefore is not significant. This 1dB change corresponds to an increase in traffic numbers of 25%. A change in noise level of 3dB is equivalent to 100% increase.

4.5 The percentage change from the measured baseline traffic flow to the predicted overall traffic flows in 2031 travelling north Kiln Barn Road is 93.4%. This corresponds to a level change to sound levels from traffic on Kiln Barn Road of up to 2.9dB. Guidance in DMRB notes that such a change leads to a 'just noticeable' subjective change in sound level.

4.6 The resultant change to vehicles travelling south from the development is 16%. This equates to a 0.6dB level increase which is acoustically insignificant.

4.7 Traffic data provided by the Transport Consultant is presented in Appendix C.

5.0 CONSTRUCTION PHASE

5.1 Given the proximity of proposed construction to neighbouring noise sensitive properties such as residential areas and site clearance noise may cause short term impacts on surrounding receptors.

5.2 A detailed construction programme; specific plant data and operations are not available at this stage of the project. Therefore, it is not possible to undertake a detailed assessment of likely impact at this stage.

5.3 Reasonable construction noise limits can be derived using the Example Method 1 (the ABC Method) of BS 5228, within section E.3.2. Table E.1 from the standard is reproduced below in **Table 5.1:**

Table E.1 Example threshold of significant effect at dwellings

Assessment category and threshold value period (L_{Aeq})	Threshold value, in decibels (dB)		
	Category A [A]	Category B [B]	Category C [C]
Night-time (23.00–07.00)	45	50	55
Evenings and weekends [D]	55	60	65
Daytime (07.00–19.00) and Saturdays (07.00–13.00)	65	70	75

NOTE 1 A significant effect has been deemed to occur if the total L_{Aeq} noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level.

NOTE 2 If the ambient noise level exceeds the threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total L_{Aeq} noise level for the period increases by more than 3 dB due to construction activity.

NOTE 3 Applied to residential receptors only.

[A] Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.

[B] Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.

[C] Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.

[D] 19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays.

Table 5.1: Table E.1 from BS 5228: Part 1

5.4 Existing ambient noise levels will place the site and surroundings within Category A of Table E.1. Therefore, the following noise ambient noise levels (as a result of construction activities) should be considered as reasonable limits to adhere to during construction works.

Time Period	Construction Noise Limits, L_{Aeq} (dB)
Night-time	45
Saturday 08:00 – 13:00	55
Weekdays 07:30 – 18:30	65

Table 5.2 - Construction Noise Limits

5.5 A noise and vibration management plan will be produced to control the works and a Section 61 application can be submitted to council, in accordance with the Control of Pollution Act 1974 if appropriate.

6.0 MITIGATION RECOMMENDATIONS

6.1 The measured results and proposed layout were used to undertake calculations, presented in **Appendix C**, for suitable façade treatments, as outlined in the following paragraphs.

External Building Fabric - Non Glazed Elements

6.2 It is assumed that the non-glazed external building fabric elements of the proposed development comprise masonry cavity walls. This would typically provide a sound reduction performance of at least the figures shown in **Table 6.1** when tested in accordance with BS EN ISO 10140-2:2010 (figures derived from: *Representative Values of Airborne SRI for Some Common Structures:* Appendix B of Flakt Woods 'Guide to Noise Control').

Element	Octave band centre frequency SRI, dB					
	125	250	500	1k	2k	4k
Masonry Cavity Wall	34	43	55	66	77	85

Table 6.1: Non-glazed elements assumed sound reduction performance

6.3 This would contribute towards a significant reduction of ambient noise levels in combination with a good quality double-glazed window configuration, as shown in **Table 6.2.**

External Building Fabric - Specification of Glazed Units

6.4 Sound reduction performance calculations have been undertaken to specify the minimum performance required from glazed elements in order to achieve recommended internal noise levels shown in **Table 2.2** of **Chapter 2**.

6.5 Calculations have been based on habitable rooms with relatively higher ratios of glazing to masonry, in order to present a more onerous assessment. This specification therefore presents a robust assessment, for BS8233:2014 criteria for internal noise levels in all affected facades.

6.6 The detailed layout of the buildings on site is not known at this stage. Assumptions have been made regarding room sizes in the calculation sheets.

6.7 Glazing calculations have been performed using the L_{Aeq} and L_{Amax} values (as appropriate) as detailed in **Table 3.1**, in absence of dawn chorus, together with the octave band levels as shown in **Table 3.2**.

6.8 The required glazing performance is shown in **Table 6.2**. The performance is specified for the whole window unit, including the frame.

Glazing Type reference, description and typical dimensions(mm)	Sound Reduction Index R_W	Octave band centre frequency (Hz) SRI (dB)					
		125	250	500	1k	2k	4k
Thermal double (6/16/6mm)	32	20	21	30	35	32	37

Table 6.2: Minimum glazing specification

External Building Fabric - Specification of Vents

6.9 It should be noted that there may be additional considerations for glazing requirements such as security and thermal performance, therefore the above specified glazing is merely guidance for how the acoustic criteria can be achieved. Alternative glazing could be used in place of the above specified units, assuming the minimum acoustic performance is met.

6.10 In addition, where non-sensitive rooms and sensitive rooms form part of an open plan area, for example a dining and kitchen area, the glazing specification for the more sensitive room should be used across all windows in this area.

Element	Octave band centre frequency SRI, dB						Overall
	125	250	500	1k	2k	4k	Dn,e,w
Standard trickle ventilator	36	34	31	34	38	38	35

Table 6.3: Required minimum attenuation values for ventilation

6.11 All major building elements should be tested in accordance with BS EN ISO 10140-2:2010. Sole glass performance data would not necessarily demonstrate compliance with this specification. No further mitigation measures would be required to achieve the recommended internal noise levels.

External amenity space

6.12 External sound levels across the site are marginally above those set out in the guidance. Localised screening can reduce the sound levels in gardens and other external amenity spaces by up to 5dBA. Following these principles of good acoustic design, the vast majority of gardens areas can achieve suitable external sound levels as set out in the guidance.

Construction Phase

6.13 In accordance with local policy construction, activities should only take place between the hours of 07:30 and 18:30 on weekdays and between 08:00 – 13:00 on Saturdays. No construction activity should be carried out during the night, on Sundays or on bank holiday's without additional consideration to controlling noise and with the prior approval of the LPA.

6.14 During construction, the contractor will employ best practicable means to control noise from construction operations.

6.15 Temporary screening in the form of solid timber hoarding can be used where operations are adjacent to sensitive receptors. Consideration will be given to neighbouring residential properties when locating the temporary site compounds and material stockpiles.

6.16 Stationary equipment and plant such as generators will be placed as far as practicable from noise sensitive properties, and preferably in areas benefiting from natural or purpose-built attenuation such as bunding or behind non-sensitive buildings.

6.17 Delivery of materials and removal of waste from the site will be planned to minimise disturbance to neighbouring properties. Idling of plant, machinery and delivery vehicles should be prohibited when not in use.

6.18 If required noise levels can be monitored regularly in accordance with BS 5228 to ensure the above set limits are not exceeded. In addition to the above all other guidance within BS 5228–1 will be followed at all times.

7.0 CONCLUSIONS

7.1 Noise levels have been measured over a period of 48 hours at two locations across the site. Measured levels have been used to calculate and assess suitable glazing specification.

7.2 This is considered a 'low risk' site when considered in accordance with guidance in ProPG.

7.3 Control measures will be implemented to manage potential impacts from construction noise.

7.4 The worst-case change in traffic flow along Kiln Barn Road as a result of the development will lead to a subjective change that is 'just noticeable' to road traffic noise levels on Kiln Barn Road. In all other locations the change will be insignificant.

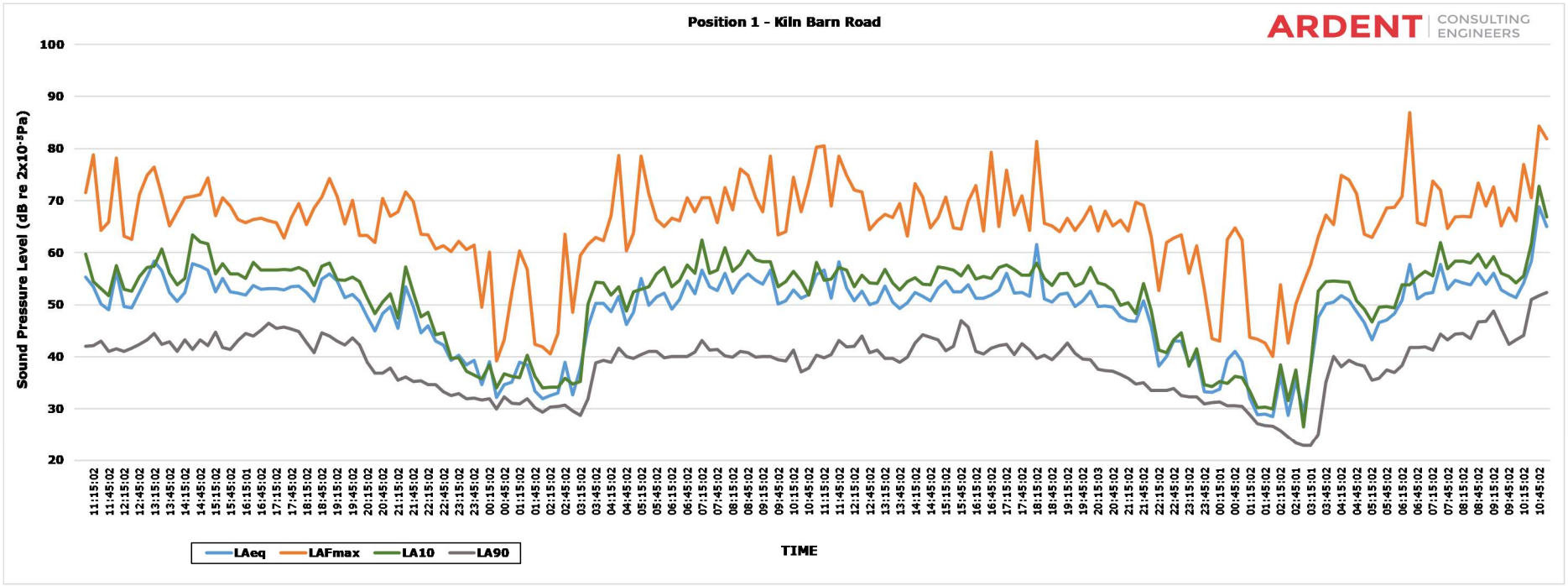
7.5 Windows can be openable and suitable internal levels will be maintained, should residents wish to naturally ventilate rooms.

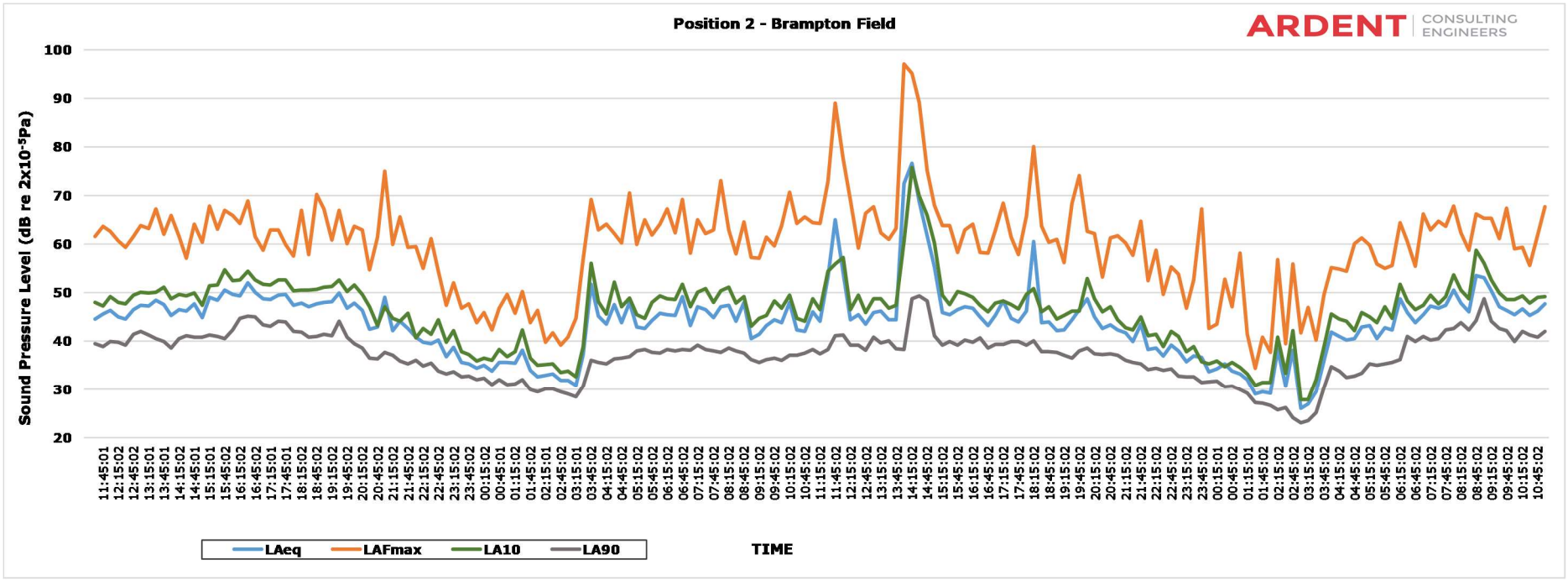
7.6 The daytime sound level in all amenity spaces can be designed to achieve suitable sound levels set out in the guidance.

7.7 This assessment demonstrates that the site is suitable for residential development provided the principles of good acoustic design are followed.

7.8 We see no reason why the development should be refused outline planning permission on the grounds of noise.

APPENDIX A


Position 1 - Kiln Barn Road
ARDENT CONSULTING ENGINEERS
Sound Pressure Level (dB re 2x10⁻⁵Pa)
100
90
80
70
60
50
40
30
20
LAeq
LAFmax
LA10
LA90
TIME


Position 2 - Brampton Field
ARDENT CONSULTING ENGINEERS
Sound Pressure Level (dB re 2x10-5Pa)
100
90
80
70
60
50
40
30
20
LAeq
LAFmax
LA10
LA90
TIME

APPENDIX B

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Position 1

Description	
Ardent CE Project No.	**182600**
Property Address	**East Malling - Site B**
Room Type	**Bedroom**
Parameter	**LAeq, 16h**

Room Dimensions and Areas	
Room volume	35.00
Total Surface area	65.50
Wall façade area	10.00
Roof façade area	0.00
Glazing area	3.60
Dne Ref Area, A0	10.00

Total façade area	13.60

Based on typical size

Room Absorption Calcuation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
Alpha bar	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	
Total Absorption	14.09	14.09	14.09	14.09	14.09	14.09	14.09	14.09	
10Log S/A	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	

Comment:
Typical Bedroom RT

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	59.9	56.6	56.7	50.6	49.8	47.0	47.2	40.3	55.5
Façade to free field	0	0	0	0	0	0	0	0	
Angle of view	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Screening (Maekewa)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Distance correction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Leq)	60	56.6	56.7	50.6	49.8	47.0	47.2	40	55.7

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw	
Glazing SRI	18	20	21	30	35	32	37	44	32	**Thermal 6/16/6**
Transmission Coefficient	0.015849	0.010000	0.007943	0.001000	0.000316	0.000631	0.000200	0.000040		
Wall SRI	34	41	45	48	56	65	69	72	54	**Typical masonry cavity wall (300mm - 380kg/m2)**
Transmission Coefficient	0.000398	0.000079	0.000032	0.000016	0.000003	0.000000	0.000000	0.000000		
Roof SRI	23	26	43	52	60	65	65	65	51	
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000		
Ventilation, Dne	36	36	34	31	34	38	38	38	35	**Standard Trickle Vent**
Transmission Coefficient	0.000251	0.000251	0.000398	0.000794	0.000398	0.000158	0.000158	0.000158		
Average Transmission Coeff	0.004673	0.002890	0.002419	0.000860	0.000378	0.000284	0.000169	0.000127		
Average SRI	23.3	25.4	26.2	30.7	34.2	35.5	37.7	39.0	34	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	37.5	32.1	31.4	20.8	16.5	12.4	10.3	2.2	25.8	
Lp (Direct)	36.6	31.3	30.6	19.9	15.6	11.5	9.5	1.3	25	**Criteria**
Lp (Rev & Direct)	40	35	34	23	19	15	13	5	28	**≤ 35**
BS8233	39	34	33	23	18	14	12	4	**28**	**≤ 35**

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Position 1

Description	
Ardent CE Project No.	**182600**
Property Address	**East Malling - Site B**
Room Type	**Bedroom**
Parameter	**LAeq, 8h**

Room Dimensions and Areas	
Room volume	35.00
Total Surface area	65.50
Wall façade area	10.00
Roof façade area	0.00
Glazing area	3.60
Dne Ref Area, A0	10.00

Total façade area	13.60

Based on typical size

Room Absorption Calcuation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
Alpha bar	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	
Total Absorption	14.09	14.09	14.09	14.09	14.09	14.09	14.09	14.09	
10Log S/A	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	

Comment:
Typical Bedroom RT

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	38.0	29.7	22.2	21.7	19.1	12.0	12.2	14.0	37.1
Façade to free field	0	0	0	0	0	0	0	0	
Angle of view	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Screening (Maekewa)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Distance correction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Leq)	38	30	22	22	19	12	12	14	24

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw	
Glazing SRI	18	20	21	30	35	32	37	44	32	**Thermal 6/16/6**
Transmission Coefficient	0.015849	0.010000	0.007943	0.001000	0.000316	0.000631	0.000200	0.000040		
Wall SRI	34	41	45	48	56	65	69	72	54	**Typical masonry cavity wall (300mm - 380kg/m2)**
Transmission Coefficient	0.000398	0.000079	0.000032	0.000016	0.000003	0.000000	0.000000	0.000000		
Roof SRI	23	26	43	52	60	65	65	65	51	
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000		
Ventilation, Dne	36	36	34	31	34	38	38	38	35	**Standard Trickle Vent**
Transmission Coefficient	0.000251	0.000251	0.000398	0.000794	0.000398	0.000158	0.000158	0.000158		
Average Transmission Coeff	0.004673	0.002890	0.002419	0.000860	0.000378	0.000284	0.000169	0.000127		
Average SRI	23.3	25.4	26.2	30.7	34.2	35.5	37.7	39.0	34	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	15.5	5.2	-3.1	-8.1	-14.3	-22.6	-24.7	-24.1	-4.4	
Lp (Direct)	14.7	4.3	-4.0	-9.0	-15.1	-23.5	-25.5	-25.0	-5.3	**Criteria**
Lp (Rev & Direct)	18	8	-1	-6	-12	-20	-22	-22	-2	**≤ 30**
BS8233	18	7	-1	-6	-12	-21	-23	-22	**-2**	**≤ 30**

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Position 1

Description	
Ardent CE Project No.	**182600**
Property Address	**East Malling - Site B**
Room Type	**Bedroom**
Parameter	**Lamax**

Room Dimensions and Areas	
Room volume	35.00
Total Surface area	65.50
Wall façade area	10.00
Roof façade area	0.00
Glazing area	3.60
Dne Ref Area, A0	10.00

Based on typical size

Total façade area	13.60

Room Absorption Calcuation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
Alpha bar	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	
Total Absorption	14.09	14.09	14.09	14.09	14.09	14.09	14.09	14.09	
10Log S/A	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	

Comment:
Typical Bedroom RT

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	73	60	56	54	55	52	44	38.8	58.1
Façade to free field	0	0	0	0	0	0	0	0	
Angle of view	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Screening (Maekewa)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Distance correction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Leq)	73	60	56	54	55	52	44	39	58.9

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw	
Glazing SRI	18	20	21	30	35	32	37	44	32	**Thermal 6/16/6**
Transmission Coefficient	0.015849	0.010000	0.007943	0.001000	0.000316	0.000631	0.000200	0.000040		
Wall SRI	34	41	45	48	56	65	69	72	54	**Typical masonry cavity wall (300mm - 380kg/m2)**
Transmission Coefficient	0.000398	0.000079	0.000032	0.000016	0.000003	0.000000	0.000000	0.000000		
Roof SRI	23	26	43	52	60	65	65	65	51	
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000		
Ventilation, Dne	36	36	34	31	34	38	38	38	35	**Standard Trickle Vent**
Transmission Coefficient	0.000251	0.000251	0.000398	0.000794	0.000398	0.000158	0.000158	0.000158		
Average Transmission Coeff	0.004673	0.002890	0.002419	0.000860	0.000378	0.000284	0.000169	0.000127		
Average SRI	23.3	25.4	26.2	30.7	34.2	35.5	37.7	39.0	34	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	50.2	35.9	30.7	24.4	21.3	17.1	7.5	0.7	29.3	
Lp (Direct)	49.4	35.1	29.9	23.5	20.4	16.3	6.7	-0.1	28.5	**Criteria**
Lp (Rev & Direct)	53	39	33	27	24	20	10	3	32	**≤ 45**
BS8233	52	38	33	26	23	19	10	3	**31**	**≤ 45**

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Noise Break-in Calculation - Position 2

Description	
Ardent CE Project No.	**182600**
Property Address	**East Malling - Site B**
Room Type	**Bedroom**
Parameter	**LAeq, 16h**

Room Dimensions and Areas	
Room volume	35.00
Total Surface area	65.50
Wall façade area	10.00
Roof façade area	0.00
Glazing area	3.60
Dne Ref Area, A0	10.00

Total façade area	13.60

Based on typical size

Room Absorption Calcuation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
Alpha bar	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	
Total Absorption	14.09	14.09	14.09	14.09	14.09	14.09	14.09	14.09	
10Log S/A	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	

Comment:
Typical Bedroom RT

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	56.0	57.2	60.1	53.6	50.9	47.3	44.1	38.4	56.8
Façade to free field	0	0	0	0	0	0	0	0	
Angle of view	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Screening (Maekewa)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Distance correction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Leq)	56	57.2	60.1	53.6	50.9	47.3	44.1	38	57.0

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw	
Glazing SRI	18	20	21	30	35	32	37	44	32	**Thermal 6/16/6**
Transmission Coefficient	0.015849	0.010000	0.007943	0.001000	0.000316	0.000631	0.000200	0.000040		
Wall SRI	34	41	45	48	56	65	69	72	54	**Typical masonry cavity wall (300mm - 380kg/m2)**
Transmission Coefficient	0.000398	0.000079	0.000032	0.000016	0.000003	0.000000	0.000000	0.000000		
Roof SRI	23	26	43	52	60	65	65	65	51	
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000		
Ventilation, Dne	36	36	34	31	34	38	38	38	35	**Standard Trickle Vent**
Transmission Coefficient	0.000251	0.000251	0.000398	0.000794	0.000398	0.000158	0.000158	0.000158		
Average Transmission Coeff	0.004673	0.002890	0.002419	0.000860	0.000378	0.000284	0.000169	0.000127		
Average SRI	23.3	25.4	26.2	30.7	34.2	35.5	37.7	39.0	34	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	33.5	32.7	34.8	23.8	17.5	12.7	7.2	0.2	28.3	
Lp (Direct)	32.7	31.8	34.0	22.9	16.7	11.9	6.4	-0.6	27.4	**Criteria**
Lp (Rev & Direct)	36	35	37	26	20	15	10	3	31	**≤ 35**
BS8233	36	35	37	26	20	15	9	2	**30**	**≤ 35**

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Position 2

Description	
Ardent CE Project No.	**182600**
Property Address	**East Malling - Site B**
Room Type	**Bedroom**
Parameter	**LAeq, 8h**

Room Dimensions and Areas	
Room volume	35.00
Total Surface area	65.50
Wall façade area	10.00
Roof façade area	0.00
Glazing area	3.60
Dne Ref Area, A0	10.00

Based on typical size

Total façade area	13.60

Room Absorption Calcuation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
Alpha bar	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	
Total Absorption	14.09	14.09	14.09	14.09	14.09	14.09	14.09	14.09	
10Log S/A	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	

Comment:
Typical Bedroom RT

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	44.9	38.4	33.3	32.8	29.7	25.4	23.0	19.6	34.9
Façade to free field	0	0	0	0	0	0	0	0	
Angle of view	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Screening (Maekewa)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Distance correction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Leq)	45	38	33	33	30	25	23	20	35

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw	
Glazing SRI	18	20	21	30	35	32	37	44	32	**Thermal 6/16/6**
Transmission Coefficient	0.015849	0.010000	0.007943	0.001000	0.000316	0.000631	0.000200	0.000040		
Wall SRI	34	41	45	48	56	65	69	72	54	**Typical masonry cavity wall (300mm - 380kg/m2)**
Transmission Coefficient	0.000398	0.000079	0.000032	0.000016	0.000003	0.000000	0.000000	0.000000		
Roof SRI	23	26	43	52	60	65	65	65	51	
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000		
Ventilation, Dne	36	36	34	31	34	38	38	38	35	**Standard Trickle Vent**
Transmission Coefficient	0.000251	0.000251	0.000398	0.000794	0.000398	0.000158	0.000158	0.000158		
Average Transmission Coeff	0.004673	0.002890	0.002419	0.000860	0.000378	0.000284	0.000169	0.000127		
Average SRI	23.3	25.4	26.2	30.7	34.2	35.5	37.7	39.0	34	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	22.4	13.9	7.9	3.0	-3.7	-9.2	-13.9	-18.5	5.4	
Lp (Direct)	21.6	13.0	7.1	2.2	-4.6	-10.0	-14.7	-19.4	4.6	**Criteria**
Lp (Rev & Direct)	25	17	11	6	-1	-7	-11	-16	8	**≤ 30**
BS8233	24	16	10	5	-2	-7	-12	-17	**7**	**≤ 30**

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Position 2

Description	
Ardent CE Project No.	**182600**
Property Address	**East Malling - Site B**
Room Type	**Bedroom**
Parameter	**Lamax**

Room Dimensions and Areas	
Room volume	35.00
Total Surface area	65.50
Wall façade area	10.00
Roof façade area	0.00
Glazing area	3.60
Dne Ref Area, A0	10.00

Total façade area	13.60

Based on typical size

Room Absorption Calcuation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
Alpha bar	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	
Total Absorption	14.09	14.09	14.09	14.09	14.09	14.09	14.09	14.09	
10Log S/A	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	

Comment:
Typical Bedroom RT

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	59	54	50	54	46	45	38	33.9	53.6
Façade to free field	0	0	0	0	0	0	0	0	
Angle of view	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Screening (Maekewa)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Distance correction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Leq)	59	54	50	54	46	45	38	34	53.8

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw	
Glazing SRI	18	20	21	30	35	32	37	44	32	**Thermal 6/16/6**
Transmission Coefficient	0.015849	0.010000	0.007943	0.001000	0.000316	0.000631	0.000200	0.000040		
Wall SRI	34	41	45	48	56	65	69	72	54	**Typical masonry cavity wall (300mm - 380kg/m2)**
Transmission Coefficient	0.000398	0.000079	0.000032	0.000016	0.000003	0.000000	0.000000	0.000000		
Roof SRI	23	26	43	52	60	65	65	65	51	
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000		
Ventilation, Dne	36	36	34	31	34	38	38	38	35	**Standard Trickle Vent**
Transmission Coefficient	0.000251	0.000251	0.000398	0.000794	0.000398	0.000158	0.000158	0.000158		
Average Transmission Coeff	0.004673	0.002890	0.002419	0.000860	0.000378	0.000284	0.000169	0.000127		
Average SRI	23.3	25.4	26.2	30.7	34.2	35.5	37.7	39.0	34	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	36.7	29.2	24.9	24.5	12.5	10.1	1.6	-4.2	23.8	
Lp (Direct)	35.8	28.3	24.0	23.6	11.6	9.3	0.8	-5.0	23	**Criteria**
Lp (Rev & Direct)	39	32	28	27	15	13	4	-2	26	**≤ 45**
BS8233	39	31	27	26	14	12	4	-2	**26**	**≤ 45**

APPENDIX C

Traffic Flow Data – Kiln Barn Road

	2018 Baseline		**2031 Design Year**		2031 Design Year + Development		
	AAWT*	%HGV	AAWT*	%HGV	AAWT*	%HGV	% increase
Kiln Barn Road (north of access)	1267	10.97%	1493	10.95%	2888	6.60%	93.44%
Kiln Barn Road (souht of access)	1267	10.97%	1493	10.95%	1732	9.70%	16.01%

* scaled from AADT using factor of 0.979 as per Traffic Appraisal Manual

APPENDIX D

ACOUSTIC TERMINOLOGY

The effects of noise on human beings may be expressed in terms of physiological damage and annoyance. It is, however, only the annoyance impacts that need to be considered in detail when addressing environmental noise impacts. Annoyance also includes the immediate effects of activity interference, for example sleep disturbance and speech interference.

The practice has become to measure sound levels in decibels (dB). The decibel scale is logarithmic rather than linear and it is useful to bear in mind that a noise level change of 3dB would be equivalent to doubling the energy level (for example doubling the volume of traffic) and that an increase of 10 dB is perceived, subjectively, as a doubling of loudness. The human ear responds differently to sounds of different frequency. The ear perceives high frequency sound of a given sound pressure level more loudly than a low frequency sound at the same level. The A-weighted sound level, dB(A), takes this response into consideration and is commonly used for measurement of environmental noise in UK. It thus indicates the subjective human response to sound.

Environmental noise levels vary continuously from second to second, it is clearly impractical to specify the sound level continuously and thus time averaging is required. In practice human response has been related to various units which include allowance for the fluctuating nature of sound with time. For the purpose of this report these include:

$L_{Aeq,T}$ the equivalent A-weighted continuous sound level.

This unit relates to the equivalent level of continuous sound for a specific time period T, for example 16 hours for daytime noise. It contains all the sound energy of the varying sound levels over the same time period and expresses it as a continuous sound level over that period. The unit is used for assessing traffic and industrial noise for planning purposes and in particular for PPG24.

$L_{A10,T}$: the A-weighted level of sound exceeded for 10% of the time period T.

This unit is used for traffic noise measurement and is the preferred unit for prediction of traffic noise in the publication, 'Calculation of Road Traffic Noise',

$L_{A90,T}$: the A-weighted level of sound exceeded for 90% of the time period T.

This unit is commonly used to represent the background noise and is used in assessing the effects of industrial noise in UK.

L_{Amax} : the maximum A-weighted level of sound over a period of measurement.

$L_{Ar,T}$ the rating level.

The specific Noise plus any adjustments for the characteristic features of the noise. Used for comparison between background levels with the noise source off.

S_{EL} the Sound Exposure Level.

Sound exposure level abbreviated as SEL and LAE, is the total noise energy produced from a single noise event condensed into a 1 second time period