

EXTERNAL NOISE ASSESSMENT

REVISION 2
(PLOTS REVISED)

CLIENT

Orchard Homes & Developments Ltd
Orchard House
51 – 67 Commercial Road
Southampton
Hampshire
SO15 1GG

SITE

Ranelagh Road
Havant
Hampshire

HAVANT BOROUGH
COUNCIL

31 JUL 2012

RECEIVED

SURVEY DATE (S)

2nd – 5th March 2012
14th – 15th June 2012

Report By



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Introduction:

Sound Advice Acoustics Ltd has been instructed by Orchard Homes & Developments Ltd, to carry out the relevant noise assessments and calculations at the site in Ranelagh Road, Havant. It is proposed that the existing land which is currently a mixture of fields and allotments is to be redeveloped to incorporate a new residential development.

It should be noted that the site shares a boundary with a large industrial unit Wartsila which currently operate 24 hours a day. Assessments and calculations are to be carried out in order to demonstrate if the industrial premises could have an acoustic impact on the proposed residential development. Further remedial recommendations and calculations are to be carried out in order to demonstrate if any potential noise level increases can be controlled to acceptable levels via an acoustic boundary screen.

With regards to external ambient noise, noise levels are to be monitored generally in accordance with Planning and Policy Guidance PPG 24 and assessments and calculation made in accordance with BS 8233 : 1999 Sound Insulation and Noise Reduction for Buildings Code of Practice. The levels recorded are to be used to evaluate the NEC Category in accordance with PPG 24 and the minimum window specification required for the proposed development.

It should be noted that the National Planning Policy Framework 2012 came into force in March 2012 and as a result Planning and Policy Guidance PPG 24 has been withdrawn. However, in the absence of the council's own policy document, it was agreed with the Environmental Health Department that for this particular site PPG 24 could be used as a suitable means of assessment of noise levels.

This noise assessment has also been undertaken in order to ascertain the potential level of disturbance the existing commercial premises could have on the proposed residential development. The commercial premises currently operate 24 hours and therefore this noise assessment has been undertaken in order to evaluate the worst case scenario and include night time operations.

The lowest recorded background noise level is to be taken from our initial planning survey carried out between 2nd – 5th March 2012.

The assessment will be made between the hours of operation and references and assessments made in accordance with British Standard 4142:1997 'Method for Rating Industrial Noise Affected Mixed Residential and Industrial Areas'.

British Standard 4142 : 1997 'Method for rating Industrial Noise Affecting Mixed Residential and Industrial Areas' is to be adopted for the basis of this background noise level assessment. A BS 4142 : 1997 noise assessment will also be carried out in order to demonstrate if any externally mounted plant currently have a detrimental effect on existing residential dwellings.

The purpose of this assessment is to ensure the acoustic protection of the existing commercial premises and mitigate the possibility of potential noise complaints from new residents.

Acoustic recommendations and re-assessments are also to be carried out in order to ensure compliance with BS 4142 : 1997 can be achieved at the nearest proposed residential dwellings.

Noise sensitive premises are not restricted to residential dwellings as offices can be affected by unwanted external noise. However, residential properties have been considered the most noise sensitive to that of the site.

In order to ensure accurate results and assessments are conducted, the 3D acoustic modelling software CADNA A is to be used in order to generate a working model to accurately calculate the resultant sound pressure levels at each of the proposed residential facades.

In addition, boundary noise levels were recorded on the morning of 25th May 2012 between 12:00 hrs and 01:45 hrs in order to ensure the 3D model is calculating in line with actual field data.

The Wartsila site consists of the following units of external plant positioned around the site.

Rear Boundary	Sound Power Level dB	Quantity
Petra PPH175 Cooling Units	Lw 88.1 dB	8
Semi-acoustic housing	Lw 92.2 dB	2
Mitsubishi R410 A	Lw 74 dB	2
FDC71VNX Unit	Lw 66 dB	1

Far Side of Yard	Sound Power Level dB	Quantity
PURY P500 YEM-4	Lw 68.8 dB	3
PURY P125 VMA	Lw 66.7 dB	1
Mitsubishi Electric RP5VHA	Lw 66.0 dB	2

External noise levels are to be recorded over, what has been considered for the site, an average / typical time period in order to assess the highest daytime and night time averages and therefore assess worse case scenario.

In addition, calculations are to be made for the predicted daytime noise levels within the outdoor living area and assessments made against the recommended levels within the World Health Organisation's 'Guidelines for Community Noise'.

Procedure:

BACKGROUND NOISE LEVEL ASSESSMENT

External noise levels were recorded over a typical weekend period 2nd – 5th March 2012 at position 1 where the operations of Wartsila are inaudible, and position 2 on 14th – 15th June 2012 on the separating boundary between the proposed site and Wartsila. These positions have been utilised to capture the ambient noise levels relevant to the nearest affected residential premises where the plant noise is both influential and non-influential.

Sample measurements were recorded over continuous 5 minute samples and from this data the $L_{Aeq, 1 \text{ HOUR}}$ dB and $L_{Aeq, 5 \text{ MINUTE}}$ dB values have been evaluated for daytime and night time periods. Sound Pressure Levels were recorded on the following setting along with a full octave band frequency analysis measured simultaneously and between 31.5 Hz and 16.0 kHz.

Daytime 07:00 – 23:00 hrs

$L_{Aeq} 1 \text{ HOUR}$ dB	$L_{A10} 1 \text{ HOUR}$ dB
$L_{AMAX} 1 \text{ HOUR}$ dB	$L_{A50} 1 \text{ HOUR}$ dB
$L_{AMIN} 1 \text{ HOUR}$ dB	$L_{A90} 1 \text{ HOUR}$ dB

Night time 07:00 – 23:00 hrs

$L_{Aeq} 5 \text{ MINUTE}$ dB	$L_{A10} 5 \text{ MINUTE}$ dB
$L_{AMAX} 5 \text{ MINUTE}$ dB	$L_{A50} 5 \text{ MINUTE}$ dB
$L_{AMIN} 5 \text{ MINUTE}$ dB	$L_{A90} 5 \text{ MINUTE}$ dB

From the downloaded recorded results the daytime time noise levels were assessed and used within the above calculations and are detailed on the attached figures 1 – 3.

The external results recorded were assessed in accordance with Planning and Policy Guidance PPG 24. Calculations have also been made in accordance with BS 8233 : 1999 'Sound Insulation and Reduction of Buildings - Code of Practice'. Recommendations were made for any additional acoustics measures to conform to these standards.

From the downloaded recorded results both the daytime and night time averages for the 24 hour period were assessed and used within the above calculations as $L_{Aeq, 16 \text{ HOUR}}$ dB levels for daytime and $L_{Aeq, 8 \text{ HOUR}}$ dB for night time. These are detailed on the attached figures 1 - 4.

With regards to position 1, the measurement position was considered the nearest position to the residential window at which the units would not be influential and therefore representative of the background noise level at the nearest affected residential window.

NEAR FIELD NOISE LEVEL MEASUREMENTS

In order to ensure an accurate working 3D model can be built, nearfield noise levels were recorded of each element of plant around the site and inputted onto the CADNA A software for further calculations to be made.

Apparatus:

The above equipment was calibrated using a sound pressure level of 114.0 dB at an octave band centre frequency of 1000Hz with reference to $2 \times 10^{-5} \text{ Nm}^{-2}$ before and after the tests and the equipment set to have no inaccuracy greater than 0.2 dB.

All the following equipment was calibrated by Salford University (UKAS NO: 0801) in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service (UKAS) on the following dates.

Calibration schedules are implemented within Sound Advice Acoustics Ltd in accordance with UKAS directive LAB 23.

Description	Make	Type	Serial No.	Calibration Intervals	Last Calibrated	Next Due Calibration
Integrated Sound Level Meter	Norsonic	118	28191	2 YEARS	28.04.11	28.04.13
12.5mm Microphone (with windshield)	GRAS	40AF	73337	2 YEARS	28.04.11	28.04.13
Microphone Pre – Amplifier	Norsonic	1206	27587	2 YEARS	28.04.11	28.04.13
Calibrator	Norsonic	1251	31963	1 YEAR	28.04.11	28.04.12
Calibrator	Norsonic	1251	31963	1 YEAR	28.04.12	28.04.13
The above equipment was calibrated using a sound pressure level of 114.0 dB at an octave band centre frequency of 1000Hz with reference to $2 \times 10^{-5} \text{ Nm}^{-2}$ before and after the tests and the equipment set to have no inaccuracy greater than 0.5 dB.						

FULL UKAS CALIBRATION DATA SHEETS AND CERTIFICATES ARE AVAILABLE UPON REQUEST.

Environmental Conditions:

2nd – 5th March 2012	Start	End
Temperature:	11.5 ^o C	9 ^o C
Relative Humidity	52%	49%
Average Wind Speed:	<0.5 m/s	<0.5 m/s
Cloud Cover:	None	Moderate
Road Surface	Dry	Dry
Atmospheric Pressure:	1020 mbar	1023 mbar

14th – 15th June 2012	Start	End
Temperature:	12 ^o C	14 ^o C
Relative Humidity	76%	82%
Average Wind Speed:	<0.5 m/s	<0.5 m/s
Cloud Cover:	Heavy	Moderate
Road Surface	Dry	Dry
Atmospheric Pressure:	1008 mbar	1007 mbar

Data acquired from local online weather station

Results:

- $L_{Aeq,t}$ - The equivalent A weighted sound pressure level recorded over a time interval of 5 minutes night time and 1 hourly daytime.
- $L_{A90,t}$ - The A weighted sound pressure level that is exceeded for 90% of the time period 5 minutes night time and 1 hourly daytime.
- $L_{A50,t}$ - The A weighted sound pressure level that is exceeded for 50% of the time period 5 minutes night time and 1 hourly daytime.
- $L_{A10,t}$ - The A weighted sound pressure level that is exceeded for 10% of the time period 5 minutes night time and 1 hourly daytime.
- L_{Amax} - The maximum A weighted sound pressure level recorded over a time interval of 5 minutes night time and 1 hourly daytime.
- L_{Amin} - The minimum A weighted sound pressure level recorded over a time interval of 5 minutes night time and 1 hourly daytime.

See attached Figures 1 – 4 for full downloaded results, and averages.

Position 1		2 nd – 3 rd March 2012																
Date / Time	LAeq	Lmax	Lmin	LA10	LA50	LA90	Octave Band Centre Frequency (Hz)											
							31.5	63	125	250	500	1.0 k	2.0 k	4.0 k	8.0 k	16.0 k		
DAYTIME LOWEST	50.1	57.9	45.1	51.9	49.7	47.6	53.6	48.4	43.9	40.9	42.8	48.8	40.2	25.8	17.3	13.4		
DAYTIME HIGHEST	59.4	64.6	56.5	60.6	59.1	58.0	72.6	68.7	63.4	58.5	52.3	52.7	52.1	58.3	48.0	39.2		
DAYTIME AVERAGE	55.5	67.6	51.7	57.0	54.9	53.5	72.0	64.8	57.6	51.7	48.7	52.9	45.8	47.7	37.4	29.6		
NIGHT TIME LOWEST NIGHT TIME HIGHEST NIGHT TIME AVERAGE	44.0	53.6	38.8	46.4	43.3	40.6	56.5	50.2	44.0	39.3	37.7	42.2	34.4	20.5	15.6	13.5		
	60.5	81.6	48.5	57.7	55.0	52.8	59.1	54.5	47.1	47.8	48.1	54.1	57.6	48.7	31.7	17.4		
	52.0	63.5	46.3	53.7	51.3	49.1	56.3	51.0	44.5	43.7	44.0	49.6	43.7	41.7	30.6	15.7		

Position 1 3 rd – 4 th March 2012																
Date / Time	LAeq	Lmax	Lmin	LA10	LA50	LA90	Octave Band Centre Frequency (Hz)									
							31.5	63	125	250	500	1.0 k	2.0 k	4.0 k	8.0 k	16.0 k
DAYTIME LOWEST	55.7	62.6	50.8	57.7	55.3	53.1	52.5	50.7	46.1	49.0	48.0	54.6	45.0	25.7	13.3	10.8
DAYTIME HIGHEST	62.6	68.8	59.6	63.8	62.5	61.3	61.7	57.8	51.2	54.5	54.4	61.3	53.4	41.5	33.2	29.6
DAYTIME AVERAGE	59.3	66.3	55.8	60.7	59.1	57.7	66.1	60.2	52.3	52.2	51.4	57.7	49.4	47.7	38.0	31.0
NIGHT TIME LOWEST	46.1	57.6	40.0	48.8	44.9	41.6	46.9	43.9	39.9	41.5	39.2	44.4	36.5	26.7	24.0	23.0
NIGHT TIME HIGHEST	58.3	66.0	53.0	60.5	57.5	55.7	67.7	64.2	59.2	55.4	51.5	54.5	48.5	50.9	37.7	27.1
NIGHT TIME AVERAGE	52.4	59.6	47.0	54.5	51.8	49.5	55.4	51.2	45.1	44.9	44.6	50.6	43.2	38.7	28.8	23.0

Position 1 4 th – 5 th March 2012																
Date / Time	LAeq	Lmax	Lmin	LA10	LA50	LA90	Octave Band Centre Frequency (Hz)									
							31.5	63	125	250	500	1.0 k	2.0 k	4.0 k	8.0 k	16.0 k
DAYTIME LOWEST	52.7	60.3	47.1	55.1	51.9	49.4	64.9	57.3	49.3	47.1	45.6	51.5	41.3	26.1	20.9	19.1
DAYTIME HIGHEST	62.2	65.5	59.4	63.3	62.0	60.9	63.8	60.3	53.7	54.4	55.0	60.5	53.4	41.6	35.9	33.3
DAYTIME AVERAGE	58.1	67.9	54.5	59.4	57.8	56.3	65.1	60.4	54.5	51.7	50.5	56.2	49.0	46.3	39.0	39.1
NIGHT TIME LOWEST	43.5	55.7	37.2	45.9	41.9	39.7	61.0	52.0	45.6	41.0	38.8	41.5	31.5	21.5	17.3	15.0
NIGHT TIME HIGHEST	60.4	65.3	56.6	61.8	60.1	58.7	62.6	57.7	51.8	52.9	52.3	58.5	48.8	51.5	37.9	21.7
NIGHT TIME AVERAGE	52.7	60.9	47.8	54.7	52.1	50.1	61.9	54.8	47.5	46.7	45.7	51.3	41.5	37.7	26.5	17.1

Position 2 14 th – 15 th June 2012																
Date / Time	LAeq	Lmax	Lmin	LA10	LA50	LA90	Octave Band Centre Frequency (Hz)									
							31.5	63	125	250	500	1.0 k	2.0 k	4.0 k	8.0 k	16.0 k
DAYTIME LOWEST	51.0	60.4	57.9	47.6	48.1	52.9	62.5	61.6	54.8	48.4	46.4	47.0	42.8	38.9	35.9	29.5
DAYTIME HIGHEST	61.7	78.4	76.1	53.1	53.7	60.4	70.6	68.0	69.6	65.8	58.4	54.8	49.0	45.2	42.6	36.1
DAYTIME AVERAGE	56.1	71.1	67.1	51.9	52.5	56.9	64.4	65.1	60.2	56.7	51.8	51.5	46.9	46.0	46.1	35.1
NIGHT TIME LOWEST NIGHT TIME HIGHEST NIGHT TIME AVERAGE	45.0	47.5	46.0	43.6	44.2	45.6	61.1	61.1	53.2	45.3	41.8	39.6	34.4	29.5	21.7	13.2
	64.3	75.1	71.1	44.8	47.6	70.1	61.6	61.2	53.5	46.2	42.8	42.0	51.5	61.4	59.7	36.1
	53.8	66.6	62.2	46.7	47.5	57.8	61.8	61.5	53.9	47.6	45.5	45.4	46.5	48.0	46.3	28.8

BACKGROUND NOISE LEVEL RESULTS

From the downloaded data, the following data has been evaluated as the lowest recorded background noise level between 09:00 hrs and 23:00 hrs

POSITION 1 2 nd – 5 th March 2012																
Date / Time	LAeq	Lmax	Lmin	LA10	LA50	LA90	Octave Band Centre Frequency (Hz)									
							31.5	63	125	250	500	1.0 k	2.0 k	4.0 k	8.0 k	16.0 k
07:00 – 23:00 DAYTIME LOWEST	55.4	68.7	40.0	59.2	51.7	45.3	81.9	73.9	66.1	58.4	50.8	46.4	40.9	38.0	31.8	31.6
23:00 - 07:00 NIGHT TIME LOWEST	44.8	55.5	36.5	47.6	43.5	38.2	58.0	51.3	44.8	40.5	37.7	43.1	35.3	21.4	12.9	10.6

Discussion of Results:

It can be seen from the attached graph and downloaded results that the external noise levels have followed the expected path and remained fairly constant throughout the day. The levels then gradually dropped off as the evening progressed and began to rise when morning traffic levels increased.

With regards to maximum levels, PPG 24 states that

"Night-time noise levels (23:00 – 07:00): sites where individual noise events regularly exceed 82 dB L_{Amax} (S time weighting) several times in any hour should be treated as being in NEC C, regardless of the $L_{Aeq,8h}$ (except where the $L_{Aeq,8h}$ already puts the site in NEC D)."

It can be seen from the downloaded data that the L_{max} limit of 82 dB has not been exceeded during the night time period. Therefore the above statement from PPG 24 would not come into force and the PPG 24 categories remain as evaluated as per the following CADNA A calculations.

PPG 24 - Noise Exposure Categories:

The following noise exposure categories have been assessed in accordance with Planning Policy Guidance Planning and Noise PPG 24 and assessed to the nearest affected façade of the proposed residential dwelling:-

The following assessments are made at the position of the highest calculated proposed façade with regards to average noise levels over their representative time periods for daytime and night time.

POSITION 1 - AVERAGE LEVELS 2nd – 5th MARCH 2012

Daytime	-	Average Level $L_{Aeq,16\text{ HOUR}}$ (07:00 – 23:00 hrs)	59.3 dB
		Noise Exposure Category B	($L_{Aeq,16\text{ HOUR}}$ 55 - 63 dB)
Night Time	-	Average Level $L_{Aeq,8\text{ HOUR}}$ (23:00 – 07:00 hrs)	52.7 dB
		Noise Exposure Category B	($L_{Aeq,8\text{ HOUR}}$ 45 - 57 dB)

POSITION 2 - AVERAGE LEVELS 14TH – 15TH JUNE 2012

Daytime	-	Average Level $L_{Aeq,16\text{ HOUR}}$ (07:00 – 23:00 hrs)	56.1 dB
		Noise Exposure Category B	($L_{Aeq,16\text{ HOUR}}$ 55 - 63 dB)
Night Time	-	Average Level $L_{Aeq,8\text{ HOUR}}$ (23:00 – 07:00 hrs)	53.8 dB
		Noise Exposure Category B	($L_{Aeq,8\text{ HOUR}}$ 45 - 57 dB)

All categories relate to traffic and mixed noise sources, and the results are corrected to the nearest decibel.

BS 8233 : 1999:

The above noise tests have been assessed in accordance with PPG 24 and category B evaluated for daytime and night time for the site at positions 1 and 2. The measurements recorded at position 2 include the acoustic influence of the Wartsila commercial premises and therefore included within the relevant external to internal BS 8233 : 1999 façade calculations.

PPG 24 introduces the concept of Noise Exposure Categories (NECs) for residential developments; these are classified as shown in Table 1. The noise levels corresponding to the noise exposure categories for new housing are given in Table 2.

Policy Planning Guidance PPG 24 states within Annex 1 that for NEC category B:-

NEC B	Noise should be taken into account when determining planning applications and where appropriate conditions imposed to ensure an adequate level of protection.
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Table 1. Noise Exposure Categories

Noise Source	NEC A dB L _{Aeq}	NEC B dB L _{Aeq}	NEC C dB L _{Aeq}	NEC D dB L _{Aeq}
Mixed				
07:00 to 23:00 hrs	<55	55-63	63-72	>72
23:00 to 07:00 hrs	<45	45-57	57-66	>66

Table 2. Extract from PPG 24

Therefore in order to achieve the required reasonable noise levels of L_{Aeq} 35 dB for habitable rooms and L_{Aeq} 30 for Bedroom at night within the proposed residential properties, the following additional acoustic measures have been calculated. (Details on calculation sheets figure's 5 – 6 inclusive).

Calculations have been carried out at both position 1 and 2 in order to demonstrate the acoustic requirements at either end of the spectrum and to further demonstrate that the proposed layout can be implemented onto this site with the presence of the commercial premises.

It should be noted that the calculations have been made with the proposed windows closed. Additional calculations were made for the top floor due to the influence of sound transmission into the various rooms via the roof / ceiling i.e. an increased impeding façade.

MINIMUM CONSTRUCTION DETAILS

STANDARD WALL CONSTRUCTION

Brick Outer face, cavity, inner brick or block system.

63	125	250	500	1.0k	2.0k	4.0k	Frequency (Hz)
36.0	40.0	44.0	45.0	51.0	56.0	60.0	dB reduction

WINDOW CONSTRUCTION (4 / 16 / 4)

63	125	250	500	1.0k	2.0k	4.0k	Frequency (Hz)
24.4	20.4	20.1	26.5	39.6	42.4	38.9	dB reduction

TRICKLE VENTS Greenwood S Vent

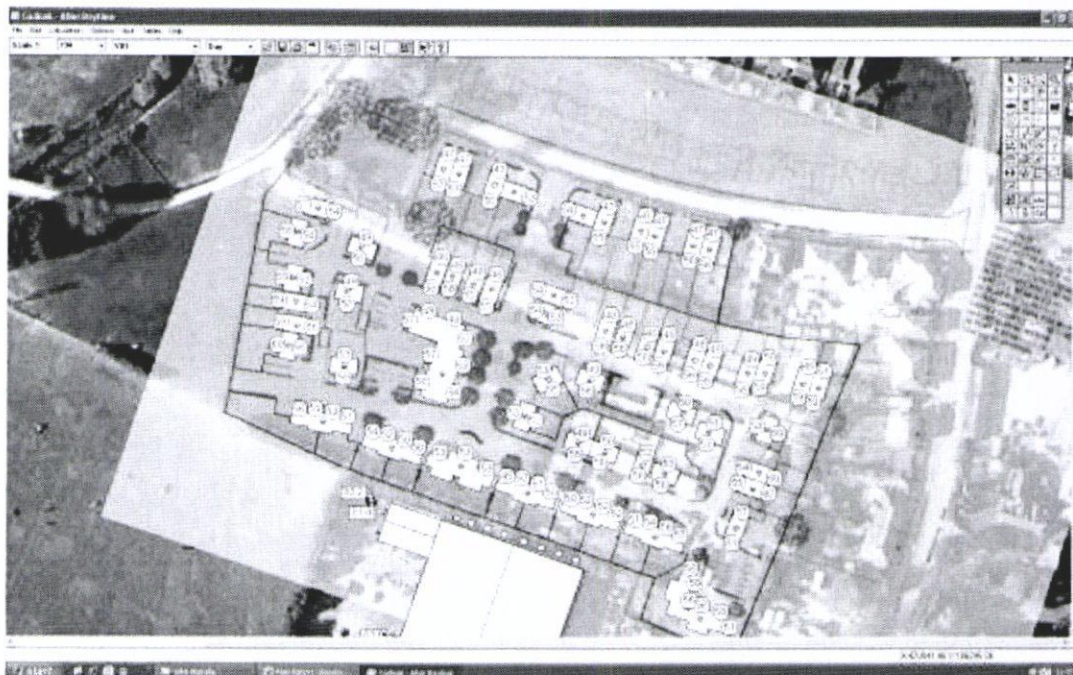
63	125	250	500	1.0k	2.0k	4.0k	Frequency (Hz)
45.0	40.0	36.0	34.0	33.0	35.0	39.0	dB reduction

ROOF CONSTRUCTION – MINIMUM VALUE

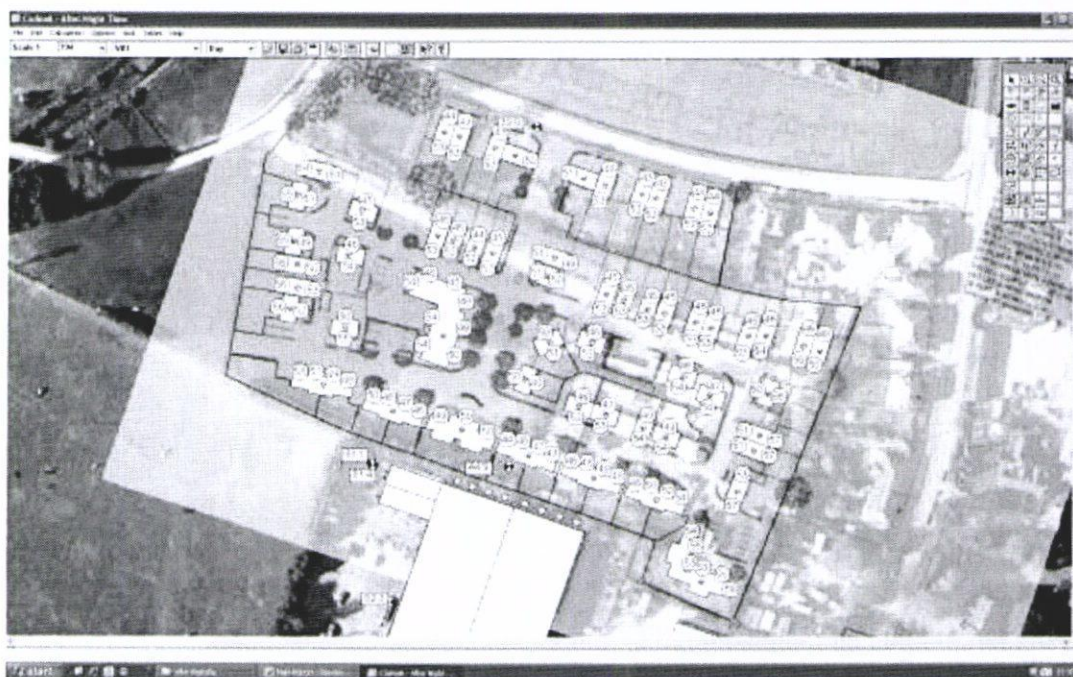
63	125	250	500	1.0k	2.0k	4.0k	Frequency (Hz)
22.0	28.0	34.0	40.0	45.0	49.0	53.0	dB reduction

The attached figures of BS 8233 : 1999 calculation sheets demonstrate the influence of the existing ambient noise levels at both positions and with the additional influence of the proposed acoustic remedial works carried out to the plant at Wartsila.

CALCULATED DAYTIME NOISE LEVELS



CALCULATED NIGHT TIME NOISE LEVELS



World Health Organisation 'Guidelines for Community Noise':

The World Health Organisation 'Guidelines for Community Noise' gives guidance as to desirable noise levels that should be achieved within outdoor living areas such as gardens, patios and verandas etc.

Table 1: Guideline values for community noise in specific environments, details the desirable target noise levels within various areas.

Outdoor Living Area

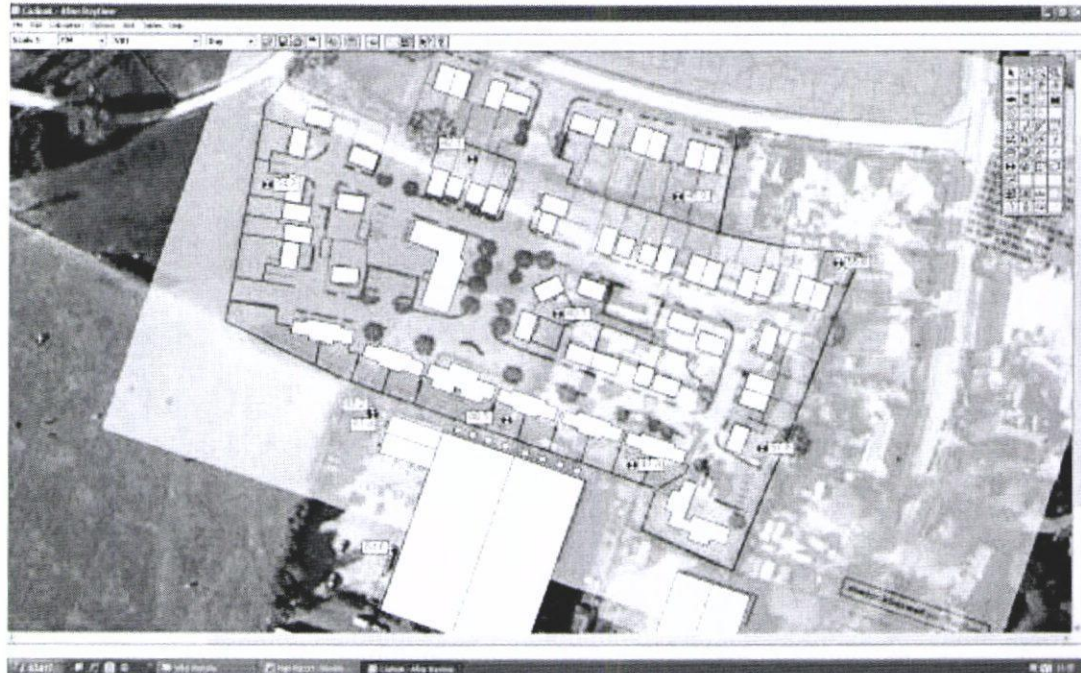
Serious Annoyance, daytime and evening $L_{Aeq\ 16\ HOUR}$ 55 dB

Moderate Annoyance, daytime and evening $L_{Aeq\ 16\ HOUR}$ 50 dB

Calculations have been carried out using the 3D modelling software CADNA A in order to calculate the resultant noise levels within outdoor living spaces and assess these against the requirements of the above guideline document.

The following calculations demonstrate that the above guideline levels are likely to exceed the above guidelines in some of the gardens areas and be below the above guidelines in other areas. The calculations carried out are a sample of the gardens on the proposed development.

CADNA A CALCULATION FOR EXTERNAL LIVING AREA NOISE LEVELS



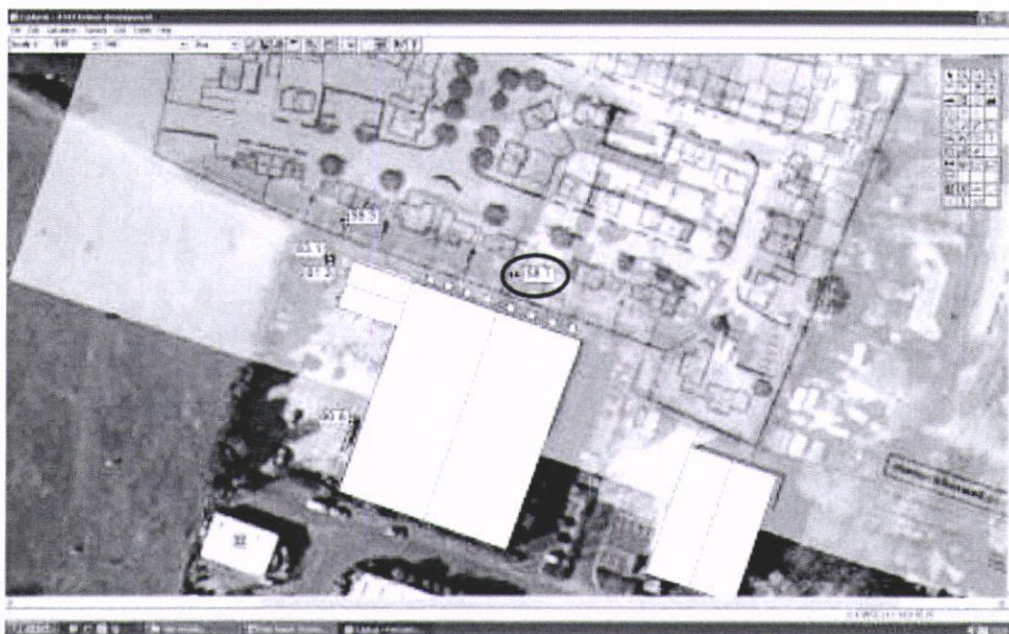
BS 4142 : 1997 Noise Assessment:

Calculations have been carried out for both daytime and night time operations as the building cooling system will operate at a less capacity a night, although the actual noise level reduction is minimal. From the calculations carried out, further attenuated calculations are carried out in order to demonstrate the levels of acoustic attenuation that will be required from each specific area together with recommendations for specific acoustic treatments.

The following CADNA A calculations carried out demonstrate the sound pressure levels at the facades of each of the proposed residential developments at top floor level in order to calculate for the worst case scenario. The calculations are also carried out using various scenarios of screen heights.

Following, the calculations, BS 4142 : 1997 noise assessments are made to demonstrate the acoustic impact at each stage and evaluate the need for further treatment.

The model is generated to produce noise levels that reflect those that were recorded during the night survey on site during a normal night time operation. During the night time survey a level of LAeq 5 MIN 58.7 dB was recorded at the position closest to the eight number cooling units. This is then reproduced to demonstrate the acoustic models accuracy.



EXISTING DAYTIME ASSESSMENT



EXISTING NIGHT TIME ASSESSMENT



BS 4142 : 1997 provides a method for measurement and rating of industrial and background noise levels outside dwellings in mixed residential and industrial areas. The rating level (defined in BS 4142:1997) is used to rate the industrial noise source outside residential dwellings (this is defined as the "specific noise source". This level is obtained by adding a 5dB correction for tonal or impulsive characteristics to the equivalent continuous A-weighted sound pressure level of the specific noise source.

The procedure defined in BS 4142: 1997 for predicting the likelihood of complaints is based on establishing the difference between the rating level and the background noise level outside the residential property of interest. The greater the difference the greater the likelihood of complaints and more specifically:-

Assessment Indicator

1. A difference of +10dB or more indicates that complaints are likely.
2. A difference of +5dB is of marginal significance.
3. If the rating is more than 10 dB below the measured background noise level then this is a positive indication that complaints are unlikely.

The assessment of noise nuisance explicitly falls outside the scope of BS 4142 : 1997. A statutory noise nuisance requires the consideration of both relative and absolute noise levels, material loss of amenity, mitigation options and other non acoustic factors. Section 80, part III of the Environmental Protection Act 1990 provides a defence of "best practicable means" against any nuisance proceedings.

However, it must also be recognised that the simple use of an overall A-weighted noise level can underestimate the degree of disturbance caused by relatively low levels of environmental noise with low frequency components or other discrete characteristics such as tonal, impulsive and / or irregular temporal features. Therefore the overall approach suggested in BS 4142 : 1997 is an important indicator of the acceptability of noise from industrial premises.

The lowest background noise level recorded has been considered to be representative of the lowest recorded background noise level associated with this site at the residential positions and therefore, the following BS 4142 : 1997 assessment could be expected.

BS 4142 : 1997 Noise Assessment 2	Time Period Assessments	
	Daytime 07:00 – 23:00	Night Time 23:00 – 07:00
Calculated Level at Residential $L_{Aeq\ 1\ HOUR}$ dB	39.0	36.0
Residual Noise Level $L_{Aeq\ 1\ HOUR}$ dB	55.4	44.8
Specific Noise Level	39.0	36.0
Character Correction	+5.0	+5.0
Rating Level	39.0	41.0
Background Noise Level $L_{A90\ 1\ HOUR}$ dB	45.3	38.2
Excess Over Background	-6.3 dB	+2.8 dB
Assessments Indicates	*2	+2

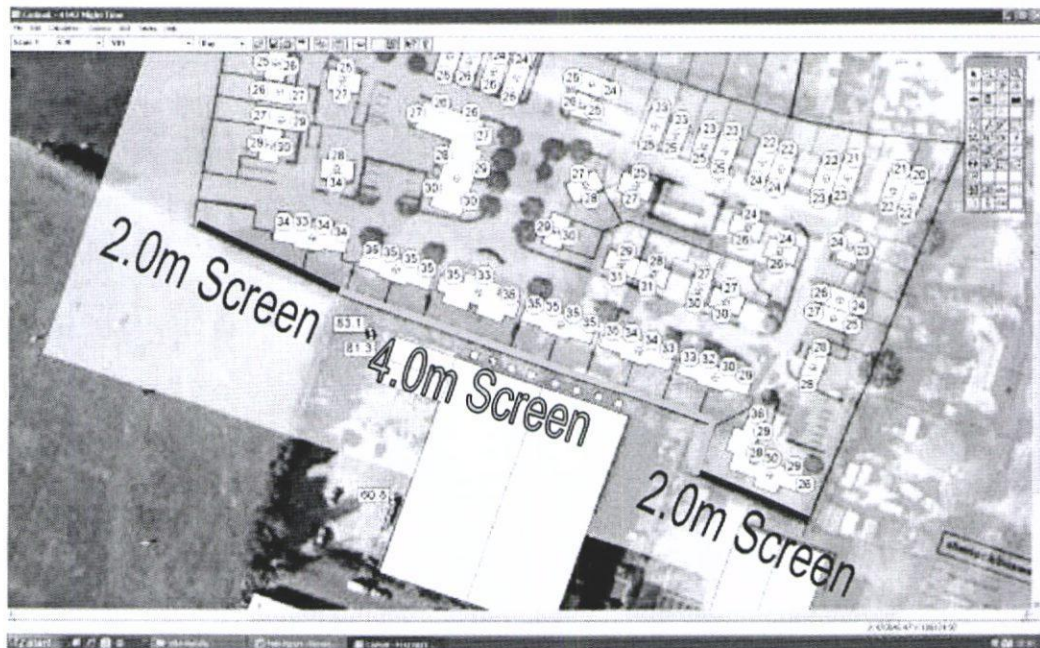
*Refer to assessment indicator above

It should be noted that the +5 dB character correction exists because of an intermittent discharge 'hiss' that occurs from one of the pumps within the existing external housing at the end of the yard. The presence of this intermittent noise will mean the BS 4142 : 1997 noise assessment returns an assessment value of +2.8 dB above lowest recorded background noise level. However, if a direct comparison is made between the calculated level and the lowest recorded background noise level the acoustic influence of the plant at the Wartsila site would likely be -2.2 dB below background.

RECOMMENDATIONS

1.0 ACOUSTIC FENCE / SCREEN

Install an acoustic fence / barrier along the perimeter of the boundary between the proposed residential development and the commercial premises. The screen can be split in height generally as demonstrated on the following diagram. The screen is to be constructed from any solid material with an absorptive inner face and a minimum mass of 13 Kg/m² in order to ensure the acoustic integrity of the screen is maintained. The screen should be continuous with no gaps and sealed to the floor at all points.



Conclusion:

CONCLUSION SUMMARY

This noise assessment undertaken on behalf of Orchard Homes in relation to the Ranelagh Road site have concluded that the general ambient site noise levels are likely to be relatively low considering the close proximity of the A27.

However, closer inspection of the direct noise levels associated with the Wartsila site that shares the proposed southern boundary, have suggested the possibility of noise complaints from future residents. Therefore, additional calculations and assessments have been carried out in order to ascertain the possibility of suitable acoustic mitigation methods in order to ensure that resultant noise levels at the nearest potentially affected residential dwellings are within acceptable levels below the lowest recorded background.

On this basis a full BS 4142 : 1997 noise assessment has been carried out with the aid of the 3D modelling software CADNA A in order to predict the noise levels at the proposed premises and evaluate the acoustic impact. As a result of this assessment recommendations have been made for the installation of an acoustic screen on the boundary.

PPG 24 & BS 8233 : 1999

Levels have been recorded and assessments made in accordance with the relevant standards. Internal criteria's have been set and calculations made in order to determine the minimum construction details required in order to meet the desired level within the proposed residential dwellings and satisfy the local councils requirements.

It will be necessary to install a window specification of 4 / 16 / 4 double glazing to all aspects of the development with Greenwood S Slot Vents installed.

Finally an assessment using the CADNA software has confirmed the predicted noise levels at each of the proposed windows.

W.H.O. GUIDELINES FOR COMMUNITY NOISE

An assessment in accordance with the World Health Organisation's 'Guidelines for Community Noise' has also been carried out in order to calculate and demonstrate the predicted noise levels within the proposed external living areas. The calculations have concluded that it will be necessary to install a 2.0m & 4.0m high fence along some of the boundaries. These are detailed on page 27 of this report.

BS 4142 : 1997 ASSESSMENT

A full external noise assessment, report and recommendations have been carried out at the proposed site of Orchard Homes at Ranelagh Road, Havant in relation to the existing neighbouring commercial industrial site.

Assessments and calculations have been carried out to BS 4142 : 1997 in order to evaluate the any potential noise level increase and the possibility of loss of amenity to the proposed development. The calculations carried out have been done so with the aid of the CADNA A 3D acoustic modelling software to generate noise levels at each of the proposed dwellings.

The BS 4142 : 1997 noise assessments have evaluated that with the installation of an acoustic screen / fence along the full length of the separating boundary, the noise levels at the proposed development should not give rise to complaints with regards to the external plant at the industrial unit. This is mainly due to the proposed layout ensuring no openable windows are present on the southern facing facades of the properties facing the southern boundary with Wartsila. Habitable rooms that do face this area will have sealed windows and additional ventilation via the northern facades facing away from Wartsila. The windows facing the boundary could be acoustically upgraded to triple glazed in order to ensure the overall acoustic integrity of this façade is not compromised and that the internal levels within the nearest noise sensitive premises are within the guidelines given within this report.

Therefore, it is the conclusion of this noise assessment that planning permission could be granted with planning conditions in place based on the proposed layout.

NOISE LEVEL SUMMARY ASSESSMENT																
Date / Time	LAeq	Lmax	Lmin	LA10	LA50	LA90	Octave Band Centre Frequency (Hz)									
							31.5	63	125	250	500	1.0 k	2.0 k	4.0 k	8.0 k	16.0 k
07:00 - 23:00																
DAYTIME LOWEST L _{Aeq} 1 HOUR	50.1	57.9	45.1	51.9	49.7	47.6	53.6	48.4	43.9	40.9	42.8	48.8	40.2	25.8	17.3	13.4
DAYTIME HIGHEST L _{Aeq} 1 HOUR	59.4	64.6	56.5	60.6	59.1	58.0	72.6	68.7	63.4	58.5	52.3	52.7	52.1	58.3	48.0	39.2
DAYTIME AVERAGE L _{Aeq} 16 HOUR	55.5	67.6	51.7	57.0	54.9	53.5	72.0	64.8	57.6	51.7	48.7	52.9	45.8	47.7	37.4	29.6
23:00 - 07:00																
NIGHT TIME LOWEST L _{Aeq} 5 MIN	44.0	53.6	38.8	46.4	43.3	40.6	56.5	50.2	44.0	39.3	37.7	42.2	34.4	20.5	15.6	13.5
NIGHT TIME HIGHEST L _{Aeq} 5 MIN	60.5	81.6	48.5	57.7	55.0	52.8	59.1	54.5	47.1	47.8	48.1	54.1	57.6	48.7	31.7	17.4
HIGHT TIME AVERAGE L _{Aeq} 8 HOUR	52.0	63.5	46.3	53.7	51.3	49.1	56.3	51.0	44.5	43.7	44.0	49.6	43.7	41.7	30.6	15.7

PPG 24 NOISE EXPOSURE CATEGORY

road traffic 07:00 - 23:00 23:00 - 07:00	B B
rail traffic 07:00 - 23:00 23:00 - 07:00	B B
air traffic 07:00 - 23:00 23:00 - 07:00	A B
mixed sources 07:00 - 23:00 23:00 - 07:00	B B

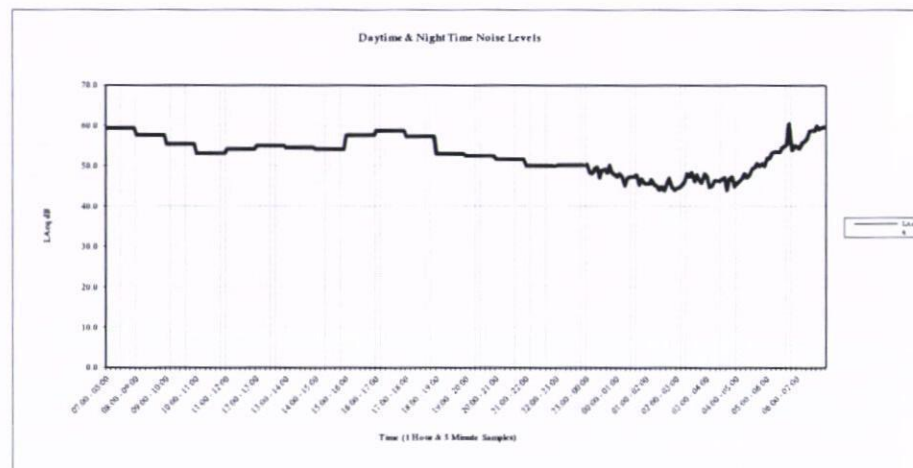


FIGURE 1
PAGE 1

NOISE LEVEL SUMMARY ASSESSMENT															
Date / Time	LAeq	Lmax	Lmin	LA10	LA50	LA90	Octave Band Centre Frequency (Hz)								
							31.5	63	125	250	500	1.0 k	2.0 k	4.0 k	16.0 k
07:00 - 23:00															
DAYTIME LOWEST LAeq 1 HOUR	55.7	62.6	50.8	57.7	55.3	53.1	52.5	50.7	46.1	49.0	48.0	54.6	45.0	25.7	13.3
DAYTIME HIGHEST LAeq 1 HOUR	62.6	68.8	59.6	63.8	62.5	61.3	61.7	57.8	51.2	54.5	54.4	61.3	53.4	41.5	33.2
DAYTIME AVERAGE LAeq 16 HOUR	59.3	66.3	55.8	60.7	59.1	57.7	66.1	60.2	52.3	52.2	51.4	57.7	49.4	47.7	38.0
23:00 - 07:00															
NIGHT TIME LOWEST LAeq 5 MIN	46.1	57.6	40.0	48.8	44.9	41.6	46.9	43.9	39.9	41.5	39.2	44.4	36.5	26.7	24.0
NIGHT TIME HIGHEST LAeq 5 MIN	58.3	66.0	53.0	60.5	57.5	55.7	67.7	64.2	59.2	55.4	51.5	54.5	48.5	50.9	37.7
NIGHT TIME AVERAGE LAeq 8 HOUR	52.4	59.6	47.0	54.5	51.8	49.5	55.4	51.2	45.1	44.9	44.6	50.6	43.2	38.7	28.8

PPG 24 NOISE EXPOSURE CATEGORY	
road traffic 07:00 - 23:00 23:00 - 07:00	B B
rail traffic 07:00 - 23:00 23:00 - 07:00	B B
air traffic 07:00 - 23:00 23:00 - 07:00	B B
mixed sources 07:00 - 23:00 23:00 - 07:00	B B

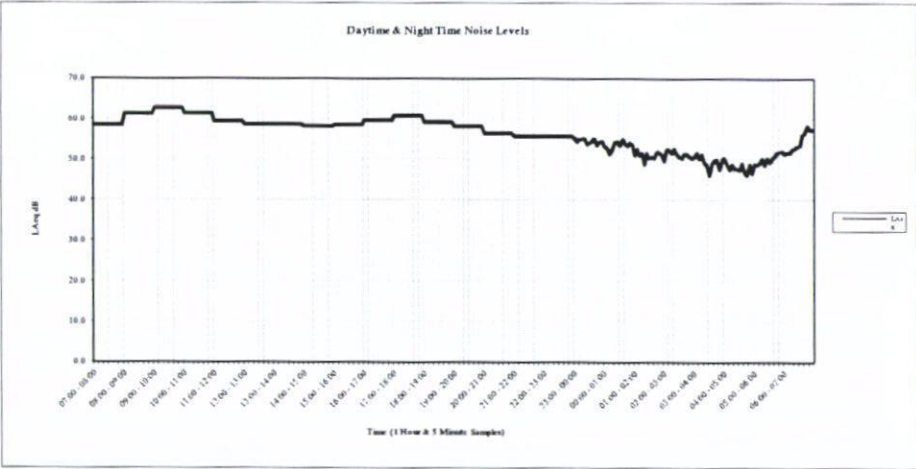


FIGURE 2
PAGE 1

NOISE LEVEL SUMMARY ASSESSMENT																
Date / Time	LAeq	Lmax	Lmin	LA10	LA50	LA90	Octave Band Centre Frequency (Hz)									
							31.5	63	125	250	500	1.0 k	2.0 k	4.0 k	8.0 k	16.0 k
07:00 - 23:00																
DAYTIME LOWEST L _{Aeq} 1 HOUR	52.7	60.3	47.1	55.1	51.9	49.4	64.9	57.3	49.3	47.1	45.6	51.5	41.3	26.1	20.9	19.1
DAYTIME HIGHEST L _{Aeq} 1 HOUR	62.2	65.5	59.4	63.3	62.0	60.9	63.8	60.3	53.7	54.4	55.0	60.5	53.4	41.6	35.9	33.3
DAYTIME AVERAGE L _{Aeq} 16 HOUR	58.1	67.9	54.5	59.4	57.8	56.3	65.1	60.4	54.5	51.7	50.5	56.2	49.0	46.3	39.0	39.1
23:00 - 07:00																
NIGHT TIME LOWEST L _{Aeq} 5 MIN	43.5	55.7	37.2	45.9	41.9	39.7	61.0	52.0	45.6	41.0	38.8	41.5	31.5	21.5	17.3	15.0
NIGHT TIME HIGHEST L _{Aeq} 5 MIN	60.4	65.3	56.6	61.8	60.1	58.7	62.6	57.7	51.8	52.9	52.3	58.5	48.8	51.5	37.9	21.7
NIGHT TIME AVERAGE L _{Aeq} 8 HOUR	52.7	60.9	47.8	54.7	52.1	50.1	61.9	54.8	47.5	46.7	45.7	51.3	41.5	37.7	26.5	17.1

PPG 24 NOISE EXPOSURE CATEGORY

road traffic	
07:00 - 23:00	B
23:00 - 07:00	B
rail traffic	
07:00 - 23:00	B
23:00 - 07:00	B
air traffic	
07:00 - 23:00	B
23:00 - 07:00	B
mixed sources	
07:00 - 23:00	B
23:00 - 07:00	B

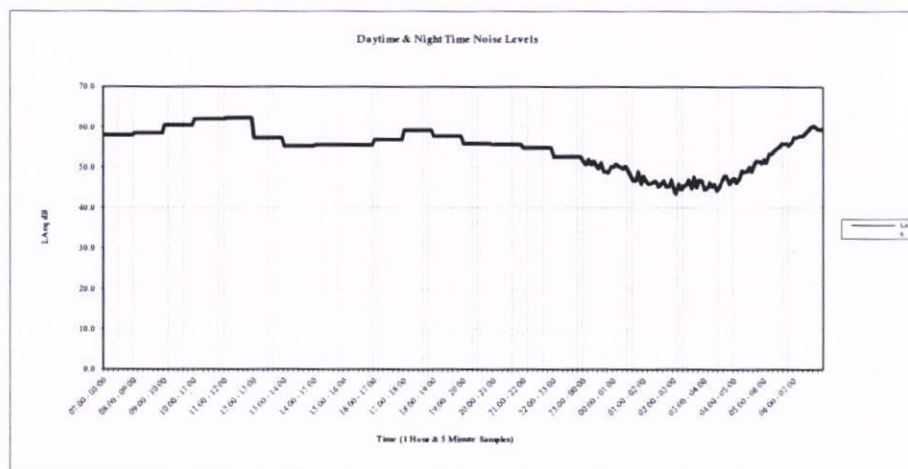


FIGURE 3
PAGE 1

NOISE LEVEL SUMMARY ASSESSMENT															
Date / Time	LAeq	Lmax	Lmin	LA10	LA50	LA90	Octave Band Centre Frequency (Hz)								
							31.5	63	125	250	500	1.0 k	2.0 k	4.0 k	16.0 k
07:00 - 23:00															
DAYTIME LOWEST L _{Aeq} 1 HOUR	51.0	60.4	57.9	47.6	48.1	52.9	62.5	61.6	54.8	48.4	46.4	47.0	42.8	38.9	29.5
DAYTIME HIGHEST L _{Aeq} 1 HOUR	61.7	78.4	76.1	53.1	53.7	60.4	70.6	68.0	69.6	65.8	58.4	54.8	49.0	45.2	36.1
DAYTIME AVERAGE L _{Aeq} 16 HOUR	56.1	71.1	67.1	51.9	52.5	56.9	64.4	65.1	60.2	56.7	51.8	51.5	46.9	46.0	35.1
23:00 - 07:00															
NIGHT TIME LOWEST L _{Aeq} 5 MIN	45.0	47.5	46.0	43.6	44.2	45.6	61.1	61.1	53.2	45.3	41.8	39.6	34.4	29.5	13.2
NIGHT TIME HIGHEST L _{Aeq} 5 MIN	64.3	75.1	71.1	44.8	47.6	70.1	61.6	61.2	53.5	46.2	42.8	42.0	51.5	61.4	36.1
NIGHT TIME AVERAGE L _{Aeq} 8 HOUR	53.8	66.6	62.2	46.7	47.5	57.8	61.8	61.5	53.9	47.6	45.5	45.4	46.5	48.0	28.8

PPG 24 NOISE EXPOSURE CATEGORY

road traffic 07:00 - 23:00 23:00 - 07:00	B B
rail traffic 07:00 - 23:00 23:00 - 07:00	B B
air traffic 07:00 - 23:00 23:00 - 07:00	A B
mixed sources 07:00 - 23:00 23:00 - 07:00	B B

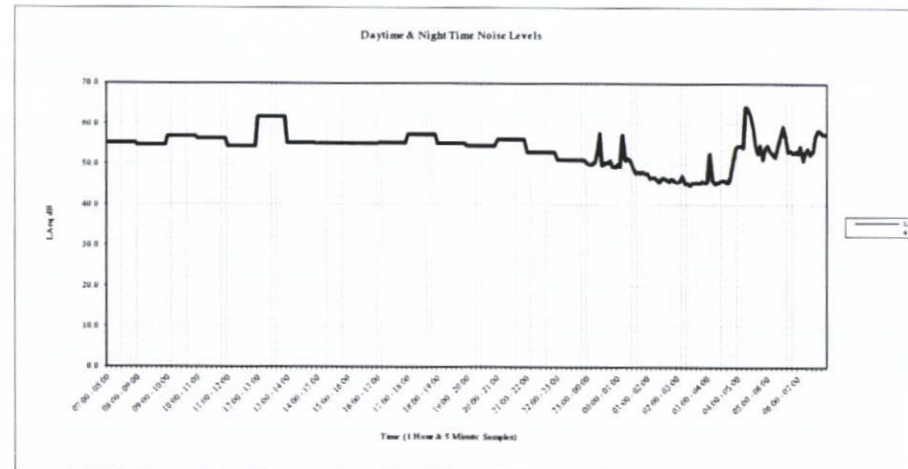


FIGURE 4
PAGE 1

Calculation Sheet BS 8233:1999 (Table 3)

Client	Orchard Homes
Site	Ranelagh Road, Havant
Figure	5

Maximum Criteria	
Daytime	Night Time
35	30

Floor	Typical 1st Floor
Room	Bedroom
	LAeq 16 Hour Daytime 60 dB & 8 Hour Night Time 53 dB

Daytime	MET
Evening	MET

Proposed Window Configuration	4 / 16 / 4 with Greenwood S Vent
--------------------------------------	----------------------------------

Leqff	The equivalent continuous sound pressure level outside the room elements under consideration
A0	The reference absorption area of 10m ² and is independent of frequency
Sf	The total façade area of the room in question
Swi	The area of the windows in the room
Sew	The area of the external wall of the room
Srr	The area of the ceiling of the room (if applicable)
S	The total area of the elements through which sound enters the room
Dne	The insulation value of the trickle ventilator (if applicable)
Rwi	The sound reduction index of the window
Rew	The sound reduction index of the external wall
Rrr	The sound reduction index of the ceiling/roof (if applicable)
A	The equivalent absorption area of the receiving room where $A=0.163V/T$

Formula	$Leq2=Leqff+10\log[A0/S*10^{(-Dne/10)}+Swi/S*10^{(-Rwi/10)}+Sew/10*10^{(-Rew/10)}+Srr/S*10^{(-Rrr/10)}]+10\log(S/A)+3$
----------------	--

	Octave Band Centre Frequency (Hz)						
	63	125	250	500	1000	2000	4000
Sf	8	8	8	8	8	8	8
Sr	18	18	18	18	18	18	18
Swi	1	1	1	1	1	1	1
Sew	7	7	7	7	7	7	7
Srr	18	18	18	18	18	18	18
S	26	26	26	26	26	26	26
A0	10	10	10	10	10	10	10
V	25	25	25	25	25	25	25
T (BS8233)	0.50	0.50	0.50	0.50	0.50	0.50	0.50
A	8	8	8	8	8	8	8
Daytime Leqff	60.2	52.3	52.2	51.4	57.7	49.4	47.7
Night time Leqff	54.8	47.5	46.7	45.7	51.3	41.5	37.7
Dne	45	40	36	34	33	35	39
Rwi	24.4	20.4	20.1	26.5	39.6	42.4	38.9
Rew	36.0	40.0	44.0	45.0	51.0	56.0	60.0
Rrr	22.0	28.0	34.0	40.0	45.0	49.0	53.0

*estimated

Predicted dB(A) Level Within The Above Room During Daytime Hours (07:00-23:00)	L_{Aeq} 16 HOUR	31.1	dB(A)
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Predicted dB(A) Level Within The Above Room During Night Time Hours (23:00-07:00)	L_{Aeq} 8 HOUR	24.9	dB(A)
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Calculation Sheet BS 8233:1999 (Table 3)

Client	Orchard Homes
Site	Ranelagh Road, Havant
Figure	6

Maximum Criteria	
Daytime	Night Time
35	30

Floor	Typical Ground Floor
Room	Lounge
	L _{Aeq} 16 Hour Daytime 60 dB & 8 Hour Night Time 53 dB

Daytime	MET
Evening	MET

Proposed Window Configuration	4 / 16 / 4 with Greenwood S Vent
--------------------------------------	----------------------------------

Leqff	The equivalent continuous sound pressure level outside the room elements under consideration
A0	The reference absorption area of 10m ² and is independent of frequency
Sf	The total façade area of the room in question
Swi	The area of the windows in the room
Sew	The area of the external wall of the room
Srr	The area of the ceiling of the room (if applicable)
S	The total area of the elements through which sound enters the room
Dne	The insulation value of the trickle ventilator (if applicable)
Rwi	The sound reduction index of the window
Rew	The sound reduction index of the external wall
Rrr	The sound reduction index of the ceiling/roof (if applicable)
A	The equivalent absorption area of the receiving room where $A=0.163V/T$

Formula	$Leq2 = Leqff + 10 \log \left[\frac{A0}{S} 10^{(-Dne/10)} + \frac{Swi}{S} 10^{(-Rwi/10)} + \frac{Sew}{S} 10^{(-Rew/10)} + \frac{Srr}{S} 10^{(-Rrr/10)} \right] + 10 \log (S/A) + 3$
----------------	--

	Octave Band Centre Frequency (Hz)						
	63	125	250	500	1000	2000	4000
Sf	10	10	10	10	10	10	10
Sr	0	0	0	0	0	0	0
Swi	2	2	2	2	2	2	2
Sew	8	8	8	8	8	8	8
Srr	0	0	0	0	0	0	0
S	10	10	10	10	10	10	10
A0	10	10	10	10	10	10	10
V	40	40	40	40	40	40	40
T (BS8233)	0.50	0.50	0.50	0.50	0.50	0.50	0.50
A	13	13	13	13	13	13	13
Daytime Leqff	60.2	52.3	52.2	51.4	57.7	49.4	47.7
Night time Leqff	54.8	47.5	46.7	45.7	51.3	41.5	37.7
Dne	45	40	36	34	33	35	39
Rwi	24.4	20.4	20.1	26.5	39.6	42.4	38.9
Rew	36.0	40.0	44.0	45.0	51.0	56.0	60.0
Rrr	22.0	28.0	34.0	40.0	45.0	49.0	53.0

*estimated

Predicted dB(A) Level Within The Above Room During Daytime Hours (07:00-23:00)	L_{Aeq} 16 HOUR	28.7	dB(A)
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Predicted dB(A) Level Within The Above Room During Night Time Hours (23:00-07:00)	L_{Aeq} 8 HOUR	22.4	dB(A)
---	-------------------------------	-------------	--------------