Sound Advice
ACOUSTICS LTD

REPORT REFERENCE:

SA – 5824/5

ENVIRONMENTAL NOISE IMPACT ASSESSMENT

ProPG Planning and Noise

British Standard 8233: 2014

World Health Organisation (WHO)

CLIENT:

Cove Construction Ltd, Peter Catt, Neill Catt and Vincent Catt

SITE:

Liss Forest Nursery

Petersfield Road

Liss

Hampshire

GU33 6HA

SURVEY DATES:

12th – 17th December 2018

Report By [redacted]

Mr. B. J. Scrivener MIOA.

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1 EXECUTIVE SUMMARY

1.1 Instruction

Sound Advice Acoustics Ltd have been instructed by Cove Construction Ltd, Peter Catt, Neill Catt and Vincent Catt to undertake a background noise survey to British Standard 8233: 2014 to determine the impact of existing noise sources on the proposed accommodation scheme at Liss Forest Nursery, Petersfield Road, Liss, Hampshire, GU33 6HA, which will consist of a Development of 37 dwellings (including affordable homes), alterations to existing access onto Petersfield Road, hard and soft landscaping, drainage and all other associated development works.

1.2 Scope of Report

The measurements will be undertaken in accordance with ISO 1996 – Part 2: 2007 to determine the existing background noise levels and British Standard 8233: 2014 will be used to determine the impact of existing traffic on the internal noise environment within the proposed residential dwellings. This report aims to establish the following:

- Existing background noise levels within the area;
- Assess the potential internal noise levels on the proposed rooms;
- Provide specifications for the ventilation and window glazing with the proposed rooms.

1.3 Summary of Results

1.3.1 Background Noise Levels

A background noise survey was undertaken from 12th – 17th December 2018 at one position at the front of site in order to establish the underlying background noise levels. The maximum day time levels were found to be $L_{Aeq,\ 16\ hour}$ 67.7 dB and the maximum night time levels were found to be $L_{Aeq,\ 8\ hours}$ 56.2 dB at position 1.

Assessment Position	Date Start	Date Finish	Daytime LAeq	Night Time LAeq
Position 1 Front	28/06/2018	03/07/2018	67.7	56.2

1.4 Potential Façade Noise Levels

1.4.1 Daytime (07:00-23:00)

Time Period	Highest Potential Façade Noise Level	Noise Risk Category 1 - Low
Average Daytime (07:00-23:00)	$L_{Aeq,\ 16\ HOUR}$ 60 dB	50 – 63 dB

1.4.2 Night Time (23:00-07:00)

Time Period	Highest Potential Façade Noise Level	Noise Risk Category 3 - High
Average Night Time (23:00-07:00)	$L_{Aeq,\ 16\ HOUR}$ 49 dB	40 – 55 dB
	Maximum (10 Times) – L_{Amax} 77 dB	>80 dB (10 Times in 8 Hours)

1.5 Risk Assessment

1.5.1 Daytime (07:00-23:00)

Risk Assessment Category	Risk Assessment
1 - Low	At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.

1.5.2 Night Time (23:00-07:00)

Risk Assessment Category	Risk Assessment
1 - Low	At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.

The above table demonstrates this site is located within Noise Risk Category 1 which suggests a low level of risk for daytime and night time levels. Therefore, further mitigation levels will be required at Stage 2.

1.6 CONCLUSION

The development should be designed with a 4mm glass / 16mm air gap / 4mm glass double glazed windows and an acoustic through frame slot vent to all rooms with daytime noise levels above $L_{Aeq\ 16\ HOUR}$ 60 dB Daytime and $L_{Aeq\ 8\ HOUR}$ 52 dB Night Time. The remaining development should be designed with a 4mm glass / 16mm air gap / 4mm glass double glazed windows and a standard through frame slot vent to all other rooms to ensure the internal noise levels are acceptable in terms of the assessment to British Standard 8233: 2014.

The guideline has been considered acceptable criteria for this assessment given the sites geographical location and proximity to a major trunk road. The layout has been designed in order to allow for acoustics and minimise the noise levels within the outdoor living spaces. The above calculation demonstrates the external living spaces surrounding the houses are likely to see a small number of the noise levels below the upper guideline of 55 dB, with the majority of the houses below the lower guideline of 50 dB.

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 council's requirements.

National Planning Policy Framework 2018 suggests that planning permission should be granted unless any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in the framework taken as a whole, or specific policies in the framework indicate the application should be restricted.

Based on the calculations and assessments made within this report it is the professional opinion of Sound Advice Acoustics Ltd that the proposed development can demonstrate compliance with the National Planning Policy Framework 2018, NPPF & NPSE and that, with regards to sound, planning permission can be granted.

2 INTRODUCTION

Sound Advice Acoustics Ltd have been instructed by Cove Construction Ltd, Peter Catt, Neill Catt and Vincent Catt to undertake a background noise survey to British Standard 8233: 2014 to determine the impact of existing noise sources on the proposed accommodation scheme at Liss Forest Nursery, Petersfield Road, Liss, Hampshire, GU33 6HA, which will consist of a Development of 37 dwellings (including affordable homes), alterations to existing access onto Petersfield Road, hard and soft landscaping, drainage and all other associated development works.

Ambient noise levels were measured between 12th – 17th December 2018. This report by Sound Advice Acoustics Ltd gives the results of these measurements and an assessment in accordance with government planning guidelines and relevant standards together with mitigation measures as required.

With regards to external ambient noise, environmental noise levels are be monitored at the site in accordance with British Standard 7445: 2003 'Description and measurement of environmental noise assessments and assessments made in-line with ProPG: Planning and Noise.

2.1 Planning Practice Guidance and Noise

March 2014 saw the publication of the Planning Practice Guidance for Noise (PPG-Noise) and this was subsequently updated in December 2014. The Planning Practice Guidance and Noise sets out details of how potential noise impacts should be evaluated.

'Local planning authorities' plan-making and decision taking should take account of the acoustic environment and in doing so consider:

- ✓ *whether or not a significant adverse effect is occurring or likely to occur;*
- ✓ *whether or not an adverse effect is occurring or likely to occur; and*
- ✓ *whether or not a good standard of amenity can be achieved.*

In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation. As noise is a complex technical issue, it may be appropriate to seek experienced specialist assistance when applying this policy.'

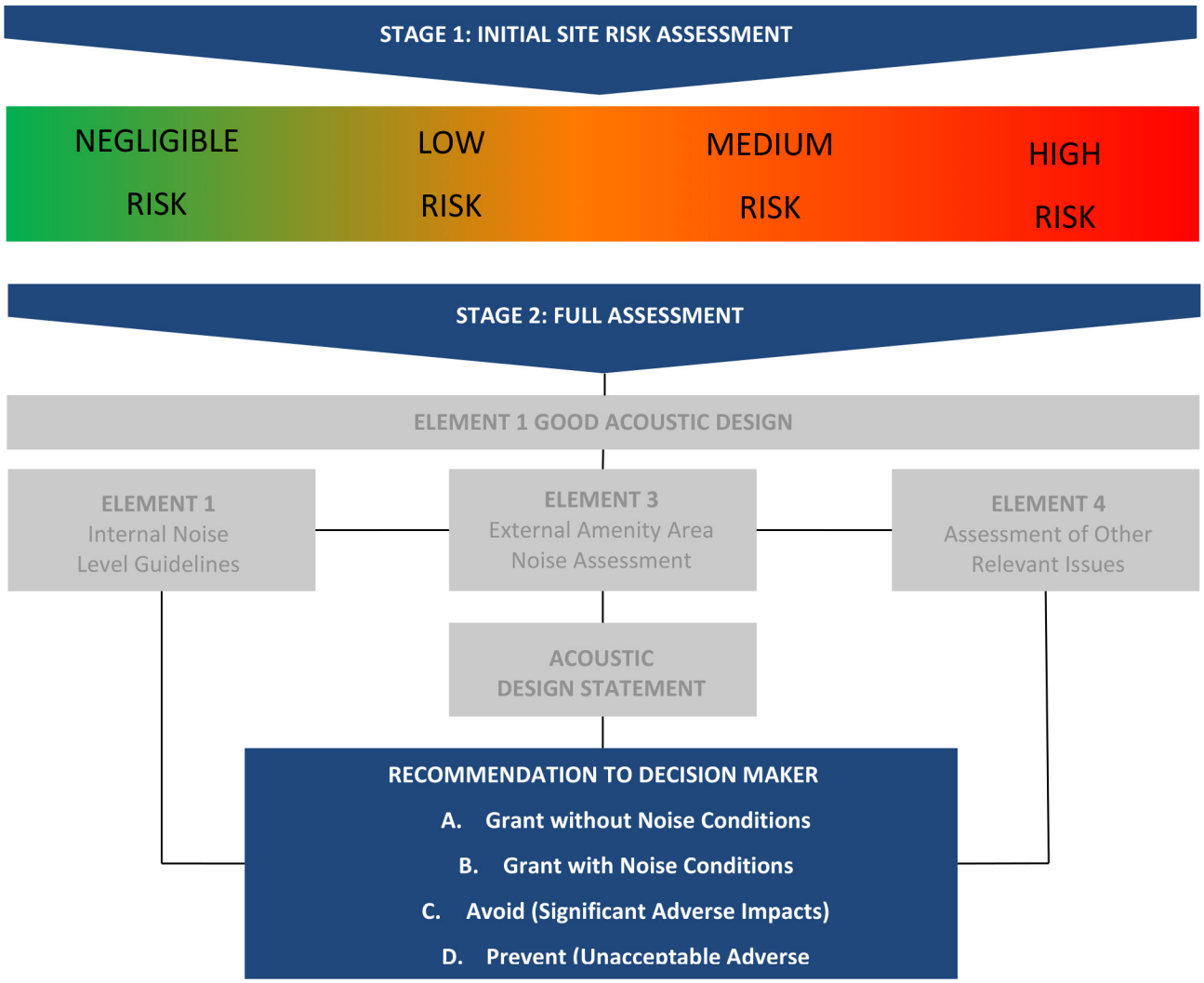
In accordance with Stage 2: Full Assessment, Other Noise Sources, detailed calculations and assessments should be carried out pertaining to these as PPG Noise does not provide advice and guidance when taking these elements into consideration.

2.1.1 Professional Practice Guidance on Planning & Noise.

The Professional Practice Guidance (ProPG) on Planning and Noise for New Residential Development was published in May 2017 by the Association of Noise Consultants (ANC), Institute of Acoustics (IOA) and Chartered Institute of Environmental Health (CIEH). This document was developed in order to offer professional guidance on recommended strategies to the management of noise for use in the associated planning applications for specific sites. This furthermore, provides a numerical acoustic standard in accordance with the Government's planning and noise policies.

This document has been developed to ensure the developer adopts a good acoustic design process to ensure protection for future residents from the potential harmful effects from noise. The ProPG denotes that it *'does not constitute an official government code of practice and neither replaces nor provides an authoritative interpretation of the law or government policy on which users should take their own advice as appropriate'.*

The ProPG adopts a twin-stage approach, firstly providing an 'Initial Noise Risk Assessment' of the proposed development site before undertaking a detailed approach of a noise impact assessment. The results from the initial noise risk assessment are an indication of the general acoustic environment of the proposed development and demonstrate how detailed the noise impact assessment will need to be in order to mitigate any acoustic issues.



2.2 British Standard 8233: 2014

Calculations are to be made in accordance with BS 8233: 2014 Sound Insulation and Noise Reduction for Buildings Code of Practice.

BS 8233: 2014 set the following parameters as target levels that should be designed to within rooms such as Living Rooms and Bedrooms.

Indoor ambient noise levels in spaces when they are unoccupied and privacy is also important		
Objective	**Typical situations**	**Design Range $L_{Aeq,t}$ dB**
Typical noise levels for acoustic privacy in shared spaces	Living room	35 – 40
NOTE: See Noise control in building services [28] and BS EN ISO 3382.		

Indoor ambient noise levels for dwellings			
Activity	**Location**	**07:00 – 23:00**	**23:00 – 07:00**
Resting	Living Room	35 dB $L_{Aeq\ 16\ HOUR}$	--
Dining	Dining Room / Area	40 dB $L_{Aeq\ 16\ HOUR}$	--
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq\ 16\ HOUR}$	30 dB $L_{Aeq\ 8\ HOUR}$

Calculations and assessments are therefore to be carried out in order to satisfy the above requirements of BS8233: 2014.

2.3 National Planning Policy Framework 2018 (NPPF) and Noise Policy Statement for England 2010 (NPSE).

References and evaluations are to be made to the National Planning Policy Framework 2018 (NPPF) and the Noise Policy Statement for England 2010 (NPSE). The purpose of this document is to include all aspects of environmental noise within assessments i.e. environmental noise, neighbour noise and neighbourhood noise. Noise is to be considered alongside other relevant issues relating to the site and should not be considered in isolation, according to the NPSE.

There are several key phrases within the NPSE aims and these are discussed below.

2.3.1 "Significant adverse" and "adverse"

There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

2.3.2 NOEL – No Observed Effect Level

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

2.3.3 LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.
Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

2.3.4 SOAEL – Significant Observed Adverse Effect Level

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

It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.

2.4 World Health Organisation 'Guidelines for Community Noise'

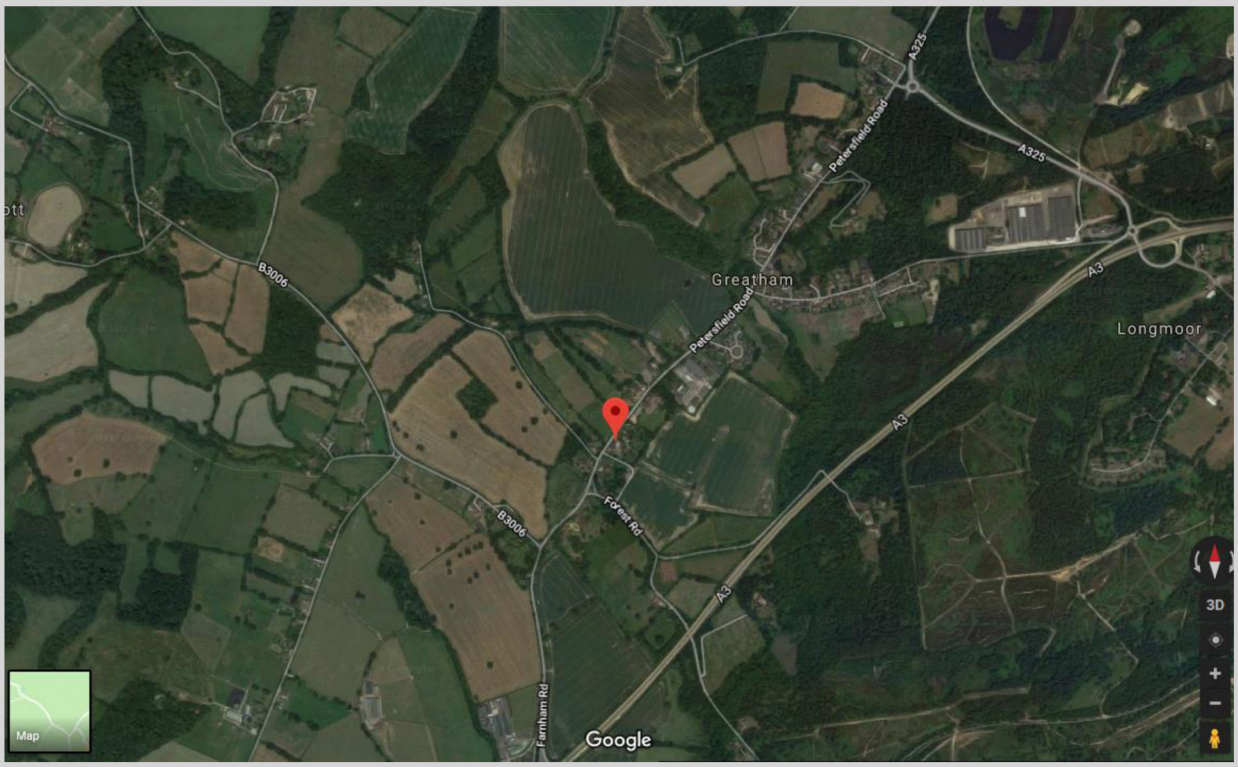
In addition, calculations are to be made for the predicted daytime noise levels within the outdoor living area and assessments made against the recommended levels within the World Health Organisation's 'Guidelines for Community Noise'. In order to evaluate these levels accurately, the 3D modelling software CADNA A is to be adopted for the purpose of this assessment.

Finally, assessments and references are to be made to the World Health Organisation Night Time Noise Guidance 2009.

3 SITE LOCATION

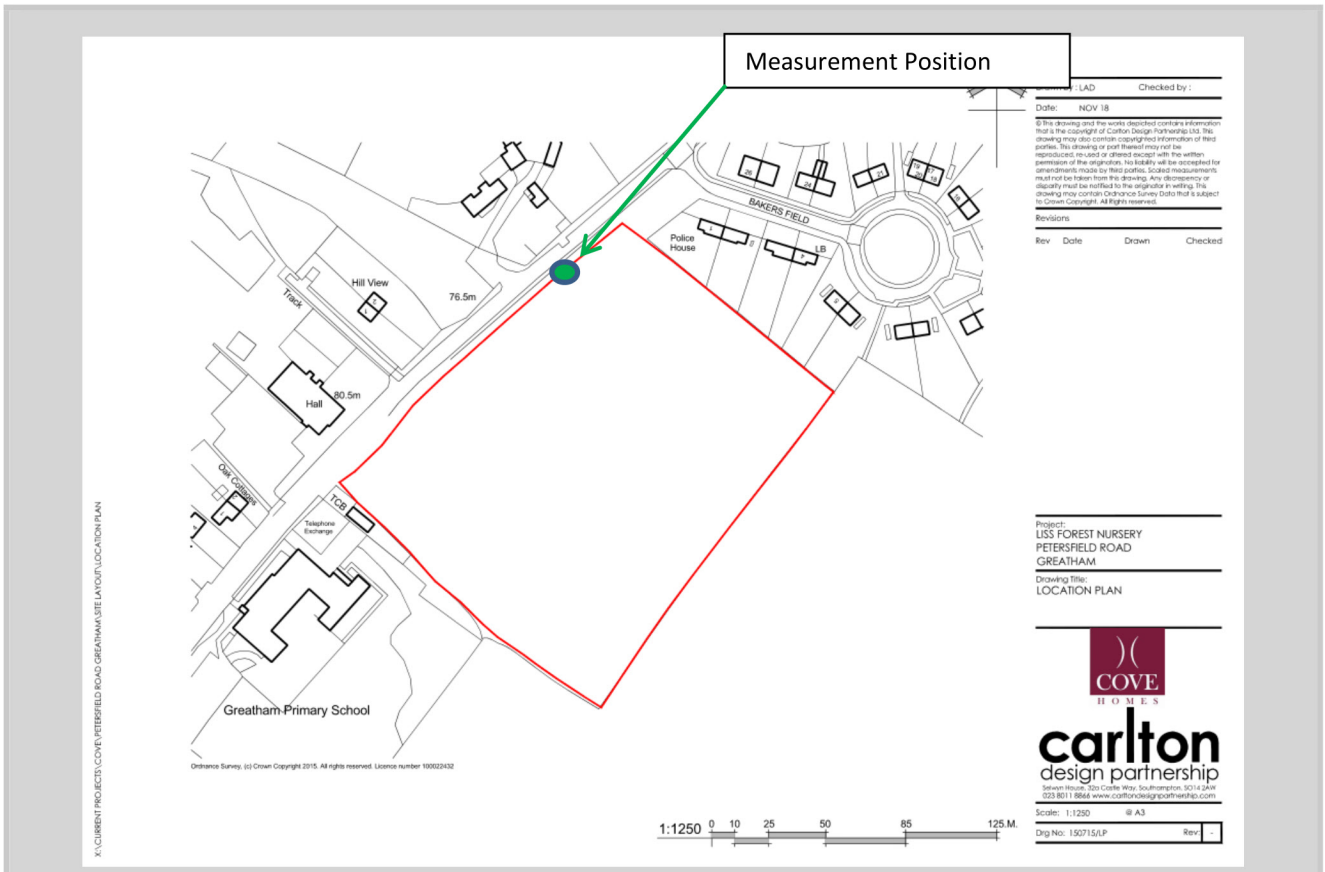
Position of Site in Wider Area

The site is located in Liss. The dominant noise source is road traffic noise.



3.1 Proposed Development

The proposed development is shown below.



4 PROCEDURE

External noise levels were recorded over a typical period and analysis date extrapolated between 07:00 hrs 12th December 2018 and 07:00 hrs on 17th December 2018 at position 1 as detailed on the attached plan sketch layout.

Position 1 was located at the Western boundary of the site in order to capture the noise levels associated with the main road. Sample measurements were recorded over continuous 15 minute samples and from this data the hourly LAeq daytime values have been evaluated. 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		Night Time 23:00 – 07:00	
$L_{Aeq\ 1\ HOUR}$ dB	$L_{A10\ 1\ HOUR}$ dB	$L_{Aeq\ 15\ MINUTES}$ dB	$L_{A10\ 15\ MINUTES}$ dB
$L_{AMAX\ 1\ HOUR}$ dB	$L_{A50\ 1\ HOUR}$ dB	$L_{AMAX\ 15\ MINUTES}$ dB	$L_{A50\ 15\ MINUTES}$ dB
$L_{AMIN\ 1\ HOUR}$ dB	$L_{A90\ 1\ HOUR}$ dB	$L_{AMIN\ 15\ MINUTES}$ dB	$L_{A90\ 15\ MINUTES}$ dB

Calculations have been made in accordance with BS 8233: 2014 '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, the daytime and night time periods were assessed and used within the above calculations as $L_{Aeq\ 16\ HOUR}$ dB levels for daytime and $L_{Aeq\ 8\ HOUR}$ dB levels for night time. These are detailed within this report. All data averaged throughout the day has been done so on a logarithmic basis to give accurate $L_{Aeq\ 16\ Hour}$ dB daytime and $L_{Aeq\ 8\ Hour}$ dB night time noise levels.

Finally, it should be noted that calculations are carried out with façade levels corrected from the recorded noise levels to the calculated façade levels.

5 APPARATUS

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

All the following equipment was calibrated 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.

5.1 118 noise meter s/n 11831471 environmental testing

Description	Make	Type	Serial No.	Calibration Intervals	Last Calibrated	Next Due Calibration
Integrated Sound Level Meter	Norsonic	118	31632	2 YEARS	01.05.2018	01.05.2020
12.5mm Microphone (with windshield)	Norsonic	1225	91720	2 YEARS	01.05.2018	01.05.2020
Microphone Pre – Amplifier	Norsonic	1201	29307	2 YEARS	01.05.2018	01.05.2020

Full calibration certificates are available upon request.

6 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.

6.1 Downloaded results, and averages.

6.1.1 Position 1 – Front

12th – 13th December 2018			Octave Band Centre Frequency (Hz)									
Date / Time	**LAeq**	**LAmax**	**31.5**	**63**	**125**	**250**	**500**	**1.0k**	**2.0k**	**4.0k**	**8.0k**	**16.0k**
DAYTIME 07:00 - 23:00 LAeq 16 HOUR & Corresponding LAmax 16 HOUR	64.7	89.1	61.7	66.3	59.1	52.9	54.1	60.0	59.3	57.4	43.7	33.8
NIGHT TIME 23:00 - 07:00 LAeq 8 HOUR & Corresponding LAmax 8 HOUR	55.4	81.3	54.7	55.4	51.6	47.8	45.5	51.3	50.0	46.2	30.6	16.6

13th – 14th December 2018			Octave Band Centre Frequency (Hz)									
Date / Time	**LAeq**	**LAmax**	**31.5**	**63**	**125**	**250**	**500**	**1.0k**	**2.0k**	**4.0k**	**8.0k**	**16.0k**
DAYTIME 07:00 - 23:00 LAeq 16 HOUR & Corresponding LAmax 16 HOUR	64.3	84.9	62.5	66.9	60.4	53.7	54.8	60.0	59.0	55.8	40.8	25.9
NIGHT TIME 23:00 - 07:00 LAeq 8 HOUR & Corresponding LAmax 8 HOUR	56.2	80.8	52.5	57.1	47.8	43.9	46.0	52.4	51.1	46.5	29.7	15.4

14th – 15th December 2018			Octave Band Centre Frequency (Hz)									
Date / Time	**LAeq**	**LAmax**	**31.5**	**63**	**125**	**250**	**500**	**1.0k**	**2.0k**	**4.0k**	**8.0k**	**16.0k**
DAYTIME 07:00 - 23:00 LAeq 16 HOUR & Corresponding LAmax 16 HOUR	64.9	83.1	61.7	66.5	60.4	54.0	55.1	60.6	59.7	56.4	40.7	24.6
NIGHT TIME 23:00 - 07:00 LAeq 8 HOUR & Corresponding LAmax 8 HOUR	54.9	80.9	57.6	54.6	49.0	44.8	45.0	50.5	49.7	46.7	32.9	25.3

15th – 16th December 2018			Octave Band Centre Frequency (Hz)									
Date / Time	**LAeq**	**LAmax**	**31.5**	**63**	**125**	**250**	**500**	**1.0k**	**2.0k**	**4.0k**	**8.0k**	**16.0k**
DAYTIME 07:00 - 23:00 LAeq 16 HOUR & Corresponding LAmax 16 HOUR	67.7	83.1	66.3	64.6	58.1	53.5	54.0	59.3	61.1	63.9	50.2	35.0
NIGHT TIME 23:00 - 07:00 LAeq 8 HOUR & Corresponding LAmax 8 HOUR	52.8	78.2	50.6	52.8	44.6	40.3	41.8	48.1	47.4	45.9	31.7	15.9

16th – 17th December 2018			Octave Band Centre Frequency (Hz)									
Date / Time	**LAeq**	**LAmax**	**31.5**	**63**	**125**	**250**	**500**	**1.0k**	**2.0k**	**4.0k**	**8.0k**	**16.0k**
DAYTIME 07:00 - 23:00 LAeq 16 HOUR & Corresponding LAmax 16 HOUR	65.4	92.1	60.9	63.8	56.4	51.1	52.3	58.3	59.0	61.0	48.9	31.6
NIGHT TIME 23:00 - 07:00 LAeq 8 HOUR & Corresponding LAmax 8 HOUR	56.0	81.4	51.7	54.4	49.0	42.6	43.9	51.4	51.0	48.5	33.4	17.7

The following noise levels have been corrected for the highest recorded façade levels and used within the BS 8233: 2014 calculations

12th – 17th December 2018			Octave Band Centre Frequency (Hz)									
Date / Time	**LAeq**	**LAmax**	**31.5**	**63**	**125**	**250**	**500**	**1.0k**	**2.0k**	**4.0k**	**8.0k**	**16.0k**
DAYTIME 07:00 - 23:00 LAeq 16 HOUR & Corresponding LAmax 16 HOUR	67.7	83.1	66.3	64.6	58.1	53.5	54.0	59.3	61.1	63.9	50.2	35.0
NIGHT TIME 23:00 - 07:00 LAeq 8 HOUR & Corresponding LAmax 8 HOUR	56.2	80.8	52.5	57.1	47.8	43.9	46.0	52.4	51.1	46.5	29.7	15.4

7 ProPG PLANNING & NOISE STAGE 1

7.1 Stage 1: Initial Site Noise Risk Assessment

The Stage 1, Initial Noise Risk Assessment, compares the recorded ambient noise levels obtained from the acoustic survey and correlates these against the risk scale within the Pro PG Document in order to evaluate any potential adverse effects the site is currently exposed to with regards to noise.

The outcome of the Stage 1 assessment will determine the level of detail required within Stage 2 in order to demonstrate suitable mitigations can be introduced to ensure continuing compliance with the relevant standards, local planning policies and Pro PG.

The following table demonstrates the Initial Risk Assessment Noise Levels as detailed within ProPG Figure.1:-

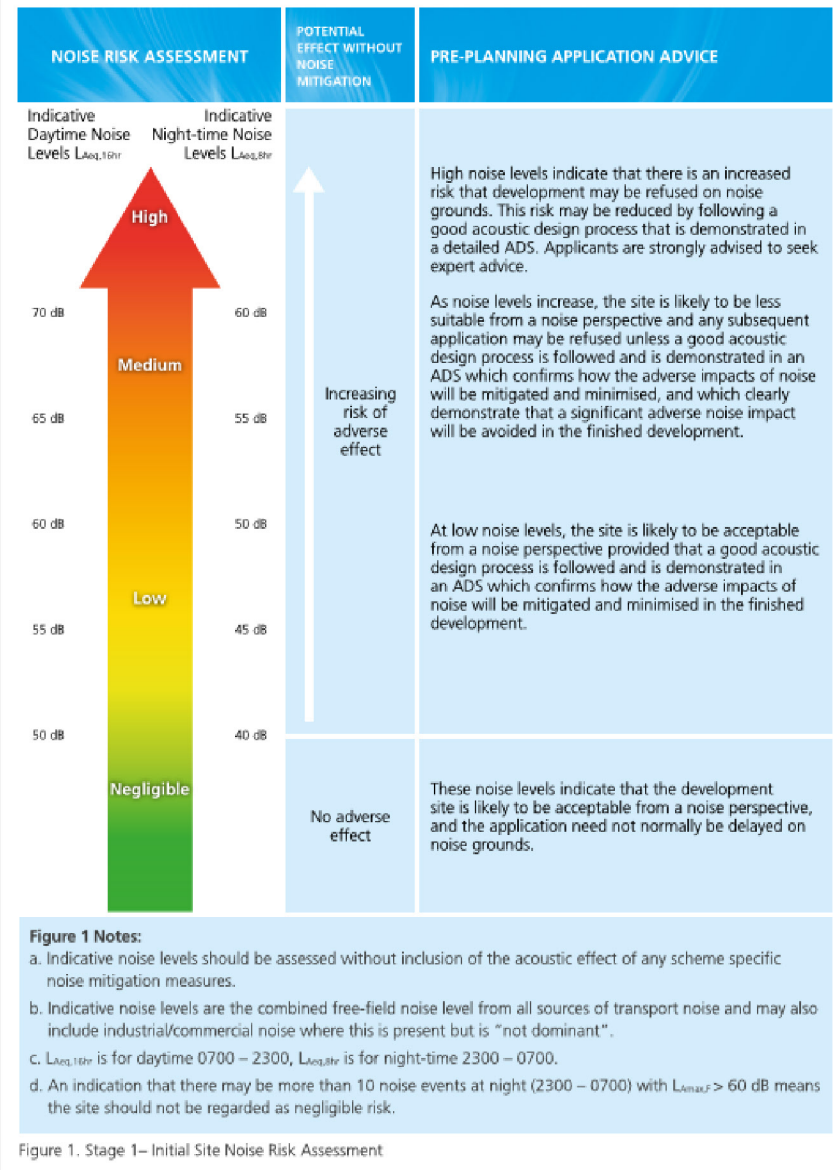


Figure 1. Stage 1– Initial Site Noise Risk Assessment

Noise Risk Category	0 – Negligible	1 – Low	2 – Medium	3 - High
Average Daytime	<50 dB	50 – 63 dB	63 – 70 dB	>70 dB
Average Night Time	<40 dB	40 – 55 dB	55 – 60 dB	>60 dB
Maximum Night Time			>80 dB (10 Times in 8 Hours)	

Based on the data collected from the aforementioned noise survey, the following ProPG Stage 1 assessments can be made:-

7.2 Potential Façade Noise Levels

7.2.1 Daytime (07:00-23:00)

Time Period	Highest Potential Façade Noise Level	Noise Risk Category 1 - Low
Average Daytime (07:00-23:00)	$L_{Aeq,\ 16\ HOUR}$ 60 dB	50 – 63 dB

7.2.2 Night Time (23:00-07:00)

Time Period	Highest Potential Façade Noise Level	Noise Risk Category 3 - High
Average Night Time (23:00-07:00)	$L_{Aeq,\ 16\ HOUR}$ 49 dB	40 – 55 dB
	Maximum (10 Times) – L_{Amax} 77 dB	>80 dB (10 Times in 8 Hours)

7.3 Risk Assessment

7.3.1 Daytime (07:00-23:00)

Risk Assessment Category	Risk Assessment
1 - Low	At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.

7.3.2 Night Time (23:00-07:00)

Risk Assessment Category	Risk Assessment
1 - Low	At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.

The above table demonstrates this site is located within Noise Risk Category 1 which suggests a low level of risk for daytime and night time levels. Therefore, further mitigation levels will be required at Stage 2.

8 ProPG PLANNING & NOISE STAGE 2 - ELEMENT 1 – GOOD ACOUSTIC DESIGN

Given the size and orientation of the proposed site, it is recommended that the developer adopt, where practically possible, a good acoustic design which should include careful consideration of the positioning of the proposed properties together with thoughts being taken as to internal layouts to minimise noise sensitive rooms facing onto dominant noise sources within the local areas.

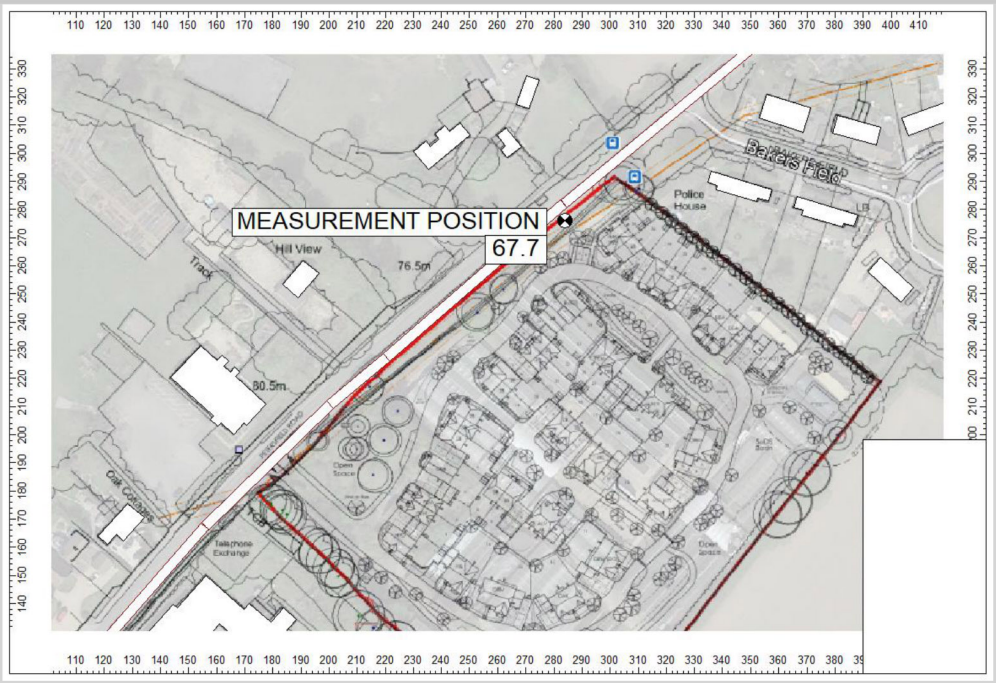
EXISTING PROPOSED INTERNAL LAYOUT

9 ELEMENT 2 – INTERNAL NOISE LEVEL GUIDELINES

9.1 Discussion of Results

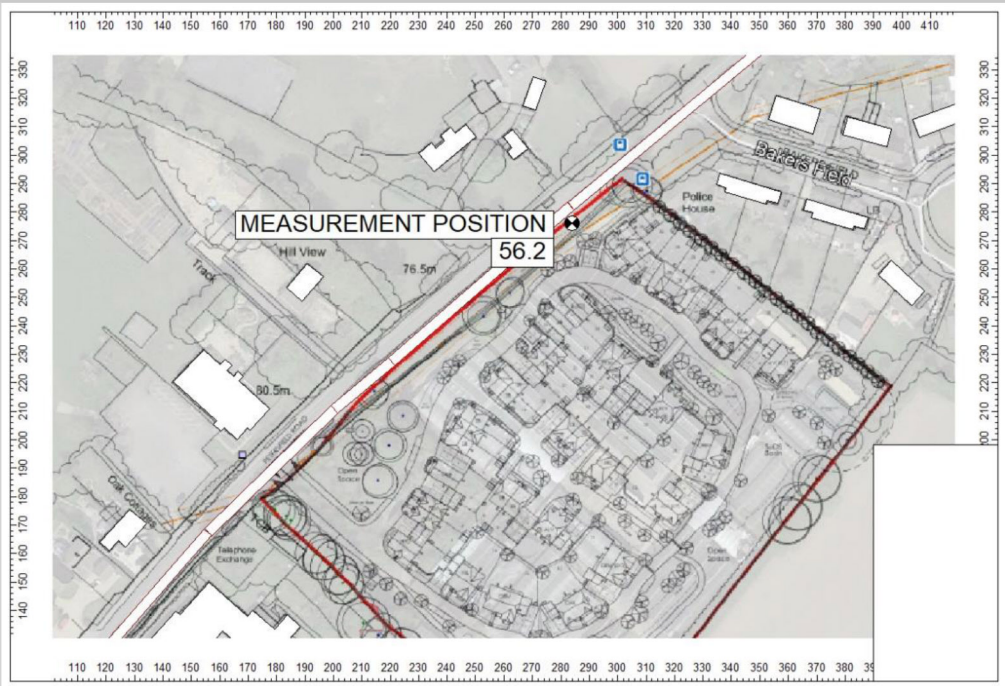
It can be seen from the attached graph and downloaded results that the external noise levels have followed the expected path and remained fairly constant throughout the day. The levels then gradually dropped off as the evening progressed and began to rise when morning traffic levels increased.

9.2 Existing Noise Levels – Daytime (07:00 – 23:00)



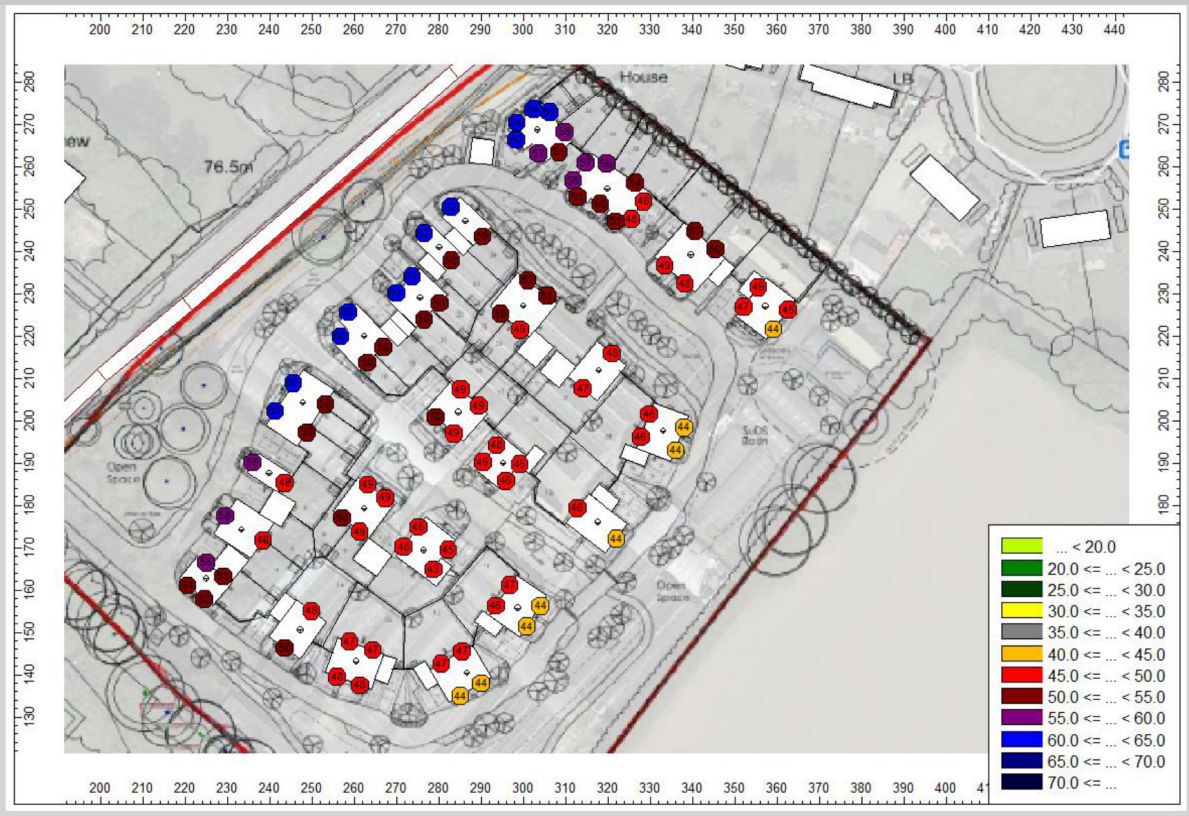
Daytime prior to development

9.3 Existing Noise Levels – Night Time (23:00 – 07:00)



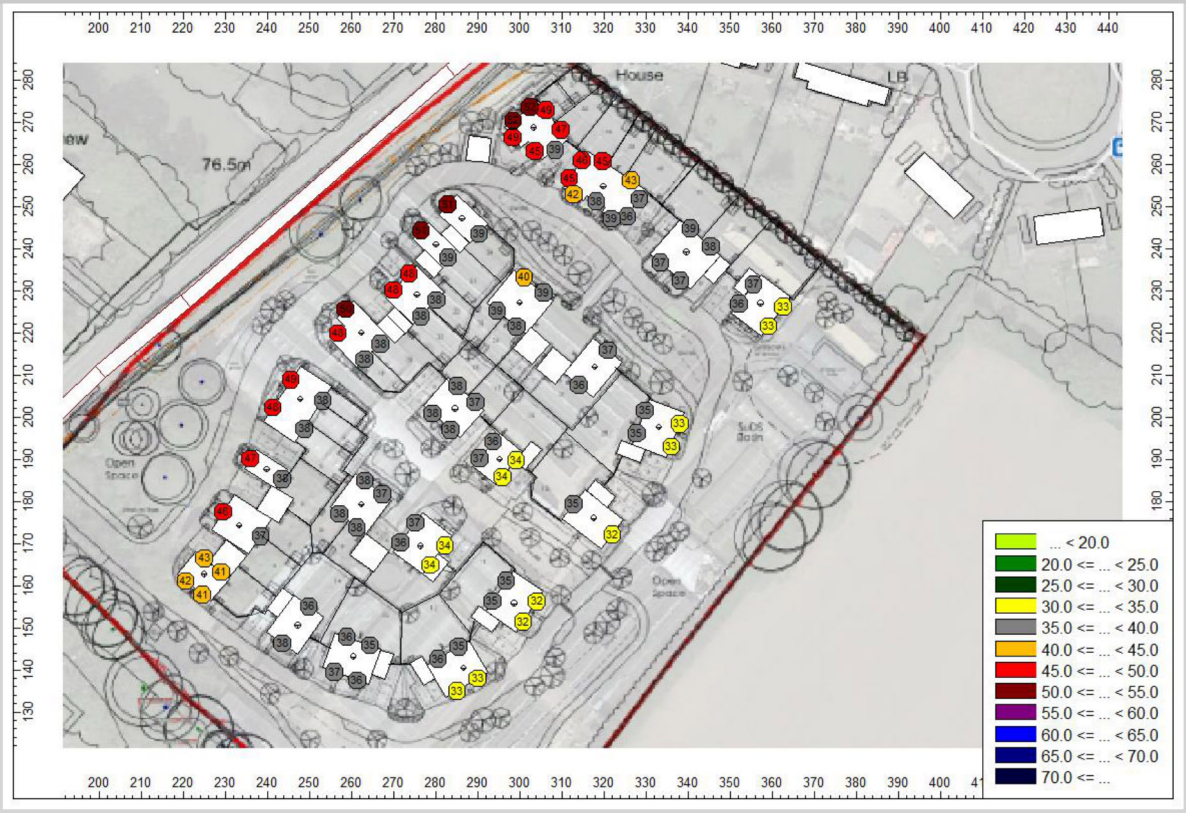
Night time prior to development

9.4 Proposed Noise levels – Daytime (07:00 – 23:00)



Daytime post development

9.5 Proposed Noise levels – Night Time (23:00 – 07:00)



Daytime post development

9.6 Recommendations

For the purpose of this assessment, the corresponding façade levels will be used within the BS 8233: 2014 calculations in order evaluate the worst case scenario and select the correct window specification.

Therefore, in order to achieve the required noise levels of $L_{Aeq\ 16\ HOUR}$ 35 dB for habitable rooms daytime and $L_{Aeq\ 8\ HOUR}$ 30 dB for Bedroom at night within the proposed, the following additional acoustic measures have been calculated.

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. Inputted levels into the calculation sheets have been corrected for distance attenuation and free field in accordance with the aforementioned British Standard.

9.7 Calculation Procedure to BS 8233: 2014

The following calculations have been carried out in order to determine the required window and ventilation specification in order to meet the requirements of BS 8233: 2014.

9.8 Ground Floor Lounge Façade Level above Daytime 60 dB & Night Time 49 dB

Proposed Window Configuration					**4 / 16 / 4 with acoustic slot frame slot vent**	
Façade corrected to daytime 64 dB & night time 52 dB						
Leqff	*The equivalent continuous sound pressure level outside the room elements under consideration*					
A0	*The reference absorption area of 10m2 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+10log[A0/S*10^(-Dne/10)+Swi/S*10^(-Rwi/10)+Sew/10*10^(-Rew/10)+Srr/S*10^(-Rrr/10)] +10log(S/A) +3					
	Octave Band Centre Frequency (Hz)					
	125	**250**	**500**	**1000**	**2000**	**4000**
Sf	10	10	10	10	10	10
Sr	0	0	0	0	0	0
Swi	2	2	2	2	2	2
Sew	8	8	8	8	8	8
Srr	0	0	0	0	0	0
S	10	10	10	10	10	10
A0	10	10	10	10	10	10
V	29	29	29	29	29	29
T (BS8233)	0.50	0.50	0.50	0.50	0.50	0.50
A	9.3	9.3	9.3	9.3	9.3	9.3
Daytime Leqff	54.1	49.5	50.0	55.3	57.1	59.9
Night time Leqff	43.8	39.9	42.0	48.4	47.1	42.5
Dne	39.0	39.5	37.0	36.0	39.0	36.0
Rwi	21.1	19.7	31.1	38.2	41.3	38.7
Rew	40.0	44.0	45.0	51.0	56.0	56.0
Rrr	28.0	34.0	40.0	45.0	49.0	49.0

Predicted dB(A) Level Within The Above Room During Daytime Hours (07:00-23:00)	$L_{Aeq\ 16\ HOUR}$	**31.0**	**dB(A)**
Predicted dB(A) Level Within The Above Room During Night Time Hours (23:00-07:00)	$L_{Aeq\ 8\ HOUR}$	**19.6**	**dB(A)**

9.9 First Floor Bedroom Façade Level above Daytime 60 dB & Night Time 49 dB

Proposed Window Configuration	**4 / 16 / 4 with 4 / 16 / 4 with acoustic slot frame slot vent**
Façade corrected to daytime 63 dB & night time 52 dB	
Leqff	*The equivalent continuous sound pressure level outside the room elements under consideration*
A0	*The reference absorption area of 10m2 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+10log[A0/S*10^(-Dne/10)+Swi/S*10^(-Rwi/10)+Sew/10*10^(-Rew/10)+Srr/S*10^(-Rrr/10)] +10log(S/A) +3

	Octave Band Centre Frequency (Hz)					
	125	**250**	**500**	**1000**	**2000**	**4000**
Sf	7	7	7	7	7	7
Sr	9	9	9	9	9	9
Swi	1.6	1.6	1.6	1.6	1.6	1.6
Sew	5.4	5.4	5.4	5.4	5.4	5.4
Srr	9	9	9	9	9	9
S	16	16	16	16	16	16
A0	10	10	10	10	10	10
V	22	22	22	22	22	22
T (BS8233)	0.50	0.50	0.50	0.50	0.50	0.50
A	7.0	7.0	7.0	7.0	7.0	7.0
Daytime Leqff	54.1	49.5	50.0	55.3	57.1	59.9
Night time Leqff	43.8	39.9	42.0	48.4	47.1	42.5
Dne	39.0	39.5	37.0	36.0	39.0	36.0
Rwi	21.1	19.7	31.1	38.2	41.3	38.7
Rew	40.0	44.0	45.0	51.0	56.0	56.0
Rrr	28.0	34.0	40.0	45.0	49.0	49.0

Predicted dB(A) Level Within The Above Room During Daytime Hours (07:00-23:00)	$L_{Aeq\ 16\ HOUR}$	**32.4**	**dB(A)**
Predicted dB(A) Level Within The Above Room During Night Time Hours (23:00-07:00)	$L_{Aeq\ 8\ HOUR}$	**21.1**	**dB(A)**

9.10 Ground Floor Lounge

Proposed Window Configuration	**4 / 16 / 4 with standard through frame slot vent**
Façade corrected to daytime 60 dB & night time 49 dB	
Leqff	*The equivalent continuous sound pressure level outside the room elements under consideration*
A0	*The reference absorption area of 10m2 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+10log[A0/S*10^(-Dne/10)+Swi/S*10^(-Rwi/10)+Sew/10*10^(-Rew/10)+Srr/S*10^(-Rrr/10)] +10log(S/A) +3

	Octave Band Centre Frequency (Hz)					
	125	**250**	**500**	**1000**	**2000**	**4000**
Sf	10	10	10	10	10	10
Sr	0	0	0	0	0	0
Swi	2	2	2	2	2	2
Sew	8	8	8	8	8	8
Srr	0	0	0	0	0	0
S	10	10	10	10	10	10
A0	10	10	10	10	10	10
V	29	29	29	29	29	29
T (BS8233)	0.50	0.50	0.50	0.50	0.50	0.50
A	9.3	9.3	9.3	9.3	9.3	9.3
Daytime Leqff	50.1	45.5	46.0	51.3	53.1	55.9
Night time Leqff	40.8	36.9	39.0	45.4	44.1	39.5
Dne	33.0	32.0	29.0	29.0	31.0	33.0
Rwi	21.1	19.7	31.1	38.2	41.3	38.7
Rew	40.0	44.0	45.0	51.0	56.0	56.0
Rrr	28.0	34.0	40.0	45.0	49.0	49.0

Predicted dB(A) Level Within The Above Room During Daytime Hours (07:00-23:00)	$L_{Aeq\ 16\ HOUR}$	**31.7**	**dB(A)**
Predicted dB(A) Level Within The Above Room During Night Time Hours (23:00-07:00)	$L_{Aeq\ 8\ HOUR}$	**22.6**	**dB(A)**

9.11 First Floor Bedroom

Proposed Window Configuration	**4 / 16 / 4 with standard through frame slot vent**
Façade corrected to daytime 60 dB & night time 49 dB	
Leqff	*The equivalent continuous sound pressure level outside the room elements under consideration*
A0	*The reference absorption area of 10m2 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+10log[A0/S*10^(-Dne/10)+Swi/S*10^(-Rwi/10)+Sew/10*10^(-Rew/10)+Srr/S*10^(-Rrr/10)] +10log(S/A) +3

	Octave Band Centre Frequency (Hz)					
	125	**250**	**500**	**1000**	**2000**	**4000**
Sf	7	7	7	7	7	7
Sr	9	9	9	9	9	9
Swi	1.6	1.6	1.6	1.6	1.6	1.6
Sew	5.4	5.4	5.4	5.4	5.4	5.4
Srr	9	9	9	9	9	9
S	16	16	16	16	16	16
A0	10	10	10	10	10	10
V	22	22	22	22	22	22
T (BS8233)	0.50	0.50	0.50	0.50	0.50	0.50
A	7.0	7.0	7.0	7.0	7.0	7.0
Daytime Leqff	50.1	45.5	46.0	51.3	53.1	55.9
Night time Leqff	40.8	36.9	39.0	45.4	44.1	39.5
Dne	33.0	32.0	29.0	29.0	31.0	33.0
Rwi	21.1	19.7	31.1	38.2	41.3	38.7
Rew	40.0	44.0	45.0	51.0	56.0	56.0
Rrr	28.0	34.0	40.0	45.0	49.0	49.0

Predicted dB(A) Level Within The Above Room During Daytime Hours (07:00-23:00)	$L_{Aeq\ 16\ HOUR}$	**33.0**	**dB(A)**
Predicted dB(A) Level Within The Above Room During Night Time Hours (23:00-07:00)	$L_{Aeq\ 8\ HOUR}$	**23.9**	**dB(A)**

9.12 Ventilation

Octave Band Frequency	125	250	500	1000	2000	4000	$D_{n,e,w}$
Acoustic through frame slot vent	39.0	39.5	37.0	36.0	39.0	36.0	37.0
Standard through frame slot vent	33.0	32.0	29.0	29.0	31.0	33.0	30.5

9.13 Glazing (R_{wi})

Octave Band Frequency	125	250	500	1000	2000	4000	R_w
4mm glass / 16mm air gap / 4mm glass	21.1	19.7	31.1	38.2	41.3	38.7	35

9.14 Walls (R_{ew})

Octave Band Frequency	125	250	500	1000	2000	4000	R_w
Brick and Concrete Block	40.0	44.0	45.0	51.0	56.0	56.0	56

9.15 Roof (R_{rr})

Octave Band Frequency	125	250	500	1000	2000	4000	R_w
Minimum Value	28.0	34.0	40.0	45.0	49.0	49.0	44

The above are minimum construction attenuation values and should alternative methods be selected; these should be equal to or greater than the above corresponding values. Calculations carried out have indicated the following specifications should be installed for this site

9.16 Glazing & Ventilation Assessment

The development should be designed with a 4mm glass / 16mm air gap / 4mm glass double glazed windows and an acoustic through frame slot vent to all rooms with daytime noise levels above $L_{Aeq\ 16\ HOUR}$ 60 dB Daytime and $L_{Aeq\ 8\ HOUR}$ 52 dB Night Time. The remaining development should be designed with a 4mm glass / 16mm air gap / 4mm glass double glazed windows and a standard through frame slot vent to all other rooms to ensure the internal noise levels are acceptable in terms of the assessment to British Standard 8233: 2014.

9.17 Night Noise Guidelines Europe 2009

The Night Noise Guidelines 2009 make direct reference to the World Health Organisations Guidelines for Community Noise 1999 with recommended guideline criteria of L_{Aeq} 30 dB indoors for continuous noise. The document goes on to explain that sleep disturbance correlates best with L_{Amax} and effects have been observed at 45 dB or less. This is particularly true if the background noise level is low. Noise events exceeding 45 dB(A) should therefore be limited.

Pro PG: Planning and Noise Appendix A 'Dealing with Noise Events' A.17 states that:-

Various studies have linked the L_{Amax} from individual noise events to behavioural awakenings. For example one study found that the "Probability of sleep stage changes to wake/S1 from railway noise increased significantly from 6.5% at 35 dB(A) to 20.5% at 80 dB(A) $L_{Amax,F}$ whilst another study concluded that "noise disturbance of sleep may be expected to become significant once the outdoor L_{Aeq} exceeds 55 dB provided peak noise levels do not exceed 75 to 80 dB. Higher L_{Aeq} values up to 60 dB may be allowed providing the peak levels do not exceed 85 dB, and the number of such events is less than about 20 per night". Based on these studies it can be concluded that at night (2300 - 0700 hrs) a significant effect on sleep disturbance e.g. behavioural awakening, is likely to occur where the maximum sound level at the façade of a building with partially open windows is above:

85 dB $L_{Amax,F}$ (where the number of events exceeding this value is ≤ 20);
or
80 dB $L_{Amax,F}$ (where the number of events exceeding this value is > 20).

Pro PG: Planning and Noise Appendix A 'Dealing with Noise Events' A.18 goes on to explain that:-

A.18 The main body of sleep research is consistent with a careful interpretation of the viewpoint set out in the World Health Organisation Guidelines which for the ordinary population is that:

- ✓ *Impacts on sleep can be detected from relatively low level maximum noise events, however the degree of resulting harm may not be significant.*
- ✓ *'Effects' on sleep (such as EEG awakenings and sleep stage changes) occur spontaneously in the general population many times per night regardless of any impacts due to noise.*
- ✓ *The smaller the number of noise events, the louder the maximum noise level that can be tolerated without adverse effects upon sleep; subject to an upper limit.*
- ✓ *At relatively low levels e.g. around 45 dB $L_{Amax,F}$ when sufficient number of such events take place during the night the adverse effects of individual noise events are likely to be limited to sleep disturbance in the form of changes in sleep state or perhaps some EEG awakenings.*
- ✓ *It normally requires noise levels higher than 45 dB $L_{Amax,F}$ before significant adverse effects such as behavioural awakenings, difficulty getting to sleep, premature awakening or difficulty getting back to sleep generally occur and the latest field research on and aircraft noise suggest that it requires internal L_{Amax} noise levels of around 65 dB before noise induced awakenings become distinguishable from spontaneous awakenings).*

Therefore the following tabulated results from the worst night have been calculated and demonstrate compliance with the requirements of Pro PG.

NIGHT TIME NOISE LEVELS 23:00 - 07:00 15 MINUTE SAMPLES				
Date / Time	**LAeq**	**LAmax**	**$L_{Amax,F}$ 80 - 85 dB**	**$L_{Amax,F}$ > 85 dB**
23:00 - 23:15	58.1	75.6		
23:15 - 23:30	58.1	79.3		
23:30 - 23:45	57.5	79.2		
23:45 - 00:00	54.6	73.9		
00:00 - 00:15	54.1	76.8		
00:15 - 00:30	56.8	76.4		
00:30 - 00:45	54.7	76.7		
00:45 - 01:00	55.1	75.1		
01:00 - 01:15	51.0	75.7		
01:15 - 01:30	37.4	49.9		
01:30 - 01:45	35.1	52.3		
01:45 - 02:00	51.6	76.8		
02:00 - 02:15	56.9	77.9		
02:15 - 02:30	53.6	78.0		
02:30 - 02:45	50.1	71.4		
02:45 - 03:00	52.1	77.0		
03:00 - 03:15	38.5	52.9		
03:15 - 03:30	52.6	77.8		
03:30 - 03:45	50.8	76.2		
03:45 - 04:00	39.0	49.6		
04:00 - 04:15	47.2	69.9		
04:15 - 04:30	39.5	53.3		
04:30 - 04:45	47.5	71.3		
04:45 - 05:00	54.4	74.5		
05:00 - 05:15	42.7	52.7		
05:15 - 05:30	58.2	78.2		
05:30 - 05:45	54.0	74.4		
05:45 - 06:00	56.2	78.0		
06:00 - 06:15	57.5	79.9		
06:15 - 06:30	61.3	76.8		
06:30 - 06:45	63.1	77.5		
06:45 - 07:00	64.1	80.8	80.8	
Total Event Count			1	0
Pro PG Annex Event Quantity Criteria			>20	<20
Pro PG Criteria Assessment			Achieved	Achieved

10 ELEMENT 3 – EXTERNAL AMENITY AREA NOISE ASSESSMENT

10.1 Outdoor Living Areas

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

In order to evaluate the external noise levels within the proposed development, and to correctly and accurately select the precise required minimum screen heights, the 3D modelling software CADNA A is to be used. Initially, the site plan is to be overlaid onto Google Earth and then imported directly into CADNA A using the geometric co-ordinates.

From this, the monitoring positions and noise sources such as roads are added. The output noise levels from the roads are then increased until the monitored noise levels are achieved at the monitoring position. This model is then saved and used as a working 3D acoustic model of the site.

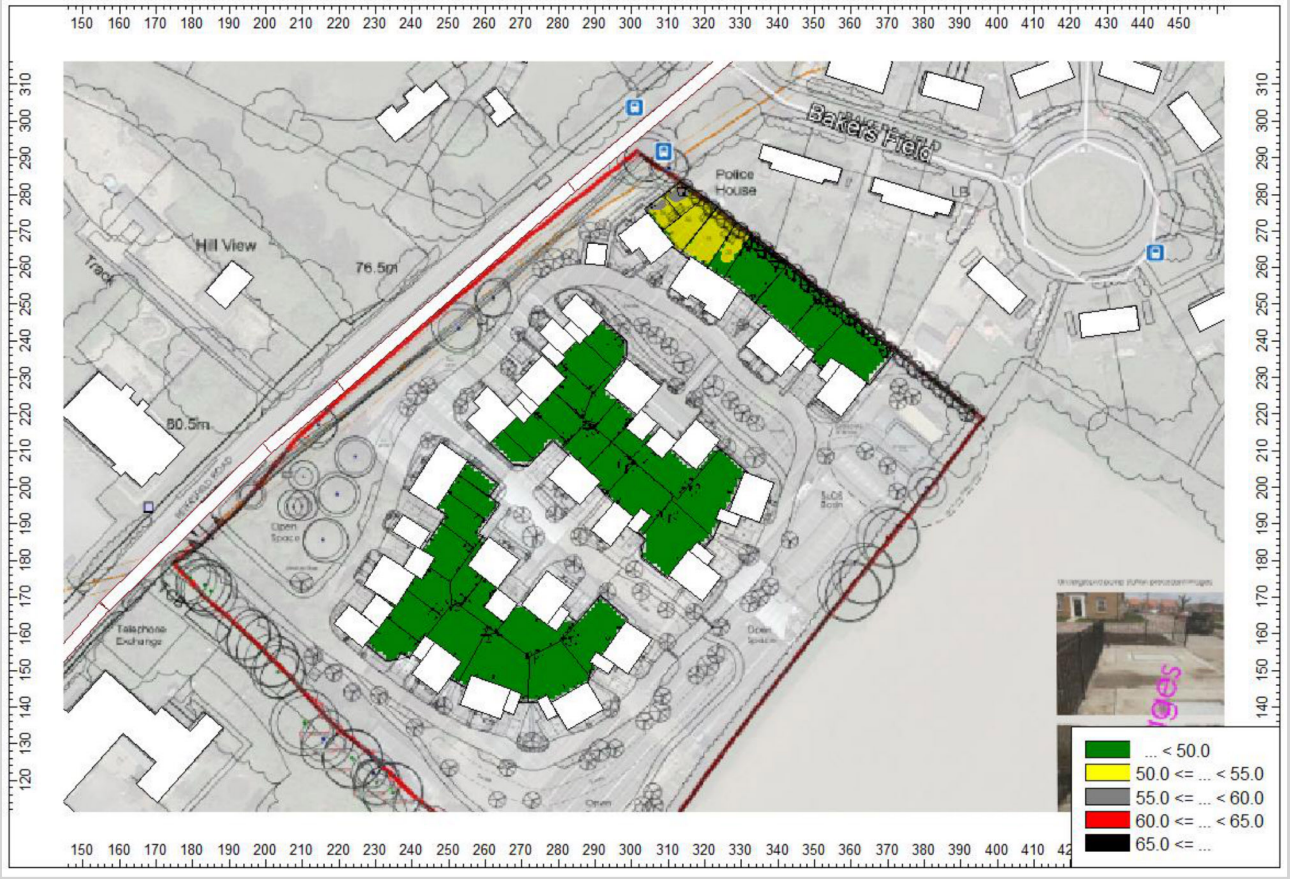
The proposed buildings are then constructed on a 3D bases and receptors placed within the garden areas.

The calculation software is then run to evaluate the garden levels within sample plots across the development.

The following CADNA A screen shots demonstrate the existing sites working 3D model. The levels at the measurement position correlate with the measured daytime average levels detailed on pages 10- 13 of this report.

3D View

The development has external living areas on the development and therefore this criteria / guideline would be appropriately considered within the proposed rear residential garden areas.



EXTERNAL LIVING AREAS

The guideline has been considered acceptable criteria for this assessment given the sites geographical location and proximity to a major trunk road. The layout has been designed in order to allow for acoustics and minimise the noise levels within the outdoor living spaces. The above calculation demonstrates the external living spaces surrounding the houses are likely to see a small number of the noise levels below the upper guideline of 55 dB, with the majority of the houses below the lower guideline of 50 dB.

11 ELEMENT 4 – ASSESSMENT OF OTHER RELEVANT ISSUES

The National Planning Policy Framework 2018 (NPPF) and assessments to the Noise Policy Statement for England 2010 (NPSE) should be made in conjunction with each other. Paragraphs 180 - 183 of the National Planning Policy Framework 2018 (NPPF) states the following:

Paragraph 180 Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) 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.

b) Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

Paragraph 181 Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications.

Paragraph 182 Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

Paragraph 183 The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities

The Noise Policy Statement for England gives various levels of effect as detailed within this report.

With the glazing / ventilation specifications achieved within this report, the development can be implemented within the guidelines of the aforementioned documents and ensure a conclusion of **NOEL – No Observed Effect Level.** This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

12 ACOUSTIC DESIGN STATEMENT

Good Acoustic Design	Given the size and orientation of the proposed site, it is recommended that the developer adopted, where practically possible, a good acoustic design which should include careful consideration of the positioning of the proposed properties together with thoughts being taken as to internal layouts to minimise noise sensitive rooms facing onto dominant noise sources within the local areas.
Internal Noise Levels	Calculations have been carried out and assessments made to BS 8233: 2014 together with design specifications supplied for the required glazing and ventilation specifications required across the development to ensure compliance.
LAmax dB Noise Levels	Assessments and calculations demonstrate that the LAmax dB Levels are within the criteria set out within ProPG
External Living Areas	The guideline has been considered acceptable criteria for this assessment given the sites geographical location and proximity to a major trunk road. The layout has been designed in order to allow for acoustics and minimise the noise levels within the outdoor living spaces. The above calculation demonstrates the external living spaces surrounding the houses are likely to see a small number of the noise levels below the upper guideline of 55 dB, with the majority of the houses below the lower guideline of 50 dB.
NPPF & NPSE	With the glazing / ventilation specifications achieved within this report, the development can be implemented within the guidelines of the aforementioned documents and ensure a conclusion of **NOEL – No Observed Effect Level.** This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
OVERALL OUTCOME	**NOEL – No Observed Effect Level**

13 RECOMMENDATION TO DECISION MAKER

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 council's requirements.

National Planning Policy Framework 2018 suggests that planning permission should be granted unless any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in the framework taken as a whole, or specific policies in the framework indicate the application should be restricted.

Based on the calculations and assessments made within this report it is the professional opinion of Sound Advice Acoustics Ltd that the proposed development can demonstrate compliance with the National Planning Policy Framework 2018, NPPF & NPSE and that, with regards to sound, planning permission can be granted using the following parameters.

As indicated in Section 2 of ProPG, following the ProPG approach will lead to the choice of one of four possible recommendations from the noise practitioner to the decision maker:

A. Planning consent may be granted without any need for noise conditions;
B. Planning consent may be granted subject to the inclusion of suitable noise conditions;
C. Planning consent should be refused on noise grounds in order to avoid significant adverse effects ("avoid"); or
D. Planning consent should be refused on noise grounds in order to prevent unacceptable adverse effects ("prevent").

RECOMMENDATION TO DECISION MAKER

Grant with Noise Conditions

14 CONCLUSION

14.1 Background Noise Levels

A background noise survey was undertaken from 12th – 17th December 2018 at one position at the front of site in order to establish the underlying background noise levels. The maximum day time levels were found to be $L_{Aeq, 16\ hour}$ 67.7 dB and the maximum night time levels were found to be $L_{Aeq, 8\ hours}$ 56.2 dB at position 1.

Assessment Position	Date Start	Date Finish	Daytime LAeq	Night Time LAeq
Position 1 Front	28/06/2018	03/07/2018	67.7	56.2

14.2 Potential Façade Noise Levels

14.2.1 Daytime (07:00-23:00)

Time Period	Highest Potential Façade Noise Level	Noise Risk Category 1 - Low
Average Daytime (07:00-23:00)	$L_{Aeq, 16\ HOUR}$ 60 dB	50 – 63 dB

14.2.2 Night Time (23:00-07:00)

Time Period	Highest Potential Façade Noise Level	Noise Risk Category 3 - High
Average Night Time (23:00-07:00)	$L_{Aeq, 16\ HOUR}$ 49 dB	40 – 55 dB
	Maximum (10 Times) – L_{Amax} 77 dB	>80 dB (10 Times in 8 Hours)

14.3 Risk Assessment

14.3.1 Daytime (07:00-23:00)

Risk Assessment Category	Risk Assessment
1 - Low	At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.

14.3.2 Night Time (23:00-07:00)

Risk Assessment Category	Risk Assessment
1 - Low	At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.

The above table demonstrates this site is located within Noise Risk Category 1 which suggests a low level of risk for daytime and night time levels. Therefore, further mitigation levels will be required at Stage 2.

14.4 CONCLUSION

The development should be designed with a 4mm glass / 16mm air gap / 4mm glass double glazed windows and an acoustic through frame slot vent to all rooms with daytime noise levels above $L_{Aeq\ 16\ HOUR}$ 60 dB Daytime and $L_{Aeq\ 8\ HOUR}$ 52 dB Night Time. The remaining development should be designed with a 4mm glass / 16mm air gap / 4mm glass double glazed windows and a standard through frame slot vent to all other rooms to ensure the internal noise levels are acceptable in terms of the assessment to British Standard 8233: 2014.

The guideline has been considered acceptable criteria for this assessment given the sites geographical location and proximity to a major trunk road. The layout has been designed in order to allow for acoustics and minimise the noise levels within the outdoor living spaces. The above calculation demonstrates the external living spaces surrounding the houses are likely to see a small number of the noise levels below the upper guideline of 55 dB, with the majority of the houses below the lower guideline of 50 dB.

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 council's requirements.

National Planning Policy Framework 2018 suggests that planning permission should be granted unless any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in the framework taken as a whole, or specific policies in the framework indicate the application should be restricted.

Based on the calculations and assessments made within this report it is the professional opinion of Sound Advice Acoustics Ltd that the proposed development can demonstrate compliance with the National Planning Policy Framework 2018, NPPF & NPSE and that, with regards to sound, planning permission can be granted.

15 UNCERTAINTY

In line with the requirements of section 10 of British Standard 4142: 2014 it is expected that the reported expanded uncertainty with a confidence limit of 95% and assuming a convergence of k=2 is likely to be +/- 2.1dB. Uncertainty, in this instance has been minimised by undertaking longer background noise measurements over a 96-hour period.

15.1 Uncertainty Budget

Sources of Uncertainty	Uncertainty Notes	Commentary	Value (half Width)	Convert to Same Units (dB)	Distribution Divisor			Standard Uncertainty (u) dB
					Normal	Rectangular	Other	
Measurement Position	Choice of position, ,	1m in 20m		0.2		rect(√/3)		0.13
	microphone orientation	Type 1 0 - 30deg	0.4		Normal			0.50
Instrumentation	Calibration	Calibration Drift	0.1		Normal			0.10
	Accuracy and precision (type 1)	Type 1 practical	1.9			rect(√/3)		0.50
Background Noise Level	Timing of Measurement							
Background Noise Level	Modal Analysis Day	Calculated Standard Deviation	3.7				s/√n	0.39
Background Noise Level	Modal Analysis Night	Calculated Standard Deviation	2.2				s/√n	0.16
Combined Uncertainty (root sum of squares)								1.05
Expanded Uncertainty U = Kuc (95% Confidence K =2)								2.1
Final Answer Expressed ads Value +/- U dB with a confidence Level of 95%								
REFERENCE: Uncertainty Budget Calculated in line with M3003: The Expression of Uncertainty and Confidence in Measurement Edition 3, Novemeber 2012 and A Good Practice Guide on the Sources and Magnitude of Uncertainty Arising in the Practical Measurement of Environmental Noise N J Craven, G Kerry Edition 1a – May 2007.								

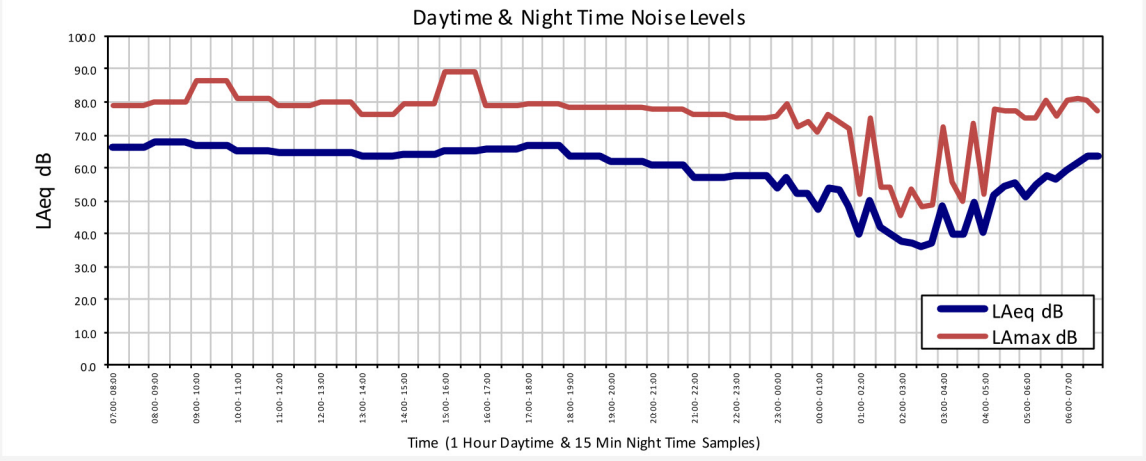
16 RESULTS

16.1 Position 1 – 12th-13th December 2018

NOISE LEVEL SUMMARY ASSESSMENT			Octave Band Centre Frequency (Hz)									
Date / Time	LAeq	LAmax	31.5	63	125	250	500	1.0k	2.0k	4.0k	8.0k	16.0k
DAYTIME 07:00 - 23:00 LAeq 16 HOUR & Corresponding LAmax 16 HOUR	64.7	89.1	61.7	66.3	59.1	52.9	54.1	60.0	59.3	57.4	43.7	33.8
NIGHT TIME 23:00 - 07:00 LAeq 8 HOUR & Corresponding LAmax 8 HOUR	55.4	81.3	54.7	55.4	51.6	47.8	45.5	51.3	50.0	46.2	30.6	16.6

DAYTIME NOISE LEVELS 07:00 - 23:00 1 HOUR SAMPLES			Octave Band Centre Frequency (Hz)									
Date / Time	LAeq	LAmax	31.5	63	125	250	500	1.0 k	2.0 k	4.0 k	8.0 k	16.0 k
07:00 - 08:00	66.5	78.9	61.7	66.1	58.5	52.3	54.8	61.6	61.1	59.4	45.0	26.9
08:00 - 09:00	67.9	80.1	63.3	68.2	61.7	54.3	56.4	63.0	62.6	60.6	45.5	27.1
09:00 - 10:00	67.0	86.3	62.2	67.1	60.9	56.1	55.8	61.3	61.2	60.9	46.6	30.5
10:00 - 11:00	64.9	81.2	61.7	65.5	58.3	53.2	53.8	59.9	59.3	58.1	44.4	26.7
11:00 - 12:00	64.5	79.1	59.9	64.6	56.6	51.2	52.7	59.0	58.5	58.5	47.5	25.7
12:00 - 13:00	64.6	80.2	63.3	66.9	59.4	53.5	54.1	59.2	58.8	58.4	44.9	27.3
13:00 - 14:00	63.4	76.3	58.7	64.2	55.3	50.6	52.3	58.4	57.7	56.6	42.6	24.6
14:00 - 15:00	64.1	79.5	61.5	67.2	60.0	53.4	54.9	59.8	58.6	55.2	41.4	25.5
15:00 - 16:00	65.2	89.1	63.5	66.3	59.1	53.4	54.7	60.4	59.5	57.7	47.5	44.8
16:00 - 17:00	65.6	78.7	64.6	68.7	61.5	54.6	55.7	61.1	60.2	57.1	41.8	26.3
17:00 - 18:00	66.8	79.2	63.9	70.0	62.9	55.6	56.3	62.1	61.4	58.4	42.9	26.6
18:00 - 19:00	63.8	78.3	62.7	66.3	59.0	52.9	53.9	59.6	58.5	54.6	38.7	33.7
19:00 - 20:00	62.1	78.5	59.3	63.6	54.4	50.0	51.9	58.4	56.9	52.0	35.9	21.6
20:00 - 21:00	61.0	78.0	56.4	62.0	55.3	49.4	50.7	57.1	55.7	51.2	34.8	18.2
21:00 - 22:00	57.3	76.1	53.2	57.0	49.7	45.1	46.9	53.4	52.2	46.8	29.7	14.0
22:00 - 23:00	57.5	75.1	52.9	58.4	56.2	46.3	47.8	53.6	52.1	47.2	30.9	15.9

NIGHT TIME NOISE LEVELS 23:00 - 07:00 15 MINUTE SAMPLES			Octave Band Centre Frequency (Hz)									
Date / Time	LAeq	LAmax	31.5	63	125	250	500	1.0 k	2.0 k	4.0 k	8.0 k	16.0 k
23:00 - 23:15	53.8	75.6	50.9	53.2	44.5	41.2	43.3	50.0	48.7	43.5	26.8	13.5
23:15 - 23:30	56.9	79.2	52.9	56.1	49.0	43.0	45.3	52.5	51.9	48.1	32.3	15.4
23:30 - 23:45	52.3	72.6	53.4	52.8	42.7	40.9	42.5	49.0	46.6	41.5	25.5	13.8
23:45 - 00:00	52.1	74.1	51.4	49.4	43.8	41.2	42.1	48.6	46.3	41.7	26.4	14.5
00:00 - 00:15	47.6	71.0	48.4	49.2	38.7	37.2	38.2	43.0	42.4	38.6	22.8	12.9
00:15 - 00:30	53.6	76.0	50.4	53.2	43.2	39.5	43.1	50.0	48.5	42.5	25.8	13.6
00:30 - 00:45	53.3	74.0	54.2	54.4	49.9	41.1	42.9	49.6	48.1	42.9	27.5	15.2
00:45 - 01:00	48.4	72.0	52.8	47.7	39.2	37.9	39.4	44.9	42.4	38.8	24.4	14.5
01:00 - 01:15	39.8	51.7	51.2	47.0	37.0	34.3	34.1	35.3	29.1	34.2	22.2	14.0
01:15 - 01:30	49.9	75.0	53.2	49.2	38.8	36.6	40.0	46.0	44.7	40.1	24.9	14.3
01:30 - 01:45	41.8	54.2	54.1	48.9	39.0	36.2	36.0	35.9	31.0	37.4	25.3	15.7
01:45 - 02:00	39.7	54.1	51.3	47.7	37.0	35.2	34.9	34.4	28.5	34.3	22.3	13.8
02:00 - 02:15	37.9	45.7	50.0	45.2	35.1	32.3	33.0	33.5	27.0	31.8	19.9	12.9
02:15 - 02:30	37.3	53.5	49.1	44.1	34.2	31.2	32.1	32.3	26.5	32.0	20.3	13.2
02:30 - 02:45	36.0	48.2	47.5	42.3	32.6	30.2	30.9	32.6	25.7	28.1	17.0	12.2
02:45 - 03:00	37.2	48.7	49.0	46.4	34.6	31.6	33.0	33.9	26.1	28.6	17.6	12.4
03:00 - 03:15	48.2	72.7	50.8	47.1	42.2	39.3	39.6	42.5	41.8	42.4	27.3	14.7
03:15 - 03:30	39.9	55.9	52.1	46.7	36.7	33.6	32.8	32.3	29.2	36.3	24.2	15.1
03:30 - 03:45	39.9	49.8	51.5	45.1	36.6	36.1	33.8	34.8	29.3	34.7	23.0	14.7
03:45 - 04:00	49.6	73.7	54.7	48.1	39.7	37.5	38.5	44.5	44.7	41.5	26.7	16.0
04:00 - 04:15	40.4	51.7	51.7	48.3	37.2	34.7	35.4	36.4	29.7	33.8	21.9	13.8
04:15 - 04:30	51.6	77.9	53.9	52.5	43.8	41.2	42.6	47.8	45.5	43.0	28.4	16.2
04:30 - 04:45	54.4	77.5	56.5	54.2	46.3	42.0	44.5	50.8	48.7	44.6	29.2	16.2
04:45 - 05:00	55.6	77.5	58.2	58.3	62.5	60.5	49.1	46.9	45.9	45.7	30.8	17.3
05:00 - 05:15	51.1	75.3	56.0	53.2	44.9	42.4	41.8	47.5	45.2	41.1	26.6	16.0
05:15 - 05:30	55.0	75.0	57.6	54.1	45.3	43.0	44.7	50.2	50.2	46.2	31.0	18.7
05:30 - 05:45	57.6	80.4	56.0	54.5	48.1	45.5	46.5	53.8	52.5	47.0	30.5	16.2
05:45 - 06:00	56.6	75.6	57.5	57.3	49.7	45.5	46.6	52.4	51.7	46.9	30.9	17.2
06:00 - 06:15	59.0	80.3	58.7	57.9	52.5	46.1	48.3	55.1	53.7	49.6	33.9	19.9
06:15 - 06:30	61.4	81.3	57.8	60.0	56.4	49.2	50.5	57.2	56.2	52.1	36.0	20.2
06:30 - 06:45	63.5	80.4	58.7	64.2	60.2	51.2	53.5	59.3	58.0	54.9	39.8	23.4
06:45 - 07:00	63.8	77.1	58.7	63.3	56.3	54.1	53.9	59.9	58.4	54.2	38.0	20.9

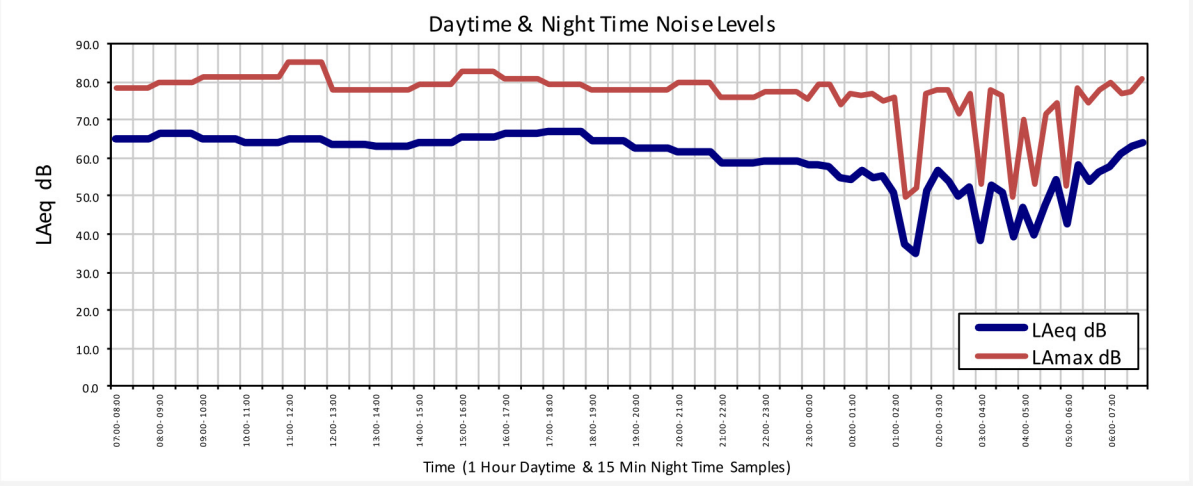


16.2 Position 1 – 13th-14th December 2018

NOISE LEVEL SUMMARY ASSESSMENT			Octave Band Centre Frequency (Hz)									
Date / Time	LAeq	LAmax	31.5	63	125	250	500	1.0k	2.0k	4.0k	8.0k	16.0k
DAYTIME 07:00 - 23:00 LAeq 16 HOUR & Corresponding LAmax 16 HOUR	64.3	84.9	62.5	66.9	60.4	53.7	54.8	60.0	59.0	55.8	40.8	25.9
NIGHT TIME 23:00 - 07:00 LAeq 8 HOUR & Corresponding LAmax 8 HOUR	56.2	80.8	52.5	57.1	47.8	43.9	46.0	52.4	51.1	46.5	29.7	15.4

DAYTIME NOISE LEVELS 07:00 - 23:00 1 HOUR SAMPLES			Octave Band Centre Frequency (Hz)									
Date / Time	LAeq	LAmax	31.5	63	125	250	500	1.0 k	2.0 k	4.0 k	8.0 k	16.0 k
07:00 - 08:00	64.9	78.5	62.3	67.6	59.1	53.2	55.0	60.8	59.5	55.7	40.3	23.7
08:00 - 09:00	66.6	79.8	63.5	68.1	61.0	54.7	56.7	62.5	61.3	57.3	42.2	31.4
09:00 - 10:00	65.0	81.3	62.3	66.4	62.2	55.0	55.3	60.6	59.6	56.5	41.5	24.8
10:00 - 11:00	64.0	81.4	63.8	66.9	60.5	54.0	54.8	59.4	58.5	55.8	41.2	25.4
11:00 - 12:00	65.0	84.9	64.6	67.8	64.3	57.2	57.4	60.0	59.2	57.1	42.4	28.0
12:00 - 13:00	63.5	78.0	62.6	66.4	57.0	53.0	54.0	59.4	58.0	54.5	39.1	23.5
13:00 - 14:00	62.9	77.8	62.1	64.3	57.3	52.4	53.2	58.7	57.5	53.5	39.2	23.1
14:00 - 15:00	64.1	79.5	61.5	67.2	60.0	53.4	54.9	59.8	58.6	55.2	41.4	25.5
15:00 - 16:00	65.4	82.7	62.1	66.6	61.3	54.0	55.4	60.7	59.6	58.1	44.7	24.4
16:00 - 17:00	66.3	80.6	65.0	70.1	62.8	55.3	56.8	61.7	60.9	58.2	43.3	29.5
17:00 - 18:00	66.7	79.2	64.6	70.5	62.9	55.1	56.5	62.1	61.5	58.0	41.9	25.9
18:00 - 19:00	64.2	77.6	61.0	65.2	58.3	51.9	53.9	60.0	59.1	55.2	38.9	27.0
19:00 - 20:00	62.7	77.9	58.8	64.1	58.2	51.1	52.8	58.5	57.5	53.3	36.5	20.8
20:00 - 21:00	61.3	79.9	55.4	60.0	54.1	48.3	50.5	57.1	56.1	52.6	36.1	20.0
21:00 - 22:00	58.7	75.7	62.2	62.1	53.5	50.9	49.4	54.5	53.4	48.9	32.1	16.8
22:00 - 23:00	59.2	77.1	53.2	62.0	56.9	46.5	48.5	54.9	54.0	49.7	33.0	16.9

NIGHT TIME NOISE LEVELS 23:00 - 07:00 15 MINUTE SAMPLES			Octave Band Centre Frequency (Hz)									
Date / Time	LAeq	LAmax	31.5	63	125	250	500	1.0 k	2.0 k	4.0 k	8.0 k	16.0 k
23:00 - 23:15	58.1	75.6	51.3	57.6	48.5	44.1	46.7	54.0	53.1	48.2	31.2	14.4
23:15 - 23:30	58.1	79.3	49.9	54.1	46.0	43.7	47.0	54.6	52.8	47.2	30.6	14.0
23:30 - 23:45	57.5	79.2	48.8	51.8	47.3	43.8	45.7	53.3	52.6	47.9	30.7	15.8
23:45 - 00:00	54.6	73.9	51.8	54.4	45.1	41.0	44.1	50.5	49.5	44.7	27.1	13.0
00:00 - 00:15	54.1	76.8	50.3	54.7	46.6	40.4	43.9	50.3	48.9	43.9	27.2	13.0
00:15 - 00:30	56.8	76.4	49.0	56.5	46.1	41.8	45.3	52.5	52.2	46.9	29.3	14.4
00:30 - 00:45	54.7	76.7	49.1	51.2	50.0	44.1	43.2	48.7	49.2	48.4	33.2	21.6
00:45 - 01:00	55.1	75.1	49.2	55.5	47.6	41.3	44.1	51.1	49.9	45.7	29.3	14.8
01:00 - 01:15	51.0	75.7	44.4	46.3	38.8	36.7	39.4	47.8	45.5	40.0	21.7	11.9
01:15 - 01:30	37.4	49.9	46.2	45.1	36.0	34.1	34.3	35.1	25.0	15.9	12.6	11.9
01:30 - 01:45	35.1	52.3	43.7	43.7	37.4	38.3	31.8	30.3	22.0	22.2	13.3	11.8
01:45 - 02:00	51.6	76.8	44.5	46.3	41.8	38.4	40.1	46.3	46.8	43.9	28.6	15.3
02:00 - 02:15	56.9	77.9	53.0	56.5	48.9	43.9	47.4	53.0	51.2	48.3	33.0	17.5
02:15 - 02:30	53.6	78.0	50.4	48.8	42.5	37.8	40.9	49.1	49.2	43.3	25.4	12.9
02:30 - 02:45	50.1	71.4	46.7	49.3	40.7	37.6	39.8	46.6	44.8	39.4	23.1	12.3
02:45 - 03:00	52.1	77.0	47.6	47.4	41.1	40.0	41.0	49.1	46.3	40.2	22.9	12.1
03:00 - 03:15	38.5	52.9	47.4	46.0	39.4	37.9	36.2	35.4	24.6	12.5	12.2	11.7
03:15 - 03:30	52.6	77.8	47.9	50.8	40.9	38.2	40.6	48.7	47.4	43.4	26.5	12.5
03:30 - 03:45	50.8	76.2	46.0	45.8	41.5	40.1	42.1	48.0	44.2	39.6	22.8	12.2
03:45 - 04:00	39.0	49.6	46.9	48.0	38.0	34.6	36.0	36.7	26.5	13.1	12.2	11.7
04:00 - 04:15	47.2	69.9	49.6	51.9	39.3	37.5	39.6	43.6	41.4	36.4	19.8	12.1
04:15 - 04:30	39.5	53.3	48.6	46.5	37.6	35.0	35.5	37.5	27.8	20.9	13.8	12.0
04:30 - 04:45	47.5	71.3	50.0	52.2	39.3	37.1	39.6	44.6	40.8	36.5	22.3	12.6
04:45 - 05:00	54.4	74.5	51.4	54.5	43.3	40.8	44.0	50.7	49.3	43.6	26.0	12.6
05:00 - 05:15	42.7	52.7	51.1	49.6	40.1	39.4	39.7	40.5	30.0	21.8	14.3	12.0
05:15 - 05:30	58.2	78.2	53.0	67.9	56.4	48.3	48.1	53.9	53.0	47.9	30.4	15.9
05:30 - 05:45	54.0	74.4	51.7	50.1	42.6	40.7	43.0	50.3	48.7	43.7	25.1	12.3
05:45 - 06:00	56.2	78.0	53.6	55.9	46.1	43.3	45.9	52.8	51.0	44.2	26.2	12.9
06:00 - 06:15	57.5	79.9	55.0	57.1	48.1	44.5	47.4	53.9	52.2	47.0	29.6	14.1
06:15 - 06:30	61.3	76.8	57.8	59.0	51.6	48.3	50.9	57.6	56.1	51.2	33.5	17.5
06:30 - 06:45	63.1	77.5	60.0	63.2	53.9	52.2	53.6	59.3	57.5	53.4	36.5	19.0
06:45 - 07:00	64.1	80.8	60.1	61.9	54.1	50.7	54.0	60.0	59.0	54.6	37.8	22.5

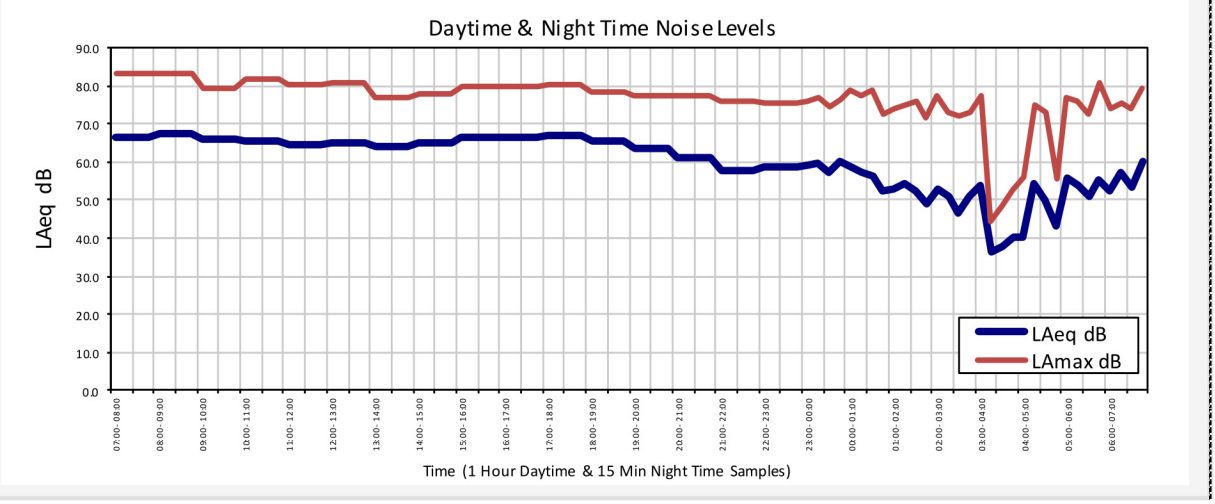


16.3 Position 1 – 14th-15th December 2018

NOISE LEVEL SUMMARY ASSESSMENT			Octave Band Centre Frequency (Hz)									
Date / Time	LAeq	LAmax	31.5	63	125	250	500	1.0k	2.0k	4.0k	8.0k	16.0k
DAYTIME 07:00 - 23:00 LAeq 16 HOUR & Corresponding LAmax 16 HOUR	64.9	83.1	61.7	66.5	60.4	54.0	55.1	60.6	59.7	56.4	40.7	24.6
NIGHT TIME 23:00 - 07:00 LAeq 8 HOUR & Corresponding LAmax 8 HOUR	54.9	80.9	57.6	54.6	49.0	44.8	45.0	50.5	49.7	46.7	32.9	25.3

DAYTIME NOISE LEVELS 07:00 - 23:00 1 HOUR SAMPLES			Octave Band Centre Frequency (Hz)									
Date / Time	LAeq	LAmax	31.5	63	125	250	500	1.0 k	2.0 k	4.0 k	8.0 k	16.0 k
07:00 - 08:00	66.4	83.0	62.1	67.0	65.6	57.9	57.8	61.9	60.8	57.4	41.2	25.0
08:00 - 09:00	67.5	83.1	64.2	68.2	61.8	54.8	57.0	63.2	62.2	58.7	42.0	29.0
09:00 - 10:00	65.8	79.4	64.0	67.3	60.3	54.9	55.8	61.1	60.4	57.8	43.1	27.9
10:00 - 11:00	65.3	81.9	61.2	66.0	59.3	55.3	56.1	60.9	59.8	56.9	42.0	25.3
11:00 - 12:00	64.6	80.1	61.2	65.4	59.1	53.8	54.6	60.3	59.2	55.8	40.5	23.7
12:00 - 13:00	64.7	80.9	62.9	67.3	60.9	55.6	55.2	60.1	59.3	56.2	41.9	24.5
13:00 - 14:00	64.2	76.9	60.4	64.7	57.1	52.5	54.3	60.2	58.9	54.8	38.6	22.1
14:00 - 15:00	64.8	78.0	61.7	66.2	59.9	53.0	54.6	60.4	59.5	55.7	39.2	21.0
15:00 - 16:00	66.2	79.5	62.9	67.5	60.2	53.7	56.1	61.9	60.8	57.4	42.2	27.5
16:00 - 17:00	66.3	79.5	62.8	68.3	59.5	53.1	55.8	61.7	61.0	58.3	43.1	24.8
17:00 - 18:00	66.8	80.3	63.6	69.8	62.8	56.4	56.6	62.1	61.6	58.5	42.3	25.9
18:00 - 19:00	65.3	78.5	61.3	66.3	58.1	52.3	54.6	60.8	60.2	56.5	39.6	21.5
19:00 - 20:00	63.3	77.3	58.0	64.2	60.1	52.2	52.7	58.8	58.2	54.3	37.8	20.5
20:00 - 21:00	61.0	77.5	55.7	62.0	57.4	48.0	49.9	56.5	56.0	52.3	35.3	18.2
21:00 - 22:00	57.7	75.9	53.9	57.2	49.4	46.7	47.1	53.4	52.5	48.3	31.6	16.0
22:00 - 23:00	58.6	75.4	55.5	61.0	56.2	47.7	48.3	54.3	53.5	49.0	32.0	16.6

NIGHT TIME NOISE LEVELS 23:00 - 07:00 15 MINUTE SAMPLES			Octave Band Centre Frequency (Hz)									
Date / Time	LAeq	LAmax	31.5	63	125	250	500	1.0 k	2.0 k	4.0 k	8.0 k	16.0 k
23:00 - 23:15	59.1	75.7	59.1	58.8	52.1	45.8	47.9	54.3	54.1	50.9	35.1	20.6
23:15 - 23:30	59.5	76.9	57.9	59.3	59.5	51.4	49.7	55.3	53.9	50.3	34.9	20.5
23:30 - 23:45	57.4	74.2	58.8	59.4	48.6	44.6	47.4	53.6	51.9	48.0	32.8	20.1
23:45 - 00:00	60.2	76.4	56.4	57.0	52.6	45.8	49.0	56.0	55.2	50.4	33.7	18.0
00:00 - 00:15	58.8	79.0	55.4	54.5	48.0	44.1	46.5	54.1	54.1	49.8	32.8	17.7
00:15 - 00:30	57.3	77.5	51.8	52.9	46.4	43.3	46.1	53.0	52.4	47.8	31.0	15.6
00:30 - 00:45	56.4	79.0	52.0	54.6	46.0	46.0	47.0	52.5	50.9	46.8	31.0	15.2
00:45 - 01:00	52.1	72.6	50.4	54.8	45.2	39.8	41.9	47.8	47.2	42.4	26.5	13.6
01:00 - 01:15	52.6	73.8	51.4	51.6	44.9	41.7	42.2	49.2	47.1	41.3	25.3	13.3
01:15 - 01:30	54.5	75.1	52.7	51.5	44.9	41.0	43.7	50.7	49.5	44.1	28.2	15.7
01:30 - 01:45	52.1	76.0	49.2	48.7	40.4	37.5	40.8	47.9	47.3	42.0	25.0	12.9
01:45 - 02:00	49.1	71.7	50.7	53.8	40.7	37.8	39.7	45.4	43.6	38.2	21.8	12.5
02:00 - 02:15	52.8	77.3	47.8	48.6	41.7	39.0	41.5	48.7	48.0	42.4	25.5	13.1
02:15 - 02:30	50.9	73.1	53.3	51.1	42.9	38.9	40.8	46.4	45.5	42.4	27.2	16.1
02:30 - 02:45	46.4	72.2	47.4	44.5	39.3	33.7	35.5	42.1	41.0	37.9	22.4	12.6
02:45 - 03:00	50.9	72.8	48.6	51.6	48.7	39.7	42.1	46.9	44.9	42.1	27.3	14.6
03:00 - 03:15	53.8	77.3	49.4	48.5	43.4	41.3	43.3	49.7	48.4	45.4	28.8	14.5
03:15 - 03:30	36.3	44.3	50.5	49.7	38.7	33.8	33.5	33.0	23.8	22.5	13.9	11.8
03:30 - 03:45	37.9	48.3	50.6	48.1	35.1	32.1	34.6	33.8	26.1	30.3	18.7	12.5
03:45 - 04:00	40.2	52.6	54.2	47.7	37.3	34.3	33.5	32.6	29.4	36.6	24.6	15.3
04:00 - 04:15	40.2	56.2	53.8	47.5	37.2	34.6	34.5	33.6	29.2	36.1	24.2	15.1
04:15 - 04:30	54.3	75.1	58.3	54.5	46.2	42.6	44.6	50.5	48.2	46.1	32.4	21.3
04:30 - 04:45	50.1	73.1	59.6	53.0	43.8	41.5	41.2	42.8	44.5	44.6	31.5	20.7
04:45 - 05:00	43.2	55.4	56.6	49.2	42.3	39.2	37.5	35.5	32.2	39.4	27.5	17.1
05:00 - 05:15	55.7	76.7	55.7	51.0	44.6	43.6	44.2	52.2	50.2	45.3	29.8	17.5
05:15 - 05:30	53.9	75.7	56.0	51.2	45.4	40.9	42.5	49.5	48.9	45.1	29.9	17.4
05:30 - 05:45	50.8	72.5	56.7	54.9	47.3	44.5	42.5	46.3	44.8	42.6	28.5	16.1
05:45 - 06:00	55.2	80.9	60.0	55.6	50.6	52.0	48.6	47.7	48.8	49.4	36.1	26.3
06:00 - 06:15	52.2	74.0	62.0	54.8	48.5	46.3	45.6	45.6	44.9	47.0	35.5	28.3
06:15 - 06:30	57.2	75.2	62.9	56.2	47.4	45.4	46.7	50.9	50.5	52.3	42.8	38.6
06:30 - 06:45	53.4	74.1	64.2	57.7	50.7	49.4	47.6	47.6	45.7	47.4	35.6	27.7
06:45 - 07:00	59.9	79.4	64.1	59.0	52.9	49.4	49.4	54.7	54.9	51.8	36.5	24.5

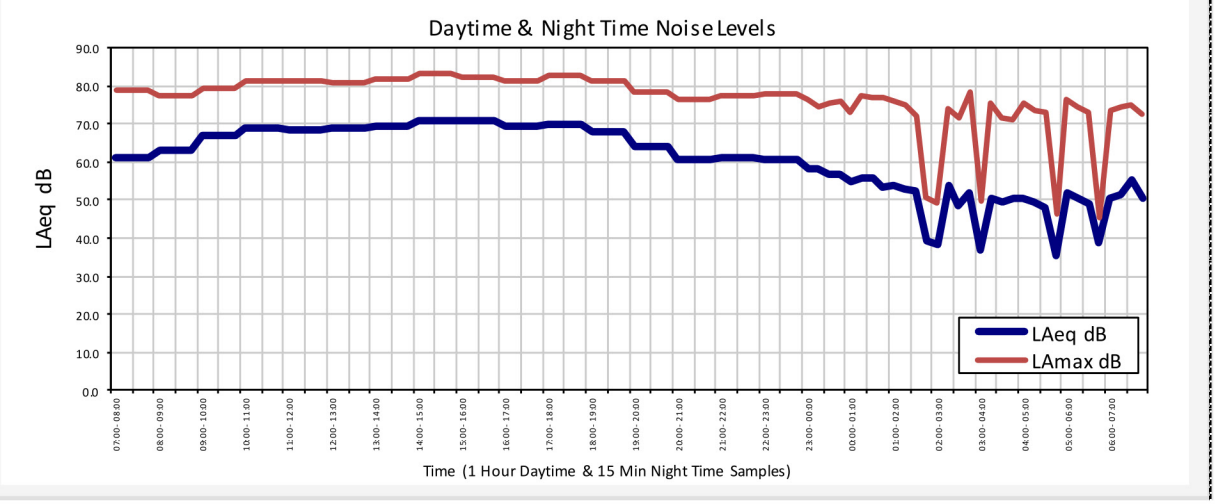


16.4 Position 1 – 15th-16th December 2018

NOISE LEVEL SUMMARY ASSESSMENT			Octave Band Centre Frequency (Hz)									
Date / Time	LAeq	LAmax	31.5	63	125	250	500	1.0k	2.0k	4.0k	8.0k	16.0k
DAYTIME 07:00 - 23:00 LAeq 16 HOUR & Corresponding LAmax 16 HOUR	67.7	83.1	66.3	64.6	58.1	53.5	54.0	59.3	61.1	63.9	50.2	35.0
NIGHTTIME 23:00 - 07:00 LAeq 8 HOUR & Corresponding LAmax 8 HOUR	52.8	78.2	50.6	52.8	44.6	40.3	41.8	48.1	47.4	45.9	31.7	15.9

DAYTIME NOISE LEVELS 07:00 - 23:00 1 HOUR SAMPLES			Octave Band Centre Frequency (Hz)									
Date / Time	LAeq	LAmax	31.5	63	125	250	500	1.0 k	2.0 k	4.0 k	8.0 k	16.0 k
07:00 - 08:00	61.3	78.7	63.5	64.3	63.4	57.1	51.4	56.0	55.8	53.0	38.4	25.0
08:00 - 09:00	63.0	77.2	67.1	63.5	55.9	52.6	53.1	58.3	57.7	54.8	40.3	28.3
09:00 - 10:00	67.0	79.3	66.4	65.4	59.9	53.0	54.1	59.9	60.8	62.4	48.2	31.9
10:00 - 11:00	68.8	81.2	66.6	64.8	57.0	53.0	55.0	61.1	62.5	64.6	50.5	33.0
11:00 - 12:00	68.6	81.1	65.4	64.9	58.2	53.6	55.0	61.0	62.5	64.2	49.6	32.3
12:00 - 13:00	68.7	80.8	67.0	65.9	57.8	54.1	55.4	61.2	62.4	64.5	50.3	33.8
13:00 - 14:00	69.3	81.6	66.6	64.9	56.8	53.5	55.0	60.7	62.6	65.7	51.8	35.2
14:00 - 15:00	71.0	83.1	68.8	66.6	58.8	55.5	56.6	61.3	64.0	67.7	54.2	39.6
15:00 - 16:00	70.8	82.3	70.2	66.3	59.3	56.1	56.7	60.5	63.7	67.7	54.3	40.6
16:00 - 17:00	69.2	81.0	70.5	67.0	58.9	55.6	55.6	59.9	62.3	65.8	52.1	36.5
17:00 - 18:00	69.7	82.8	67.9	65.4	57.7	53.7	54.7	59.4	62.6	66.7	53.3	39.0
18:00 - 19:00	68.1	81.4	59.6	63.8	59.2	51.9	52.8	58.3	61.1	64.8	51.4	36.1
19:00 - 20:00	63.9	78.4	59.1	60.9	53.6	49.3	50.9	56.9	57.6	59.5	45.9	28.4
20:00 - 21:00	60.6	76.4	54.5	58.8	50.9	46.8	48.2	55.0	54.9	54.5	40.6	22.3
21:00 - 22:00	61.1	77.3	55.4	62.4	54.2	49.3	50.0	55.9	55.2	54.8	41.2	23.7
22:00 - 23:00	60.4	77.8	55.4	58.4	50.8	48.2	48.7	54.9	54.8	54.0	39.9	22.2

NIGHT TIME NOISE LEVELS 23:00 - 07:00 15 MINUTE SAMPLES			Octave Band Centre Frequency (Hz)									
Date / Time	LAeq	LAmax	31.5	63	125	250	500	1.0 k	2.0 k	4.0 k	8.0 k	16.0 k
23:00 - 23:15	58.1	76.3	57.3	57.7	50.8	45.1	46.1	52.3	52.5	52.1	38.2	21.3
23:15 - 23:30	58.2	74.2	53.9	58.1	48.8	44.5	46.9	53.3	52.8	50.9	36.0	18.1
23:30 - 23:45	56.7	75.5	52.1	53.7	46.8	42.7	45.6	51.9	51.2	49.4	35.4	18.7
23:45 - 00:00	56.5	75.8	52.6	58.1	48.7	43.6	44.8	51.9	50.9	49.2	35.3	18.3
00:00 - 00:15	54.7	73.2	51.5	55.3	46.0	41.2	43.5	50.0	49.4	47.2	32.6	17.7
00:15 - 00:30	55.8	77.5	51.6	53.8	45.8	41.3	43.6	50.1	50.2	49.7	35.9	18.8
00:30 - 00:45	55.6	76.9	50.9	54.2	44.1	42.3	44.7	51.4	49.5	48.3	34.5	18.6
00:45 - 01:00	53.2	76.8	50.1	55.0	42.8	39.5	42.2	49.3	47.3	44.8	29.6	14.7
01:00 - 01:15	53.9	76.1	47.0	50.3	43.3	41.1	43.3	50.0	48.2	45.4	30.9	15.0
01:15 - 01:30	52.8	75.1	49.5	50.1	44.2	38.0	41.2	47.9	47.1	45.8	32.0	16.0
01:30 - 01:45	52.4	72.2	48.2	51.8	44.0	37.3	40.4	48.3	47.0	44.2	29.0	14.0
01:45 - 02:00	39.2	50.5	49.1	47.3	36.3	32.2	33.2	35.2	30.9	32.1	19.6	12.4
02:00 - 02:15	38.5	49.0	48.1	44.1	35.7	33.5	32.5	33.2	30.1	32.8	20.2	12.6
02:15 - 02:30	53.6	74.0	51.9	53.4	47.0	42.1	43.2	48.4	47.2	47.8	34.1	17.0
02:30 - 02:45	48.5	71.4	46.6	47.0	41.1	36.8	37.5	44.2	42.6	41.1	27.5	13.8
02:45 - 03:00	51.9	78.2	46.3	49.9	41.9	38.3	41.1	46.0	45.8	46.2	33.1	16.6
03:00 - 03:15	36.7	49.8	46.7	45.6	41.9	35.3	30.9	31.8	27.8	28.3	16.2	11.9
03:15 - 03:30	50.2	75.6	47.4	45.4	41.6	38.8	40.7	44.1	43.9	44.9	29.9	14.9
03:30 - 03:45	49.4	71.7	47.3	51.3	39.9	34.0	36.6	43.6	44.2	43.1	29.1	13.5
03:45 - 04:00	50.2	70.8	49.0	50.1	42.7	35.0	37.7	44.6	45.1	43.1	27.6	13.3
04:00 - 04:15	50.5	75.4	48.5	47.4	40.6	37.2	38.8	45.4	45.3	42.9	28.8	16.0
04:15 - 04:30	49.4	73.5	47.3	47.9	39.3	36.4	37.8	43.6	43.6	43.7	30.3	14.0
04:30 - 04:45	48.1	72.8	43.6	46.9	37.0	38.0	35.1	41.2	43.7	41.1	25.1	12.7
04:45 - 05:00	35.5	46.5	45.7	43.7	36.0	31.5	30.0	31.4	27.3	26.9	15.3	11.9
05:00 - 05:15	52.0	76.3	48.9	51.2	45.4	39.6	39.8	48.1	46.7	42.4	25.8	12.4
05:15 - 05:30	50.2	74.5	47.5	48.6	43.9	40.6	37.7	44.6	45.6	42.2	26.2	12.7
05:30 - 05:45	49.1	72.9	48.1	49.3	41.6	38.4	37.3	45.1	43.7	39.8	24.0	12.2
05:45 - 06:00	38.6	45.2	47.6	48.8	41.2	35.7	33.4	35.4	30.1	25.9	14.5	11.8
06:00 - 06:15	50.3	73.6	51.6	50.7	41.3	38.8	40.4	44.4	44.7	44.0	30.8	15.8
06:15 - 06:30	51.2	74.5	51.1	52.2	45.2	42.2	40.8	46.8	45.7	43.0	28.9	13.5
06:30 - 06:45	55.4	74.8	52.3	57.4	46.8	43.5	45.4	50.7	49.6	48.0	33.6	17.5
06:45 - 07:00	50.2	72.6	53.9	53.0	44.4	41.7	39.7	45.2	45.3	41.3	24.6	12.4

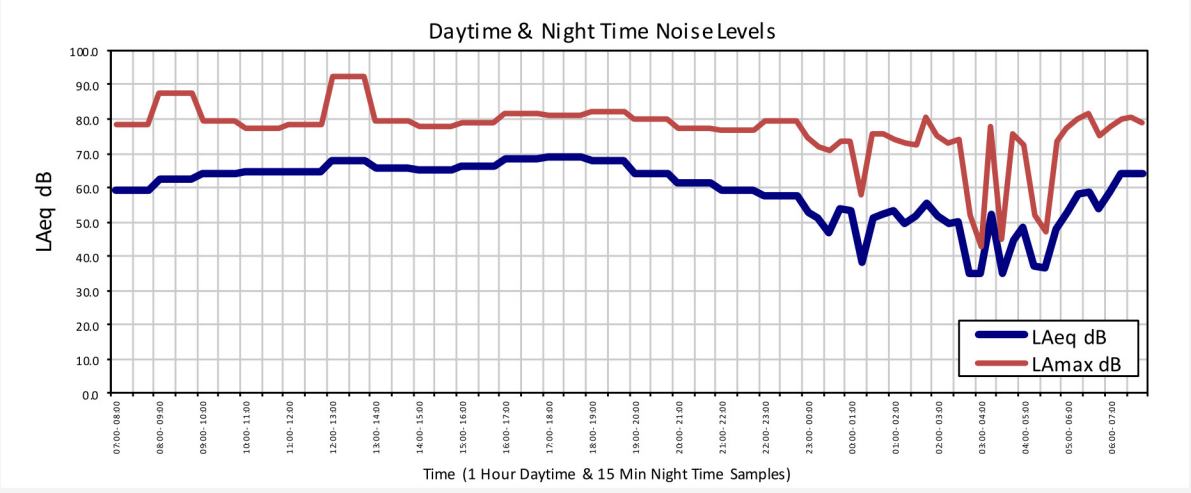


16.5 Position 1 – 16th-17th December 2018

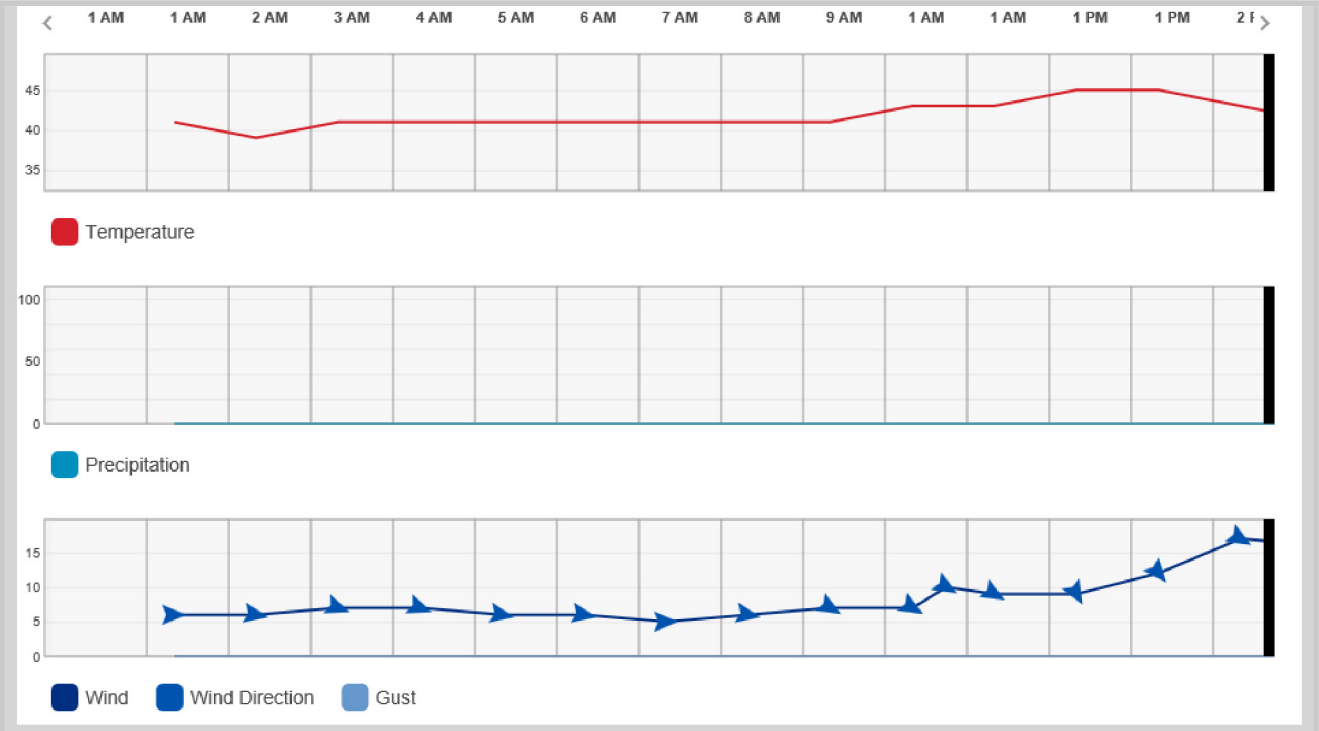
NOISE LEVEL SUMMARY ASSESSMENT			Octave Band Centre Frequency (Hz)									
Date / Time	LAeq	LAmax	31.5	63	125	250	500	1.0k	2.0k	4.0k	8.0k	16.0k
DAYTIME 07:00 - 23:00 LAeq 16 HOUR & Corresponding LAmax 16 HOUR	65.4	92.1	60.9	63.8	56.4	51.1	52.3	58.3	59.0	61.0	48.9	31.6
NIGHT TIME 23:00 - 07:00 LAeq 8 HOUR & Corresponding LAmax 8 HOUR	56.0	81.4	51.7	54.4	49.0	42.6	43.9	51.4	51.0	48.5	33.4	17.7

DAYTIME NOISE LEVELS 07:00 - 23:00 1 HOUR SAMPLES			Octave Band Centre Frequency (Hz)									
Date / Time	LAeq	LAmax	31.5	63	125	250	500	1.0 k	2.0 k	4.0 k	8.0 k	16.0 k
07:00 - 08:00	59.4	78.2	54.6	55.8	48.7	46.4	47.5	54.6	54.3	51.7	36.5	17.8
08:00 - 09:00	62.7	87.4	56.0	58.1	52.9	48.9	50.4	57.7	57.0	56.1	41.3	21.1
09:00 - 10:00	64.0	79.7	58.7	63.2	57.8	50.9	52.7	59.3	58.7	56.2	40.9	23.0
10:00 - 11:00	64.6	77.3	59.8	63.6	57.7	50.7	53.5	59.8	59.3	56.9	42.0	22.7
11:00 - 12:00	64.7	78.2	59.2	63.7	57.5	51.8	53.7	59.8	59.3	57.4	43.7	24.1
12:00 - 13:00	68.0	92.1	58.9	66.3	59.3	54.1	53.9	60.0	60.1	64.4	56.7	31.0
13:00 - 14:00	65.8	79.3	59.2	69.6	60.3	53.1	53.5	59.5	59.7	60.7	47.3	28.2
14:00 - 15:00	65.1	77.9	59.7	64.3	56.1	52.2	53.0	59.5	59.4	58.9	45.3	26.5
15:00 - 16:00	66.4	79.0	61.1	64.0	56.3	51.7	53.5	59.8	60.3	61.4	48.0	31.9
16:00 - 17:00	68.5	81.7	66.9	65.3	57.0	53.0	54.4	58.9	61.4	65.2	52.1	38.0
17:00 - 18:00	68.7	81.1	65.6	64.9	56.8	52.3	53.7	58.6	61.4	65.6	52.4	37.6
18:00 - 19:00	68.0	82.1	64.6	62.7	54.8	50.8	52.8	58.2	60.9	64.7	51.4	36.2
19:00 - 20:00	64.3	79.8	55.4	60.8	54.1	48.3	50.8	56.6	57.8	60.2	46.8	30.6
20:00 - 21:00	61.4	77.2	53.9	61.1	53.0	47.8	49.1	55.5	55.6	55.8	42.3	24.7
21:00 - 22:00	59.0	77.0	52.7	57.4	52.5	48.3	48.1	53.6	53.2	52.9	39.4	22.3
22:00 - 23:00	57.7	79.4	51.5	57.0	50.1	47.1	46.4	51.9	52.1	51.6	38.1	21.8

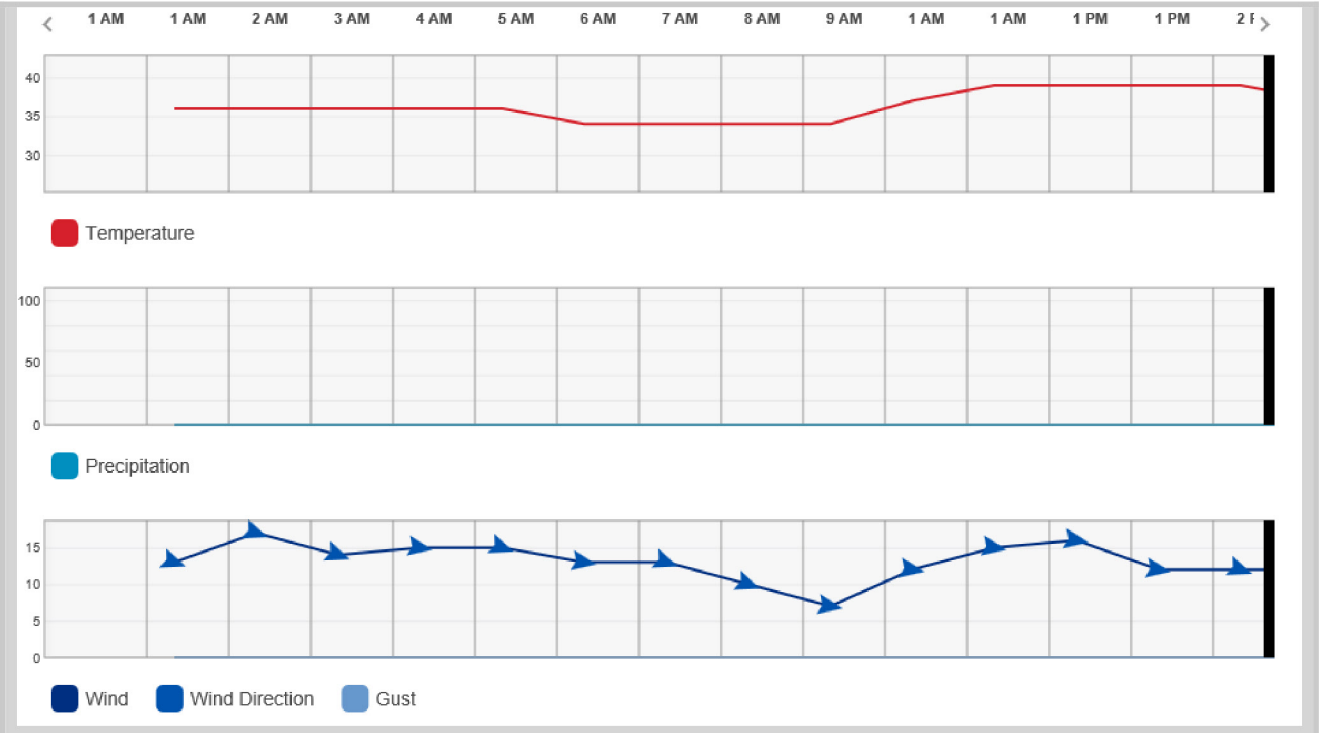
NIGHT TIME NOISE LEVELS 23:00 - 07:00 15 MINUTE SAMPLES			Octave Band Centre Frequency (Hz)									
Date / Time	LAeq	LAmax	31.5	63	125	250	500	1.0 k	2.0 k	4.0 k	8.0 k	16.0 k
23:00 - 23:15	52.5	74.5	50.3	49.6	44.7	37.9	38.8	46.8	47.9	45.2	30.0	14.4
23:15 - 23:30	51.0	71.7	53.5	51.1	43.0	38.0	39.7	45.3	45.3	45.0	31.3	15.4
23:30 - 23:45	46.9	70.7	49.3	46.3	38.3	35.3	36.9	42.9	39.9	40.2	26.7	13.4
23:45 - 00:00	54.1	73.6	50.3	53.7	43.5	37.6	41.8	50.1	48.4	46.0	31.6	15.3
00:00 - 00:15	53.3	73.7	49.8	51.2	41.1	37.7	41.6	48.5	47.8	46.1	31.9	15.4
00:15 - 00:30	38.4	58.0	49.8	45.6	36.4	31.6	31.3	33.1	30.1	32.9	20.3	12.7
00:30 - 00:45	51.2	75.5	48.2	45.3	42.6	37.1	37.5	44.9	46.8	44.2	27.5	13.3
00:45 - 01:00	52.3	75.9	48.0	48.5	39.7	36.2	40.0	47.8	47.0	44.5	30.1	14.6
01:00 - 01:15	53.1	74.3	49.6	50.5	45.9	39.0	40.1	48.6	47.9	45.0	30.4	14.6
01:15 - 01:30	49.5	73.2	50.0	49.3	48.0	36.6	38.3	46.3	42.6	40.6	25.8	12.6
01:30 - 01:45	51.8	72.6	49.0	47.0	41.5	38.5	40.2	47.6	46.2	43.6	28.5	13.5
01:45 - 02:00	55.7	80.5	50.9	50.0	53.2	41.6	41.6	49.6	50.8	49.2	33.5	18.9
02:00 - 02:15	51.6	75.2	50.2	51.3	46.4	38.7	39.4	44.3	44.9	47.3	34.5	17.0
02:15 - 02:30	49.3	73.2	49.0	45.4	39.1	36.4	37.2	44.8	44.0	41.3	26.5	13.6
02:30 - 02:45	49.9	74.3	50.0	48.7	41.9	36.7	37.5	44.5	44.9	42.3	26.3	13.0
02:45 - 03:00	35.2	51.7	49.0	45.2	34.4	27.5	28.9	29.9	27.1	29.2	16.5	11.9
03:00 - 03:15	35.0	43.0	48.2	44.5	33.5	26.8	28.9	29.7	27.0	29.1	16.6	11.9
03:15 - 03:30	52.1	77.8	47.9	49.1	43.7	35.5	38.4	47.2	46.7	45.4	30.5	14.3
03:30 - 03:45	34.9	45.0	49.3	45.7	34.6	28.3	28.3	29.6	26.8	28.8	16.3	11.9
03:45 - 04:00	44.6	75.7	49.3	46.1	33.9	27.7	34.3	44.4	29.7	30.1	17.3	12.2
04:00 - 04:15	48.4	72.6	49.6	46.7	42.0	35.4	35.9	43.2	43.5	40.5	24.7	12.7
04:15 - 04:30	37.2	52.2	49.3	46.7	41.0	37.1	32.8	31.4	27.6	29.5	17.4	12.4
04:30 - 04:45	36.7	47.1	48.1	44.8	35.0	34.0	31.6	32.9	28.0	27.5	15.6	11.9
04:45 - 05:00	48.0	73.4	49.6	47.6	39.6	34.6	37.3	43.4	42.7	39.7	25.4	12.6
05:00 - 05:15	52.5	77.5	49.5	51.7	42.4	42.2	41.0	48.4	47.2	43.3	26.4	12.5
05:15 - 05:30	58.2	80.0	50.6	53.1	45.9	42.7	46.4	53.7	53.3	49.6	34.1	15.9
05:30 - 05:45	58.6	81.4	51.8	52.1	49.5	43.9	46.2	53.6	53.4	51.3	36.2	18.7
05:45 - 06:00	53.9	75.2	51.6	52.6	50.0	43.6	43.2	48.5	48.8	46.7	32.5	16.3
06:00 - 06:15	58.5	77.7	53.6	55.0	46.0	42.9	45.6	54.1	53.5	49.6	33.6	16.1
06:15 - 06:30	63.9	80.2	55.4	61.1	53.3	50.1	51.4	59.2	58.7	56.0	40.5	21.6
06:30 - 06:45	64.1	80.6	58.4	64.3	59.8	51.0	52.1	59.3	59.0	56.2	41.4	28.2
06:45 - 07:00	64.3	78.7	57.7	62.5	56.0	51.1	51.9	59.3	59.1	56.8	41.4	22.8



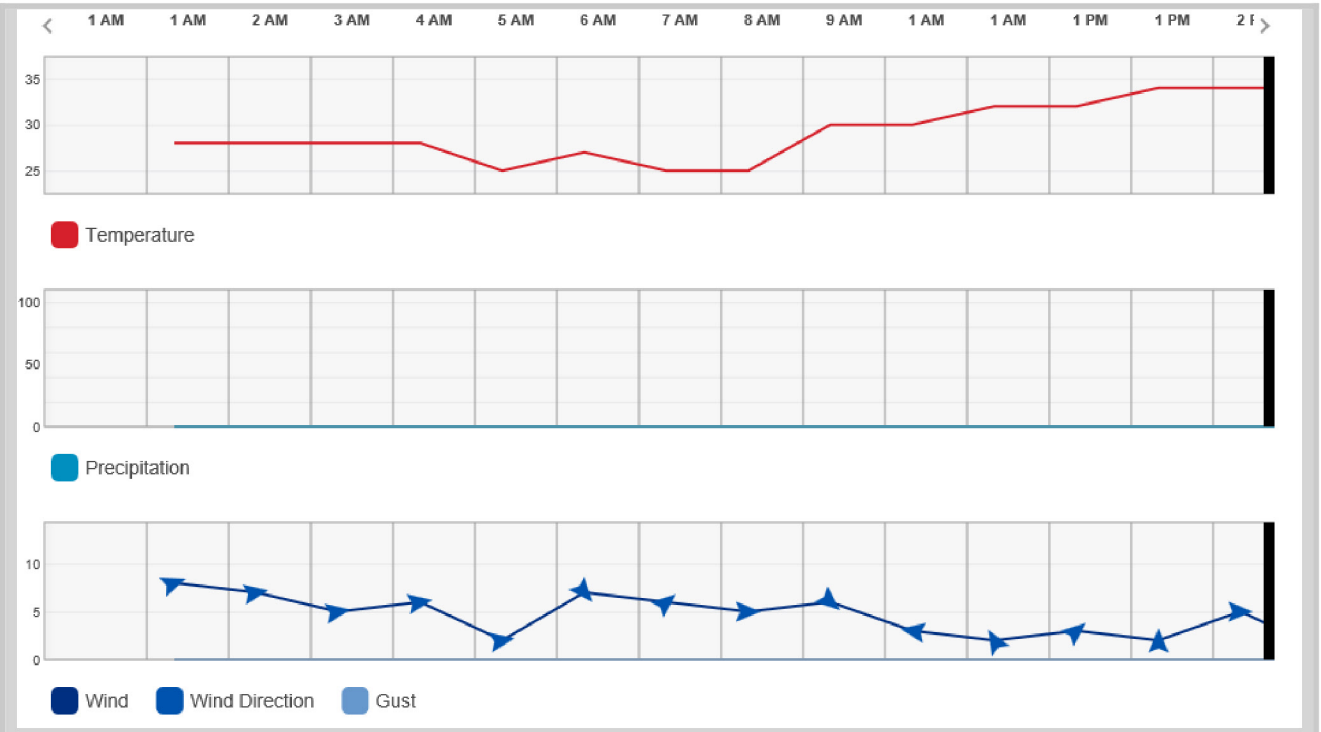
17 ENVIRONMENTAL CONDITIONS



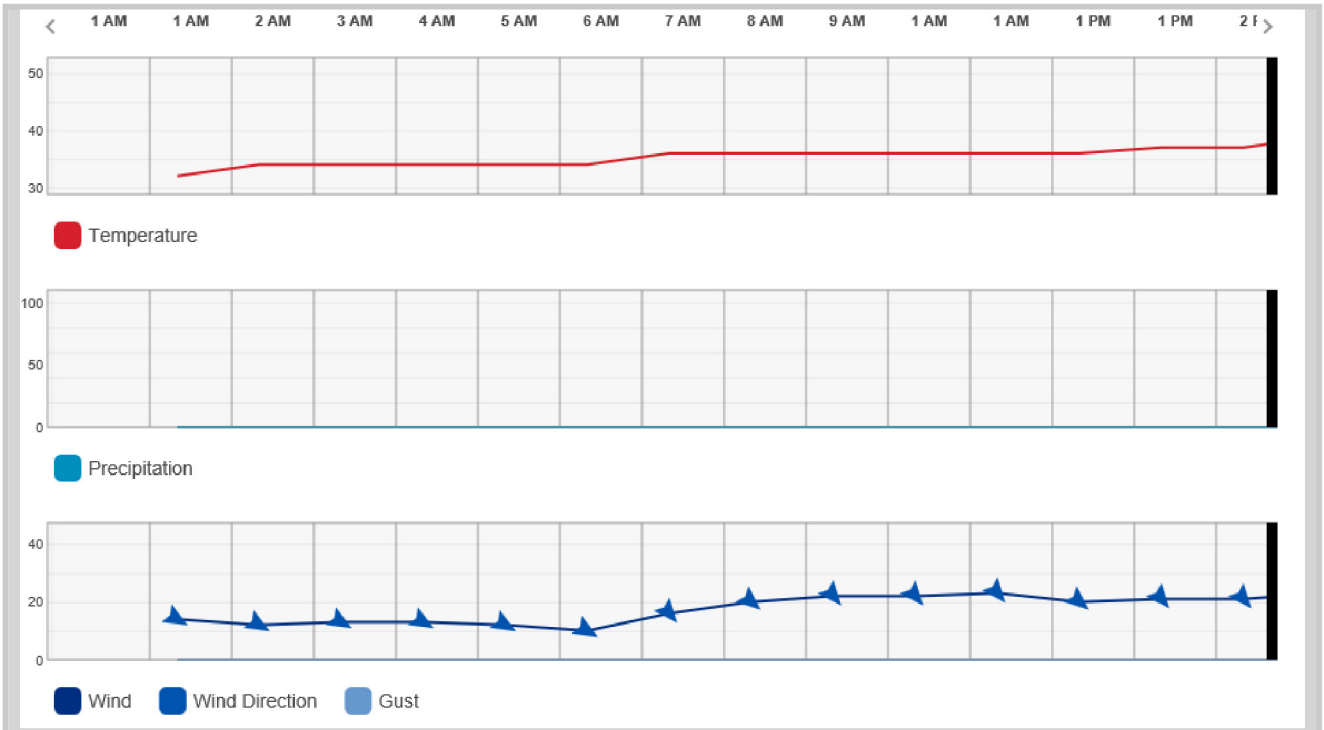
12th December 2018



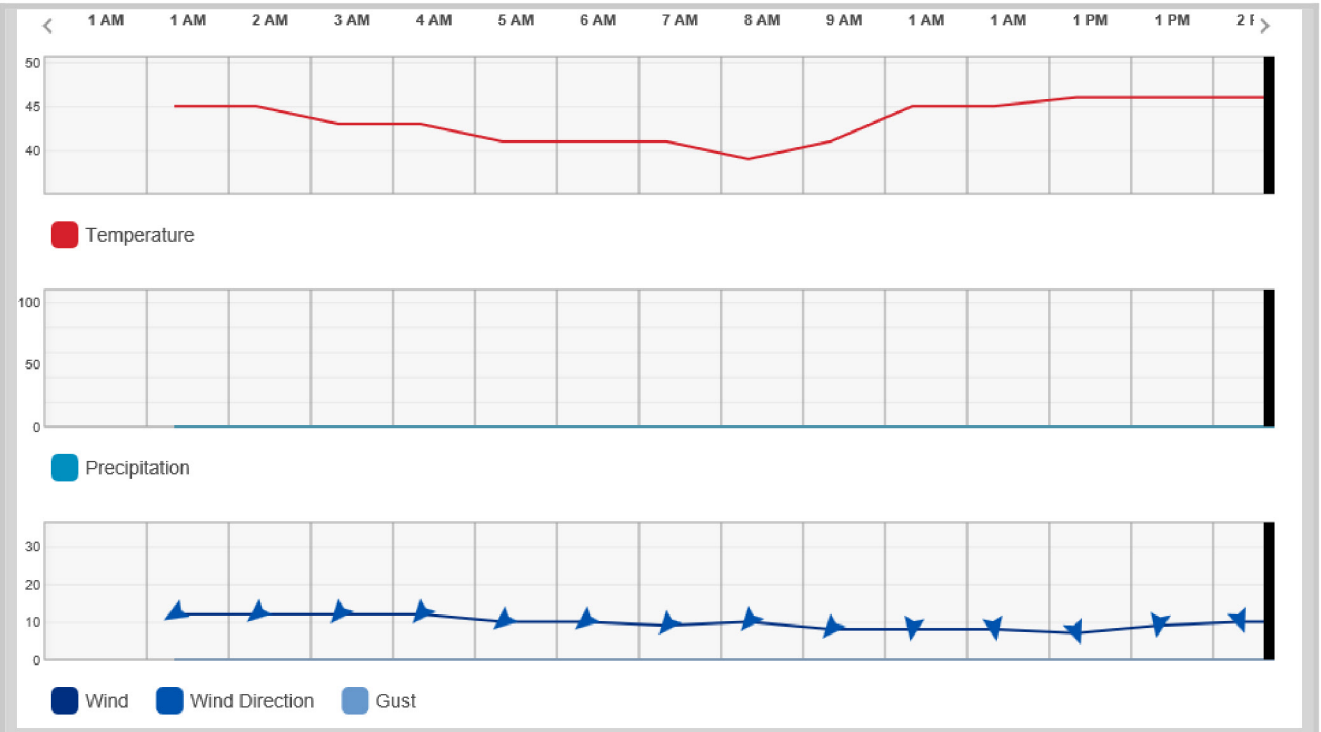
13th December 2018



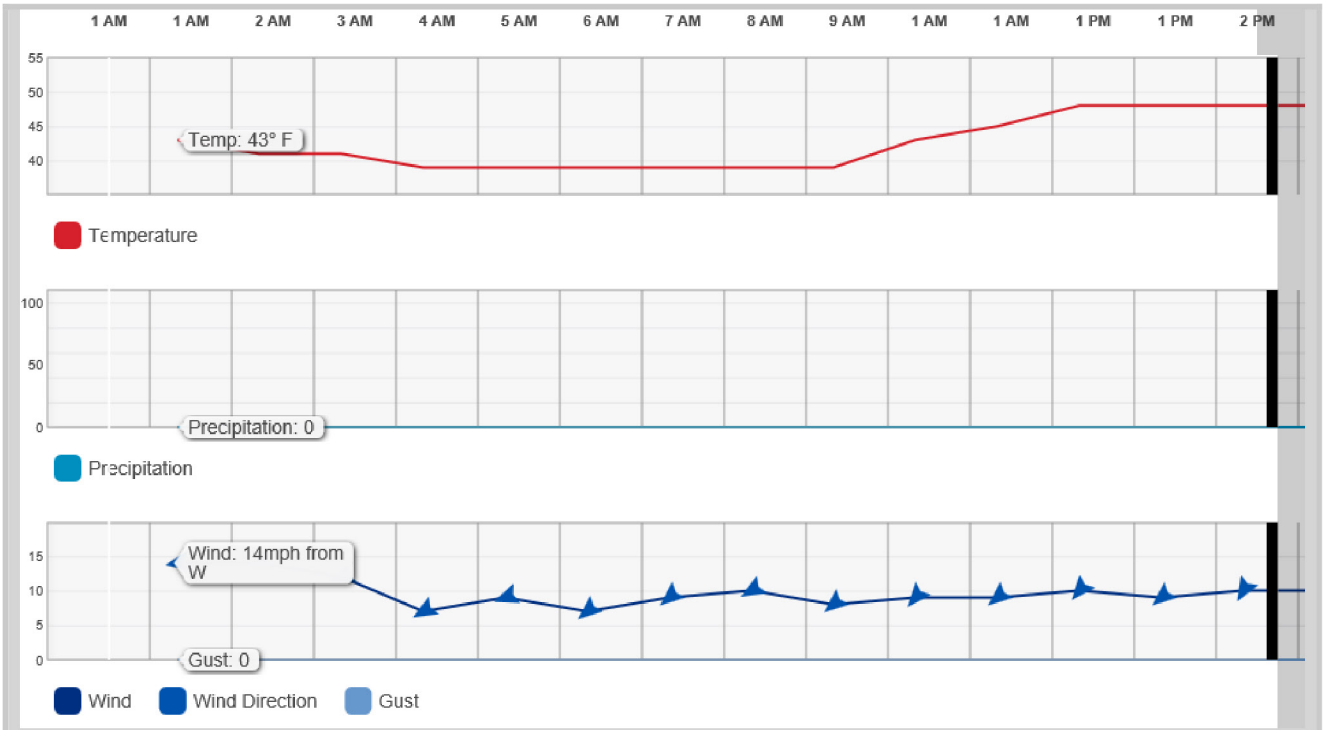
14th December 2018



15th December 2018



16th December 2018



17th December 2018

#END OF REPORT#