Three Spires Acoustics

Acoustics, Noise and Regulatory Control Consultants

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For: Drayton Parish Council

Environmental Noise Assessment Report

Drayton Village, Abingdon, Oxfordshire

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Three Spires Acoustics Ltd

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EXECUTIVE SUMMARY

Three Spires Acoustics (TSA) have been commissioned by Drayton Parish Council to undertake an environmental noise assessment at two residential sites in the village of Drayton, Abingdon, Oxfordshire. The assessment has been requested as part of the Parish Council's provision of evidence to support Policy C-LF6: A34 NOISE REDUCTION which is part of the Parish Council's Neighbourhood Plan, "Drayton 2020".

The acoustic assessment has been carried out in accordance with the requirements of:

- National Planning Policy Framework (NPPF) 2012
- Noise Policy Statement for England (NPSE) 2010
- BS8233: 2014 - Sound insulation and noise reduction for buildings.
- World Health Organisation (WHO)- Community Noise 1999

A detailed environmental noise survey has been undertaken over a 7day period at two locations within the village of Drayton which have been chosen by the Parish Council as representative locations effected by vehicle road noise from the A34.

Proposed acceptability criteria have been detailed based upon national & international guideline criteria & standards.

The outcome of the assessment has been compared against acceptability criteria which indicates that the existing noise climate at both measurement locations is above guideline levels for amenity areas and therefore in the context of the rural setting could be considered to cause an "Observed Adverse Effect" and as such the noise impact on any future residential development should be minimised and mitigated by the use of good acoustic design principles.

Potential residential development closer to the A34 will inevitably lead to higher levels of noise exposure with the potential of causing a "Significant Observed Adverse Effect", it is considered that development in these areas should be avoided unless there are sustainability or local development reasons for such development.

With regard to other uses such as recreational or light industrial it is considered that these are suitable use types for the area.

We consider that the report provides evidence to support Drayton Parish Council's opinion that existing road traffic noise from the A34 may cause significant adverse and other adverse impacts on health and quality of life and that proposed new residential development within the village which is close to the A34 should be avoided and that noise exposure to new development in existing residential areas should be mitigated and reduced by the use of good acoustic design principles as required by NPPF and NPSE.

It is also recommend that the Parish Council also seek clarification from the Highways Agency as to the noise reduction measures they may be undertaking as part of their responsibilities under the Environmental Noise Directive (END).

1. INTRODUCTION

TSA have been commissioned by Drayton Parish Council to undertake an environmental noise assessment at two residential sites in the village of Drayton, Abingdon, Oxfordshire. The assessment has been requested as part of the Parish Council's provision of evidence to support Policy C-LF6: A34 NOISE REDUCTION which is part of the parish councils Neighbourhood Plan, "Drayton 2020".

1.1. OBJECTIVES

- To establish the ambient and background A-weighted L_{90}, L_{eq} and L_{max} noise levels at two representative locations within Drayton the village which experience noise from A34.
- To identify appropriate noise assessment acceptability criteria and compare the measurement results against the identified criteria.
- To make recommendations where appropriate

2. SITE AND MEASUREMENT POSITIONS

The two locations identified by Drayton Parish Council are to the west of the village and have direct line of the site over the A34. A plan identifying the measurement locations and position of the A34 relative to these locations is presented in figure 1 below.

Figure 1: Aerial Photo of Measurement Locations & A34

3. REGULATORY FRAMEWORK

3.1. DEVELOPMENT CONTROL

National planning guidance is now contained within the National Planning Policy Framework (NPPF) 'the Framework' (March 2012) and the Noise Policy Statement for England - NPSE (March 2010). Previously planning guidance on noise was contained within PPG24 (Planning Policy Guidance: Planning and Noise - PPG24, this guidance has now been withdrawn.

3.1.1. National Planning Policy Framework 2012

Under the heading of Conserving and Enhancing the Natural Environment, noise aims are detailed at s.123, which states that:

Planning policies and decisions should aim to:

- *avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- *mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*
- *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*

3.1.2. National Planning Policy Guidance 2014

The NPPG was published as an online resource on 6 March 2014. The most recent Government advice on how planning can manage potential noise impacts can be found in a specific part of the NPPG. This advice is intended to be updated online from time to time and the original published advice

The initial advice in the NPPG states that "local planning authorities working with local communities and businesses may decide to develop and include in their Local Plans specific standards to apply to various forms of proposed development and locations in their area". The NPPG cautions that "Care should be taken, however, to avoid these being implemented as fixed thresholds as specific circumstances may justify some variation being allowed".

The NPPG includes guidance on how to recognise when noise could be a concern in planning decisions and includes advice that the planning process should be used to "avoid" significant observed adverse effects occurring, by use of appropriate mitigation such as altering design and layout. The NPPG also states that the planning process should be used to "prevent" unacceptable adverse effects where noise is noticeable and very disruptive leading to extensive and regular changes in behaviour and/or an inability to mitigate the effect of noise leading to psychological stress or physiological effects.

3.1.3. Noise Policy Statement for England 2010

NPPF affirms that National Policy Statements form part of the overall framework of national planning policy, and should be a material consideration in decisions on planning applications. The Noise Policy Statement for England came into force in 2010 and states:

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life.*

The NPPF noise aims widely reflect those in NPSE. The NPSE does however include some context within the explanatory note to assessing noise impact and uses established concepts from toxicology currently being applied to noise impacts, these include:

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.

SOAEL *– Significant Observed Adverse Effect Level.* This is the level above which significant adverse effects on health and quality of life occur.

LOAEL *– Lowest Observed Adverse Effect Level.* This is the level above which adverse effects on health and quality of life can be detected.

However, it's clear that 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.

3.1. ENVIRONMENTAL NOISE (ENGLAND) REGULATIONS 2006

The EU Directive 2002/49/EC relating to assessment and management of Environmental noise, generally referred to as the Environmental Noise Directive (END), is implemented in England by the EN Regulations. The END has three principle objectives:

a. to determine the noise exposure of the population through noise mapping

b. make information on environmental noise and its effects available to the public

c. establish action plans (often described as noise action plans), based on the mapping results.

The Department for Environment, Food and Rural Affairs (Defra) has recently completed the second round of strategic noise mapping, the results of which inform the latest Noise Action Plans (NAPs). The NAPs were updated in 2013, consulted on and adopted in 2014. These were developed by Defra (as the Competent Authority). The latest NAPs cover the 65 agglomerations that were included in the Round 2 noise mapping. They also provide further details about the process to be followed to enable the formal identification of quiet areas in the agglomerations.

Road noise mapping data for the A34 from the round 1 strategic mapping is available from DEFRA's EU Noise Mapping data. Figure 2 below details the L_{den} road noise values for the area. The measurement locations fall within the 60-65dB(A) contour range. It is possible to derive the $L_{Aeq,16hr}$ level from the L_{den} level by the following calculation[1].

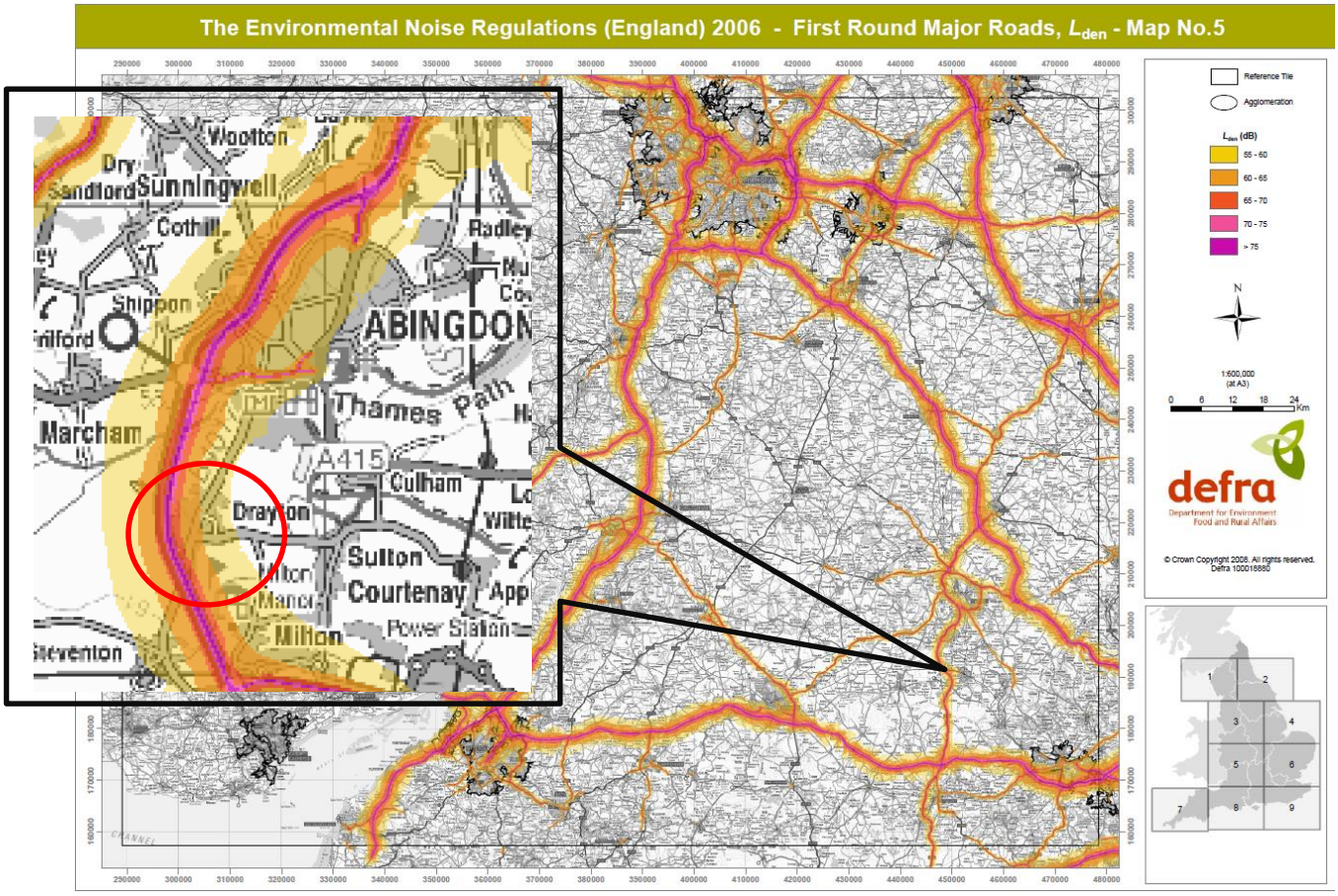
$$\mathbf{Lden = 0.92 \times L_{A10,18hr} + 4.2}$$

$$\mathbf{\& \; L_{Aeq,16hr} = L_{A10,18hr} - 2}$$

This results in an approximate level of 59-64dB(A) $L_{Aeq,16hr}$.

[1] Method of converting the UK Road Traffic Noise Indices LA10,18hr to the EU Noise Indices for Noise Mapping

Figure 2:ENDs 2006- L_{den} Noise Contour Map – Major Roads



4. CRITERIA

4.1. BS8233:2014 SOUND INSULATION AND NOISE REDUCTION FOR BUILDINGS.

Guidance on suitable internal noise levels can be found in BS8233:2014: Sound insulation and noise reduction for buildings. BS8233 suggests indoor ambient noise criterion for reasonable resting and sleeping conditions in bedrooms and living rooms and is presented in Table 1 below.

Table 1: BS8233 Summary Table

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 $L_{Aeq,8\ hour}$

NOTE 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or LAmax,F, depending on the character and number of events per night. Sporadic noise events could require separate values.

NOTE 5 If relying on closed windows to meet the guide values, there needs to be appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment.

NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.

With regard to noise from individual noise events it is considered that for a reasonable standard in noise sensitive rooms at night (i.e. bedrooms), individual noise events measured with F time-weighting should not normally exceed 45dB L_{Amax} more than 10 times a night. This guideline is supported by advice contained in a previous version of the same standard, namely BS8233:1999 and WHO Community Noise Guidelines

4.1.1. BS8233: Amenity Areas.

BS8233:2014 (Section 7.7.3.2 Design criteria for external noise) contains the following guidance:

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

Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB LAeq,T or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space."

4.2. WHO GUIDELINES FOR COMMUNITY NOISE 1999 –EXTERNAL AMENITY AREAS

Section 4 of the WHO guidelines deals with annoyance noise, its states;
The capacity of a noise to induce annoyance depends upon many of its physical characteristics, including its sound pressure level and spectral characteristics, as well as the variations of these properties over time. However, annoyance reactions are sensitive to many non-acoustical factors of social, psychological or economic nature, and there are also considerable differences in individual reactions to the same noise
Annoyance to community noise varies with the type of activity producing the noise. Speech communication, relaxation, listening to radio and TV are all examples of noise-producing activities. During the daytime, few people are seriously annoyed by activities with LAeq levels below 55 dB; or moderately annoyed with LAeq levels below 50 dB. Sound pressure levels during the evening and night should be 5–10 dB lower than during the day.
Therefore we consider the objective level for the protection of amenity areas appropriate for this site should be between 50-55dB(A) $L_{Aeq,T}$
Guideline levels from the WHO Community Noise guidance also suggests an external limit of 55dB(A) LAeq,T for school playing areas.

4.3. PROPOSED ACCEPTABILITY CRITERIA

In order to determine the noise impact on the proposed development and in accordance with NPPF & NPSE requirements, proposed acceptability criteria (pre or post mitigation) have been based upon the guidance and corresponding thresholds detailed in section 5 of this report and are presented in Table 2 below;

Table 2: Proposed Acceptability Criteria Table

Criteria	Location	Proposed Acceptability Level	Period
BS8233	Internal	35dB(A) $L_{Aeq,T}$	Day
		30dB(A) $L_{Aeq,T}$	Night
		45dB(A) L_{AMax}	Night
BS 8233/WHO	External	50-55dB(A) $L_{Aeq,T}$	Day

5. SURVEY

5.1. METHODOLOGY

The measurement assessment methodology outlined in the Planning Policy Guidance 24 (now removed) is considered appropriate and has been followed for assessment purposes.

5.2. SURVEY DETAILS

An unattended acoustic survey of ambient and background noise levels was carried out between 12:59 on 21/07/2014 until 12:15 on 28/07/2014.

Measurement positions MP1, 52 Whitehorns Way and MP2, 33 Lockway are indicated on figure 1 on page 6 of the report. Measurements are considered representative of typical ambient levels at each site. Due to battery supply limitations measurements at MP1 could only be made until 16:00 on the 25/07/2014, measurements are considered valid for assessment purposes.
Measurements were obtained using the following instrumentation complying with the Type 1 specification of IEC 60651, IEC 61260 and IEC 61672;

Bruel & Kjaer 2250 sound analysers (Serial Number 2764958 & 2106216)

Bruel & Kjaer 4231 Field calibrator (Serial Number 3001533)

The equipment was calibrated using a 4231 field calibrator both before and after the survey and no significant drift was observed. Full calibration certificates are available upon request. The analysers were set to record all broadband and statistical A-weighted and octave band sound pressure levels including L10, L90, Leq and LMax. Measurements were simultaneously made of 1 minute and 1hour periods. The weather conditions and wind were both noted and although variable throughout the survey period are considered satisfactory. Meteorological data from the closest weather station at RAF Benson Airbase is presented in Appendix C. It is noted that wind direction changed during the measurement period and resulted in a decrease in measured levels, this is discussed later in the report.

The acoustic climate is considered to be dominated by vehicle traffic noise using the A34 which is approximately 175m from MP1 and 200m from MP2

5.3. MEASUREMENT RESULTS

A summary of the measurement results are presented in Tables 3 and 4 and figures 3 and 4 below. Further measurement results are detailed in Appendix B.

Table 3: MP1 54 Whitehorns Way, Drayton Village - Summary of Measurement Results

Name	Start time	End time	Duration	LAeq dB(A)	LAFmax dB(A)	LAF10 dB(A)	LAF90 dB(A)
(All) DAY	21/07/2014 12:59:26	25/07/2014 16:00:00	59:00:34	56	85	59	45
(All) NIGHT	21/07/2014 23:00:00	25/07/2014 07:00:00	40:00:00	55	88	59	45
Highest Day	21/07/2014 12:59:26	21/07/2014 23:00:00	10:00:34	60	81	63	55
Highest Night	21/07/2014 23:00:00	22/07/2014 23:00:00	24:00:00	56	88	59	47
Highest Day Hour	23/07/2014 08:00	23/07/2014 09:00	01:00:00	65	82	67	50
Highest Night Hour	25/07/2014 05:00	25/07/2014 06:00	01:00:00	60	67	63	54
DAY	21/07/2014 12:59:26	21/07/2014 23:00:00	10:00:34	60	81	63	55
DAY	22/07/2014 23:00:00	23/07/2014 23:00:00	24:00:00	56	85	55	43
DAY	24/07/2014 07:00:00	24/07/2014 23:00:00	16:00:00	51	81	54	47
DAY	25/07/2014 07:00:00	25/07/2014 16:00:00	9:00:00	53	81	55	44
NIGHT	21/07/2014 23:00:00	22/07/2014 23:00:00	24:00:00	56	88	59	47
NIGHT	23/07/2014 23:00:00	24/07/2014 07:00:00	8:00:00	49	62	52	41
NIGHT	24/07/2014 23:00:00	25/07/2014 07:00:00	8:00:00	55	67	59	44

Figure 3: 54 Whitehorns Way, Drayton Village LAeq,1hour Time History Profile

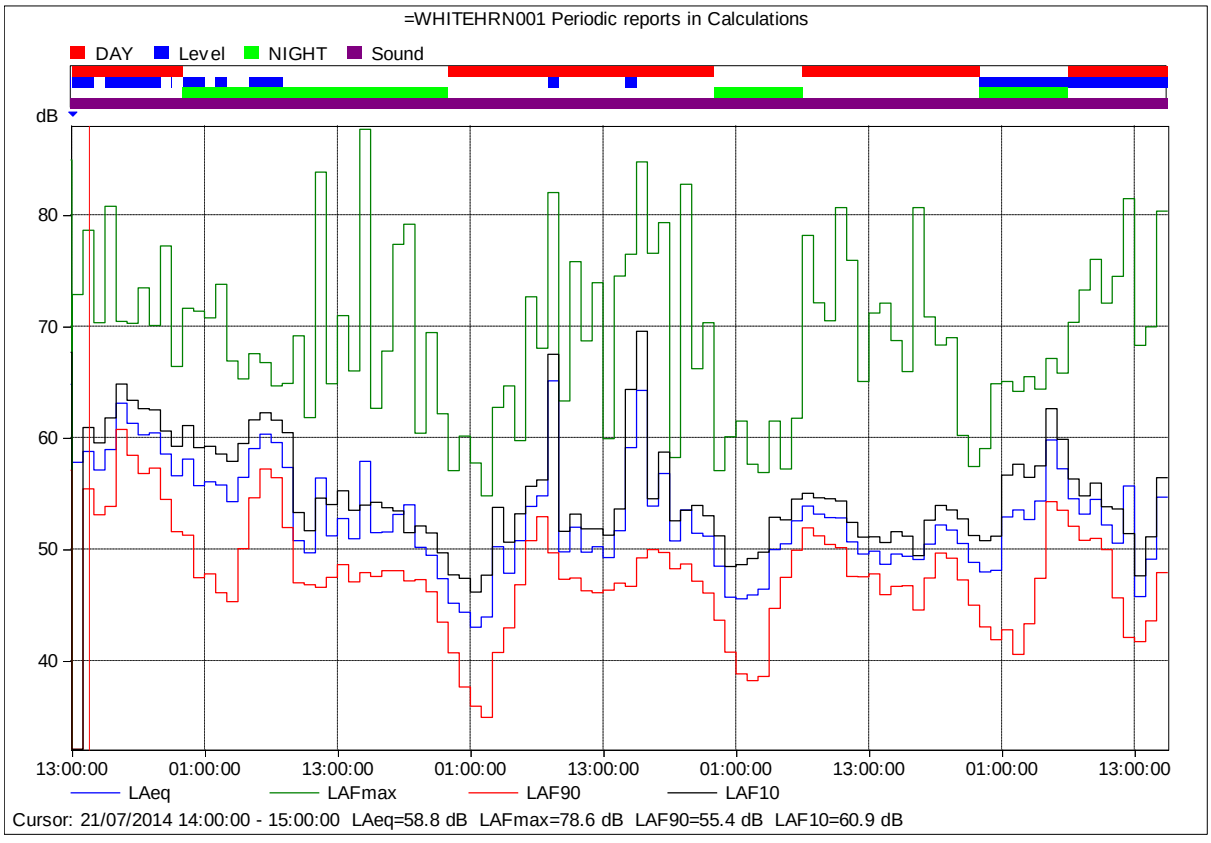
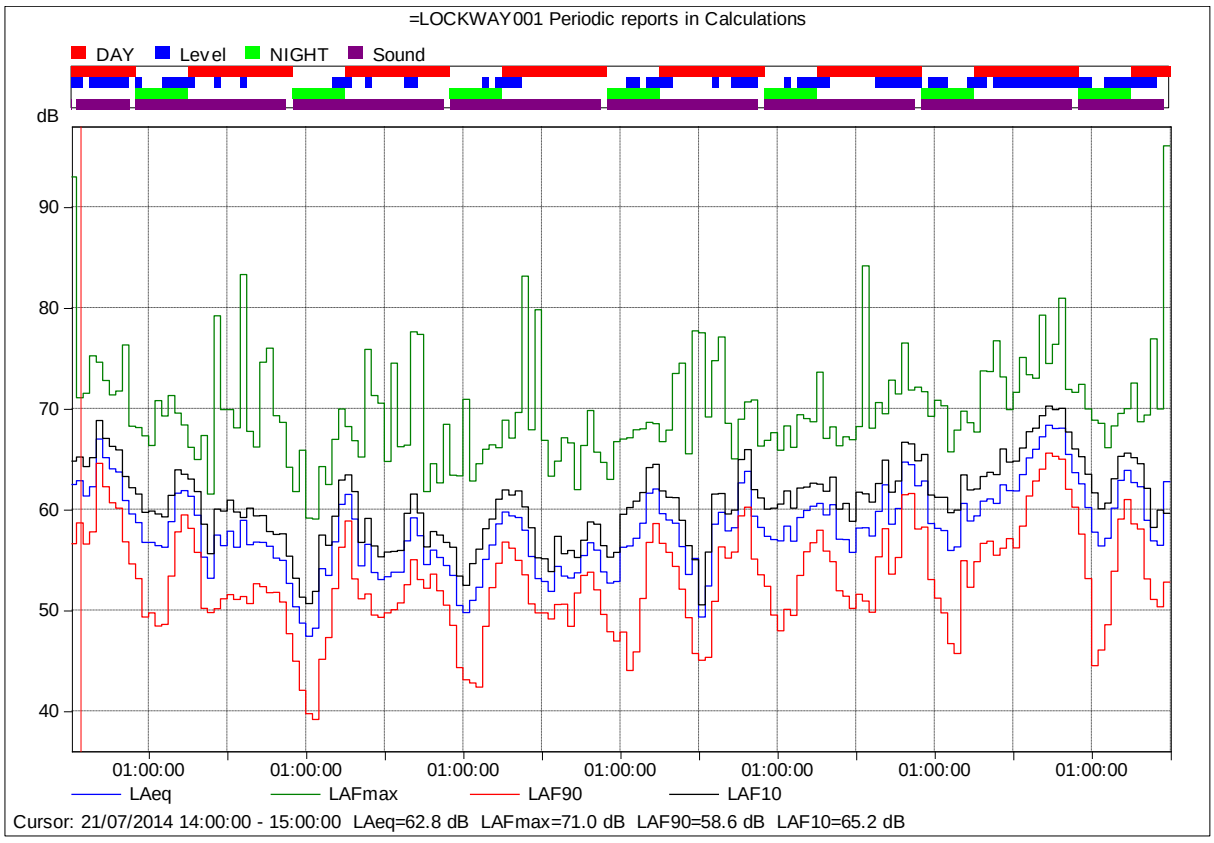


Table 4: MP2 33 Lockway Drayton Village - Summary of Measurement Results

Name	Start time	End time	Duration	LAeq dB(A)	LAFmax dB(A)	LAF10 dB(A)	LAF90 dB(A)
(All) DAY	21/07/2014 13:12:19	28/07/2014 12:15:10	111:02:51	61	96	65	51
(All) NIGHT	21/07/2014 23:00:00	28/07/2014 07:00:00	56:00:00	58	72	62	47
Highest Day	21/07/2014 13:12:19	21/07/2014 23:00:00	9:47:41	63	93	66	58
Highest Night	27/07/2014 23:00:00	28/07/2014 07:00:00	8:00:00	61	72	64	51
Highest Day Hour	27/07/2014 19:00	27/07/2014 18:00	01:00:00	68	76	70	65
Highest Night Hour	27/07/2014 23:00	28/07/2014 00:00	01:00:00	63	72	65	57
DAY	21/07/2014 13:12:19	21/07/2014 23:00:00	9:47:41	63	93	66	58
DAY	22/07/2014 07:00:00	22/07/2014 23:00:00	16:00:00	57	83	61	51
DAY	23/07/2014 07:00:00	23/07/2014 23:00:00	16:00:00	57	78	60	51
DAY	24/07/2014 07:00:00	24/07/2014 23:00:00	16:00:00	56	83	59	51
DAY	25/07/2014 07:00:00	25/07/2014 23:00:00	16:00:00	59	78	62	49
DAY	26/07/2014 07:00:00	26/07/2014 23:00:00	16:00:00	61	84	64	53
DAY	27/07/2014 07:00:00	27/07/2014 23:00:00	16:00:00	65	81	68	58
DAY	28/07/2014 07:00:00	28/07/2014 12:15:10	5:15:10	60	96	64	52
NIGHT	21/07/2014 23:00:00	22/07/2014 07:00:00	8:00:00	59	71	62	51
NIGHT	22/07/2014 23:00:00	23/07/2014 07:00:00	8:00:00	55	70	59	43
NIGHT	23/07/2014 23:00:00	24/07/2014 07:00:00	8:00:00	54	71	58	45
NIGHT	24/07/2014 23:00:00	25/07/2014 07:00:00	8:00:00	58	69	62	48
NIGHT	25/07/2014 23:00:00	26/07/2014 07:00:00	8:00:00	58	69	62	51
NIGHT	26/07/2014 23:00:00	27/07/2014 07:00:00	8:00:00	59	72	63	50
NIGHT	27/07/2014 23:00:00	28/07/2014 07:00:00	8:00:00	61	72	64	51

Figure 4: 33 Lockway, Drayton Village LAeq,1hour Time History Profile



5.4. MEASUREMENT RESULTS ANALYSIS

5.4.1. Whitehorns Way

1) The overall measured daytime level was 56dB(A) $L_{Aeq,T}$. The highest measured day level was 60dB(A) $L_{Aeq,16hour}$ and the highest one hour measured period was 65dB(A) $L_{Aeq,1hour}$. The range of daytime measured levels ranged from 51dB(A) $L_{Aeq,16hour}$ to 60dB(A) $L_{Aeq,16hour}$
2) The overall night level was 55dB(A) $L_{Aeq,T}$. The highest night level 56dB(A)$L_{Aeq,16hour}$ and the highest one hour measured period was 60dB(A) $L_{Aeq,1hour}$. The range of night measured levels ranged from 49dB(A) $L_{Aeq,8hour}$ to 56dB(A) $L_{Aeq,8hour}$
3) L_{den} noise mapping derivation to LAeq,16hour corresponds to the measured levels
4) L_{AMax} nightime levels are typically between 60-70dB(A)
5) The overall and highest daytime $L_{Aeq,16hour}$ levels were in excess of the WHO and BS8233 recommended maximum levels for amenity areas.
6) Allowing for windows to be partially open (12dB(A) attenuation) for summer cooling and rapid ventilation, internal noise levels due to road traffic noise are likely to be above the recommended internal noise criteria detailed in BS8233 of 30dB(A) $L_{Aeq,8hour}$ night and 35 to 40dB(A) $L_{Aeq,16hour}$ day

5.4.2. Lockway

1) The overall measured daytime level was 61dB(A) $L_{Aeq,T}$. The highest measured day level was 65dB(A) $L_{Aeq,16hour}$ and the highest one hour measured period was 68dB(A) $L_{Aeq,1hour}$. The range of daytime measured levels ranged from 56dB(A) $L_{Aeq,16hour}$ to 65dB(A) $L_{Aeq,16hour}$
2) The overall night level was 58dB(A) $L_{Aeq,T}$. The highest night level 61dB(A)$L_{Aeq,16hour}$ and the highest one hour measured period was 63dB(A) $L_{Aeq,1hour}$. The range of night measured levels ranged from 54dB(A) $L_{Aeq,8hour}$ to 61dB(A) $L_{Aeq,8hour}$
3) L_{den} noise mapping derivation to LAeq,16hour corresponds to the measured levels
4) Wind direction changed from the 22nd to the 26th July from a south westerly to a north easterly resulting in a likely reduction in measured noise levels of approximately 5dB(A) $L_{Aeq,16hour}$. Wind direction changed back during the 26th and 27th July resulting in an increase in overall $L_{Aeq,T}$. Although measurements were not undertaken at White Horns Way during this time it is considered that a similar effect may of taken place.
5) L_{AMax} nightime levels are typically between 60-70dB(A)
6) The overall and highest daytime $L_{Aeq,16hour}$ levels were in excess of the WHO and BS8233 recommended maximum levels for amenity areas.
7) Allowing for windows to be partially open(12dB(A) attenuation) for summer cooling and rapid ventilation, internal noise levels due to road traffic noise are likely to be above the recommended internal noise criteria suggested in BS8233 of 30dB(A) $L_{Aeq,8hour}$ night and 35 to 40dB(A) $L_{Aeq,16hour}$ day

5.5. DISCUSSION

Measured noise levels at both locations were typically above guideline levels for amenity areas. If the NPPG Noise Exposure Table, in the context of a rural setting, is applied it can be considered that noise causes an "Observed Adverse Effect" i.e.

"Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life".

NPPG states that such exposure should be minimised and mitigated to within acceptable levels.

Sound propagation from a line source such as main highway attenuates at approximately 3dB(A) per doubling of distance, noise exposure is therefore likely to increase at any proposed residential development which is closer to the A34 with the potential to cause a "Significant Observed Adverse Effect" i.e.

"The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area"

NPPG states that such development should be avoided unless there are sustainability or other local planning reasons for such development.

It is also recommend that the Parish Council seek clarification from the Highways Agency as to the noise reduction measures they may be undertaking as part of their responsibilities under the Environmental Noise Directive (END).

Drayton Parish Council have also requested that consideration is given to other uses types for the land such as recreational (football pitches) and /or light industrial.

There is limited guideline information regarding noise exposure limits for recreational land, however WHO Community Noise 1999 indicates an upper limit of 55dB(A) LAeq,1hour for school playing fields. It is therefore considered that the existing noise exposure levels would not be detrimental to recreational uses such as football or other similar sports.

It is also considered that noise insulation and ventilation measures could be incorporated into light industrial building design to reduce any noise break in to acceptable levels for this land use type.

5.1. NOISE SENSITIVE DEVELOPMENT - GOOD ACOUSTIC DESIGN

Where there are proposals for new development in existing residential areas of the village already effecting by noise from the it is recommended that good acoustic design principles are followed.

Good acoustic design is that which will achieve good acoustic standards, as far as is reasonably practicable, both internally (inside noise sensitive parts of the building(s)) and externally (in spaces to be used for amenity purposes). Consideration of what is reasonable will include the practicability and availability of technical solutions as well as the associated costs and financial implications, legal requirements and health and safety issues.

Good acoustic design must also provide an integrated solution whereby good acoustic design principles are aligned with, or do not otherwise conflict with, other design aspects that will affect living conditions and the quality of life of the inhabitants or other sustainable design objectives and requirements. Solely relying on sound insulation of the building envelope to achieve acceptable acoustic conditions in new residential

development, when other means may be available to achieve good acoustic standards or to reduce the need to rely on sound insulation of the building envelope, is not regarded as good acoustic design.

5.2. ACOUSTIC DESIGN CRITICAL STEPS

Where residential development is proposed in such the following questions illustrate the types of consideration that will help to achieve the good acoustic design of a noise sensitive scheme:

1) Has noise from the surrounding area been taken into consideration in arranging the site layout? For example, have residential units been located as far away as practicable from an adjacent noise source?
2) Is it practicable to use screening by existing structures or methods incorporated into the proposal to reduce noise levels affecting the sensitive facades and parts of the scheme?
3) Where practicable has the surrounding acoustic environment been taken into account in relation to the internal layout of residential units? Are bedrooms located on the quieter facades? Are gable ends and non-noise sensitive facades orientated towards the dominant source in preference to noise sensitive facades?
4) Will there be part of the habitable space in each unit which does not overlook the significant noise source? Have sensitive rooms been placed on the quietest façade? NB: Single aspect units where all the habitable space overlooks the significant noise source should be avoided.
5) Has consideration been given to suitable noise insulation of the building envelope? This is not currently covered by Building Regulations and can be overlooked if not considered at the planning stage. How will this affect the residential amenity and utility of the proposed scheme?
6) Has consideration been given to the acoustic quality of private or communal outdoor spaces within the scheme? What measures have been included to enhance the acoustic quality of any outdoor amenity spaces? Where access to private or communal quiet outdoor amenity space cannot be, or has not been, provided within a scheme then is there ready access to a suitable quiet outdoor amenity space nearby?

6. CONCLUSION

Three Spires Acoustics (TSA) has undertaken an environmental noise assessment at two residential sites in the village of Drayton, Abingdon, Oxfordshire. The assessment has been requested as part of the Parish Council's provision of evidence to support Policy C-LF6: A34 NOISE REDUCTION which is part of the Parish Council's Neighbourhood Plan, "Drayton 2020".

The acoustic assessment has been carried out in accordance with the requirements of:

- National Planning Policy Framework (NPPF) 2012
- Noise Policy Statement for England (NPSE) 2010
- BS8233: 2014 - Sound insulation and noise reduction for buildings.
- World Health Organisation (WHO)- Community Noise 1999

A detailed environmental noise survey has been undertaken over a 7day period at two locations within the village of Drayton which have been chosen by the Parish Council as representative locations effected by vehicle road noise from the A34.

Proposed acceptability criteria have been detailed based upon national & international guideline criteria & standards.

The outcome of the assessment has been compared against acceptability criteria which indicates that the existing noise climate at both measurement locations is above guideline levels for amenity areas and therefore in the context of the rural setting could be considered to cause an "Observed Adverse Effect" and as such the noise impact on any future residential development should be minimised and mitigated by the use of good acoustic design principles.

Potential residential development closer to the A34 will inevitably lead to higher levels of noise exposure with the potential of causing a "Significant Observed Adverse Effect", it is considered that development in these areas should be avoided unless there are sustainability or local development reasons for such development.

We consider that the report provides evidence to support Drayton Parish Council's opinion that existing road traffic noise from the A34 may cause significant adverse and other adverse impacts on health and quality of life and that proposed new residential development within the village which is close to the A34 should be avoided and that noise exposure to new development in existing residential areas should be mitigated and reduced by the use of good acoustic design principles as required by NPPF and NPSE.

It is also recommend that the Parish Council also seek clarification from the Highways Agency as to the noise reduction measures they may be undertaking as part of their responsibilities under the Environmental Noise Directive (END).

APPENDIX A – RESULTS

Figure 5: 33 Lockway LAeq,1hour Daytime Profile

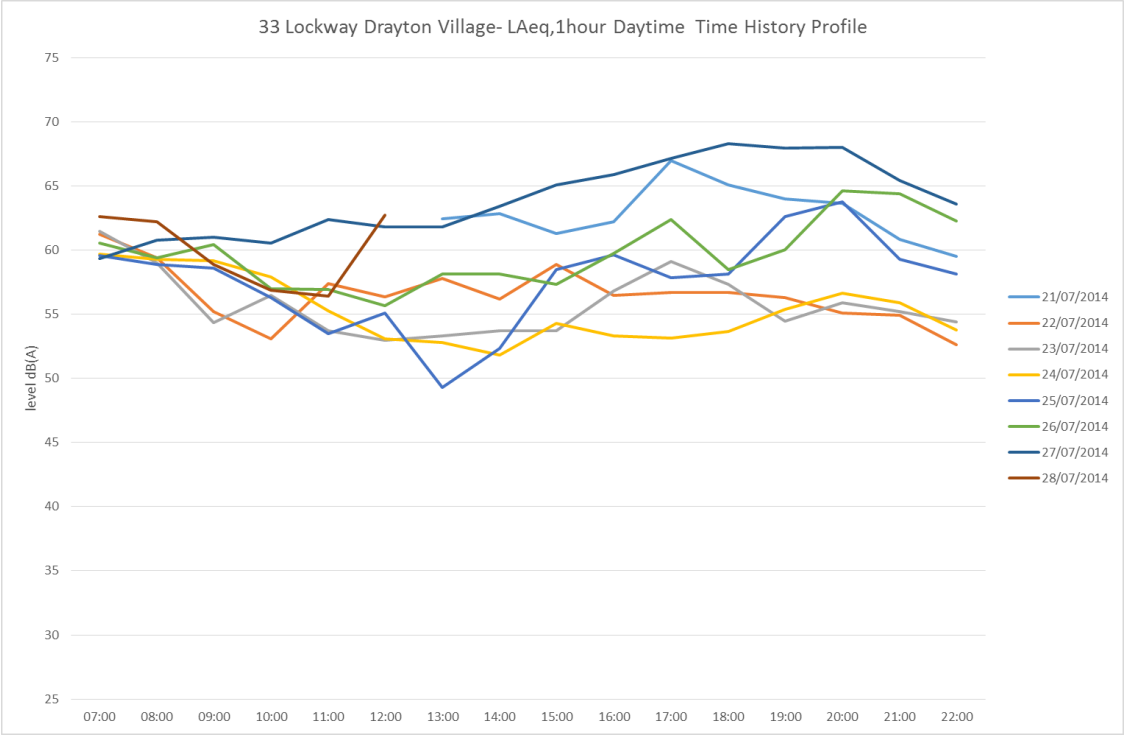


Figure 6: 33 Lockway LAeq,1hour Night Time Profile

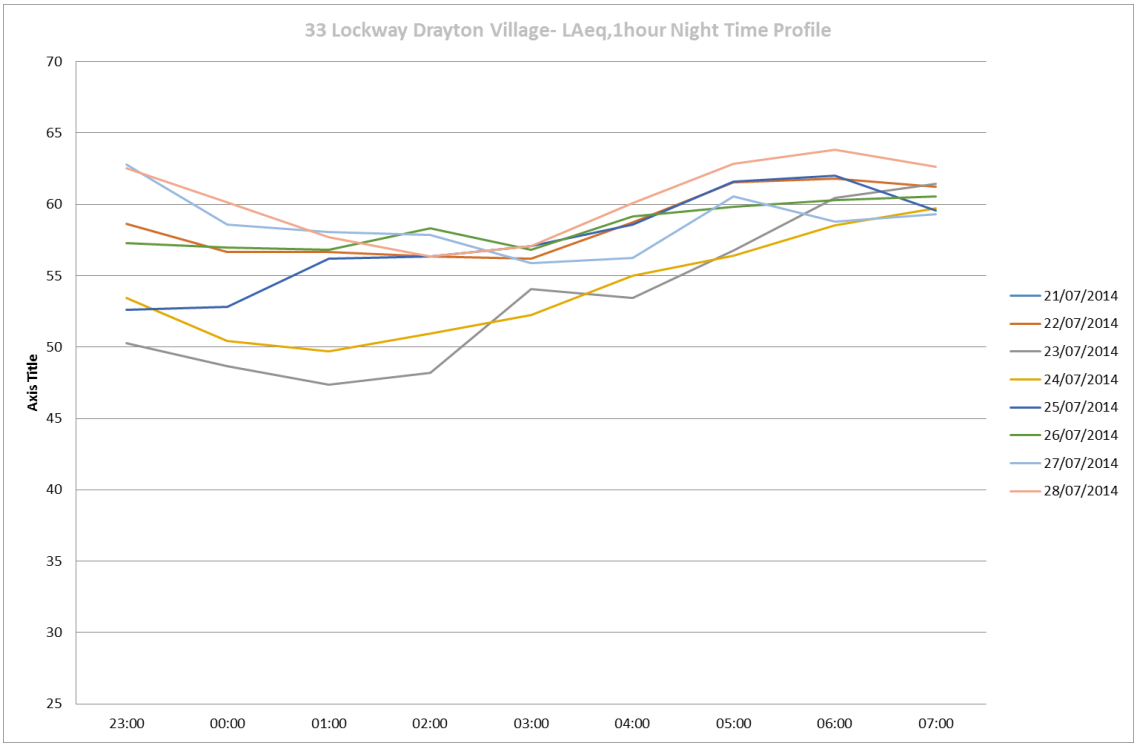


Figure 7: 54 Whitehorns Way LAeq,1hour Daytime Profile

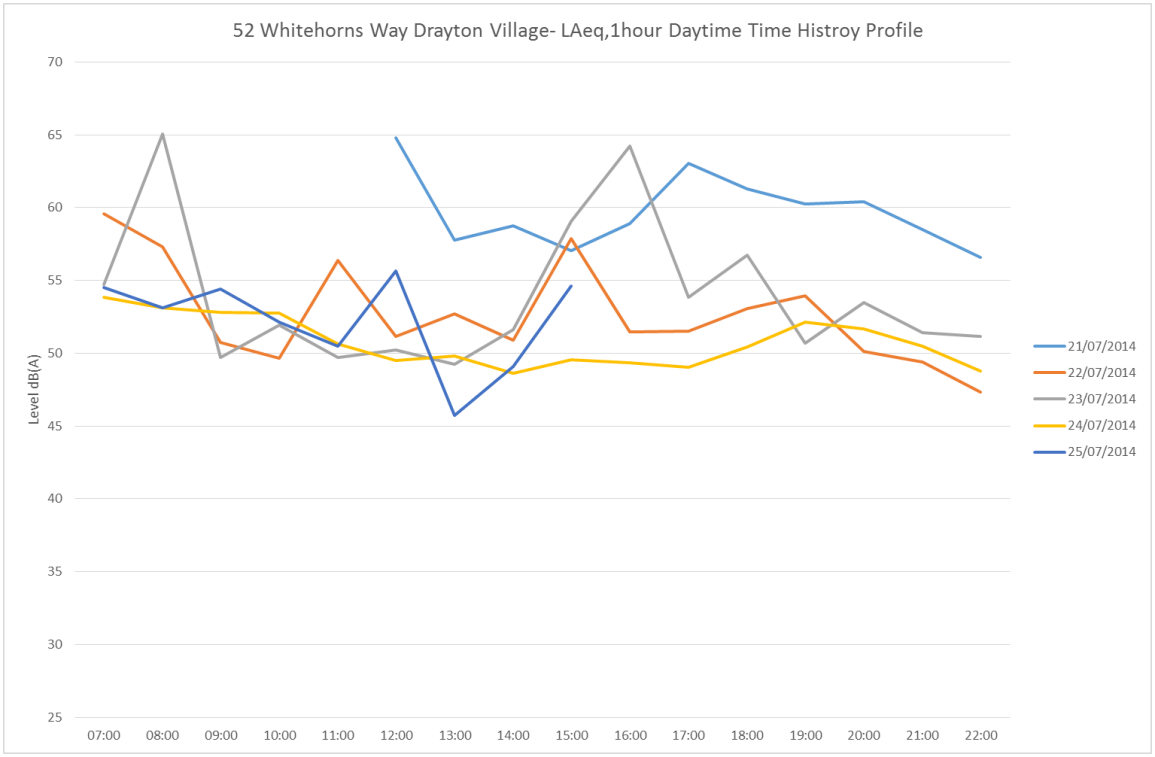


Figure 8: 54 Whitehorns Way LAeq,1hour Daytime Profile

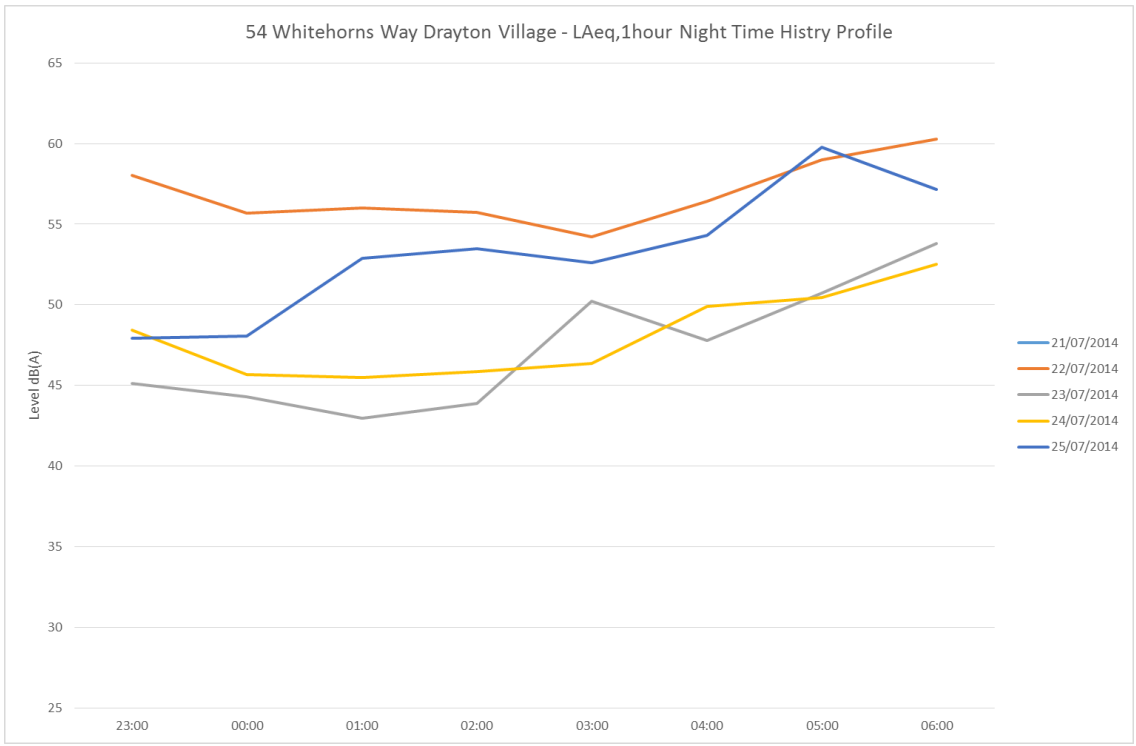


Table 5: MP2 33 Lockway Drayton Village - Summary of LAeq,1hour Measurement Results

Start Time	$L_{Aeq,1hour}$ 21/07/2014	$L_{Aeq,1hour}$ 22/07/2014	$L_{Aeq,1hour}$ 23/07/2014	$L_{Aeq,1hour}$ 24/07/2014	$L_{Aeq,1hour}$ 25/07/2014	$L_{Aeq,1hour}$ 26/07/2014	$L_{Aeq,1hour}$ 27/07/2014	$L_{Aeq,1hour}$ 28/07/2014
23:00		59	50	53	53	57	63	63
00:00		57	49	50	53	57	59	60
01:00		57	47	50	56	57	58	58
02:00		56	48	51	56	58	58	56
03:00		56	54	52	57	57	56	57
04:00		59	53	55	59	59	56	60
05:00		62	57	56	62	60	61	63
06:00		62	60	59	62	60	59	64
07:00		61	61	60	60	61	59	63
08:00		59	59	59	59	59	61	62
09:00		55	54	59	59	60	61	59
10:00		53	56	58	56	57	61	57
11:00		57	54	55	54	57	62	56
12:00		56	53	53	55	56	62	63
13:00	62	58	53	53	49	58	62	
14:00	63	56	54	52	52	58	63	
15:00	61	59	54	54	58	57	65	
16:00	62	56	57	53	60	60	66	
17:00	67	57	59	53	58	62	67	
18:00	65	57	57	54	58	59	68	
19:00	64	56	54	55	63	60	68	
20:00	64	55	56	57	64	65	68	
21:00	61	55	55	56	59	64	65	
22:00	60	53	54	54	58	62	64	

Table 6: MP2 54 Whitehorns Way Drayton Village - Summary of LAeq,1hour Measurement Results

Start Time	$L_{Aeq,1hour}$ 21/07/2014	$L_{Aeq,1hour}$ 22/07/2014	$L_{Aeq,1hour}$ 23/07/2014	$L_{Aeq,1hour}$ 24/07/2014	$L_{Aeq,1hour}$ 25/07/2014
23:00		58	45	48	48
00:00		56	44	46	48
01:00		56	43	46	53
02:00		56	44	46	53
03:00		54	50	46	53
04:00		56	48	50	54
05:00		59	51	50	60
06:00		60	54	53	57
07:00		60	55	54	54
08:00		57	65	53	53
09:00		51	50	53	54
10:00		50	52	53	52
11:00		56	50	51	50
12:00	65	51	50	50	56
13:00	58	53	49	50	46
14:00	59	51	52	49	49
15:00	57	58	59	50	55
16:00	59	51	64	49	
17:00	63	52	54	49	
18:00	61	53	57	50	
19:00	60	54	51	52	
20:00	60	50	53	52	
21:00	59	49	51	50	
22:00	57	47	51	49	

APPENDIX B – RESULTS

Figure 9: Weather Data

Weather History for Benson, United Kingdom

View Current Weather in Benson, United Kingdom

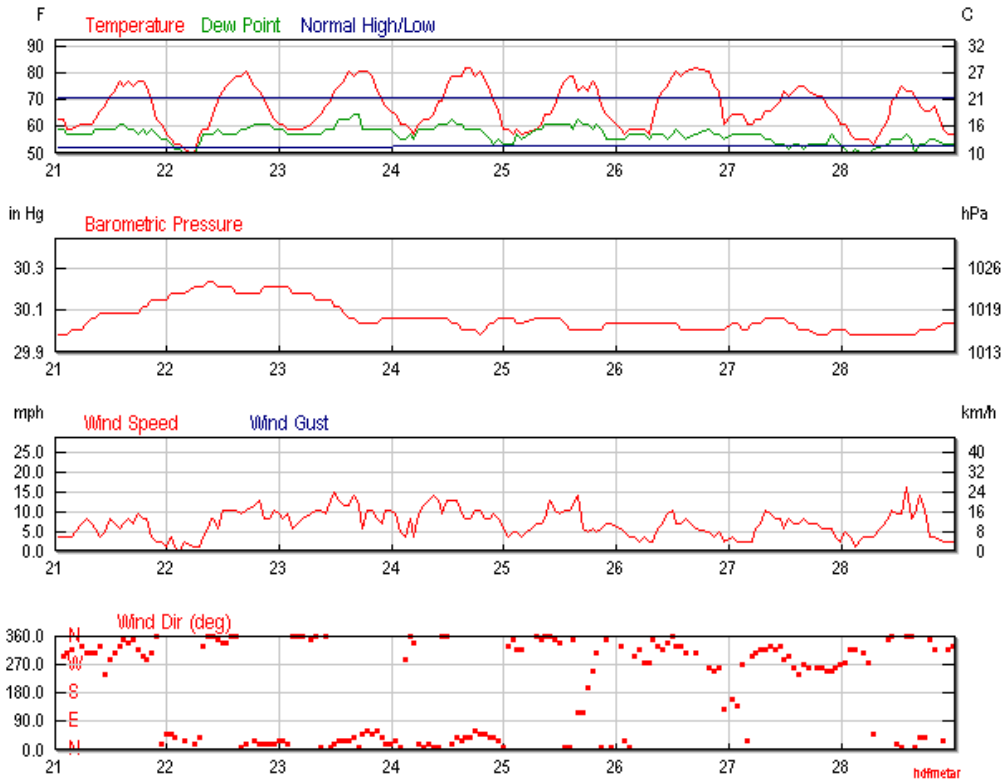
From: July 21 201 To: July 2 201

Get History

Daily | Weekly | Monthly | Custom

	Max	Avg	Min	Sum
Temperature				
Max Temperature	29 °C	27 °C	24 °C	
Mean Temperature	22 °C	20 °C	17 °C	
Min Temperature	14 °C	13 °C	9 °C	
Degree Days				
Heating Degree Days (base 65)	2	0	0	2
Cooling Degree Days (base 65)	6	3	0	25
Growing Degree Days (base 50)	21	18	13	142
Dew Point				
Dew Point	18 °C	14 °C	9 °C	
Precipitation				
Precipitation	0.0 mm	0.0 mm	0.0 mm	0.00 mm
Snowdepth	-	-	-	-
Wind				
Wind	26 km/h	10 km/h	0 km/h	
Gust Wind	29 km/h	29 km/h	29 km/h	
Sea Level Pressure				
Sea Level Pressure	1024 hPa	1018 hPa	1015 hPa	

Custom Weather History Graph



Weather History & Observations

2014	Temp. (°C)			Dew Point (°C)			Humidity (%)			Sea Level Press. (hPa)			Visibility (km)			Wind (km/h)			Precip. (mm)	Events
Jul	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	high	sum	
21	26	20	14	16	14	13	94	71	40	1022	1019	1015	31	15	8	14	8	-	0.00	
22	27	18	9	16	14	9	100	72	37	1024	1023	1022	31	14	0	21	8	-	0.00	Fog
23	29	22	14	18	15	14	98	69	37	1024	1020	1017	26	13	5	24	14	29	0.00	
24	29	21	13	17	14	12	94	65	34	1019	1017	1015	27	14	6	23	14	-	0.00	Rain
25	28	21	13	17	15	12	100	72	41	1019	1017	1016	26	12	3	23	10	-	0.00	Rain
26	28	21	13	15	14	13	94	63	31	1018	1017	1015	24	14	6	16	8	-	0.00	
27	24	19	14	14	13	11	89	61	36	1018	1017	1015	27	16	10	16	8	-	0.00	
28	24	17	11	14	12	10	94	67	34	1017	1016	1015	31	20	10	26	8	-	0.00	Rain

APPENDIX C – NPPG NOISE EXPOSURE HIEARCHY

Figure 10: NPPG Noise Exposure Table

This table summarises the noise exposure hierarchy, based on the likely average response.

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed Adverse Effect Level	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Revision date: 06 03 2014

APPENDIX D GLOSSARY OF TERMS

The Decibel

The unit used to describe the magnitude of sound is the decibel (dB) and the quantity measured is the sound pressure level. The decibel scale is logarithmic and it ascribes equal values to proportional changes in sound pressure, which is a characteristic of the ear. Use of a logarithmic scale has the added advantage that it compresses the very wide range of sound pressures to which the ear may typically be exposed to a more manageable range of numbers. The threshold of hearing occurs at approximately 0 dB (which corresponds to a reference sound pressure of 2 x 10-5 pascals) and the threshold of pain is around 120 dB. The sound energy radiated by a source canalso be expressed in decibels. The sound power is a measure of the total sound energy radiated by a source per second, in watts. The sound power level, Lw is expressed in decibels, referenced to 10-12 watts.

Frequency, Hz

Frequency is analogous to musical pitch. It depends upon the rate of vibration of the air molecules that transmit the sound and is measure as the number of cycles per second or Hertz (Hz). The human ear is sensitive to sound in the range 20 Hz to 20,000 Hz (20 kHz). For acoustic engineering purposes, the frequency range is normally divided up into discrete bands. The most commonly used bands are octave bands, in which the upper limiting frequency for any band is twice the lower limiting frequency, and one-third octave bands, in which each octave band is divided into three. The bands are described by their centre frequency value and the ranges which are typically used for building acoustics purposes are 63 Hz to 4 kHz (octave bands) and 100 Hz to 3150 Hz (one-third octave bands).

A-weighting

The sensitivity of the ear is frequency dependent. Sound level meters are fitted with a weighting network which approximates to this response and allows sound levels to be expressed as an overall single figure value, in dB(A).

Environmental Noise Descriptors

Where noise levels vary with time, it is necessary to express the results of a measurement over a period of time in statistical terms. Some commonly used descriptors follow. LAeq, T The most widely applicable unit is the equivalent continuous A-weighted sound pressure level (LAeq, T). It is an energy average and is defined as the level of a notional sound which (over a defined period of time, T) would deliver the same A-weighted sound energy as the actual fluctuating sound. LAE Where the overall noise level over a given period is made up of individual noise events, the LAeq, T can be predicted by measuring the noise of the individual noise events using the sound exposure level, LAE (or SEL or LAX). It is defined as the level that, if maintained constant for a period of one second, would deliver the same A weighted sound energy as the actual noise event. LA1 The level exceeded for 1% of the time is sometimes used to represent typical noise maxima. LA10 The level exceeded for 10% of the time is often used to describe road traffic noise. LA90 The level exceeded for 90% of the time is normally used to describe background noise.

Sound Transmission in the Open Air

Most sources of sound can be characterised as a single point in space. The sound energy radiated is proportional to the surface area of a sphere centred on the point. The area of a sphere is proportional to the square of the radius, so the sound energy is inversely proportional to the square of the radius. This is the inverse square law. In decibel terms, every time the distance from a point source is doubled, the sound pressure level is reduced by 6 dB. Road traffic noise is a notable exception to this rule, as it approximates to a line source, which is represented by the line of the road. The sound energy radiated is inversely proportional to the area of a cylinder centred on the line. In decibel terms, every time the distance from a line source is doubled, the sound pressure level is reduced by 3 dB.