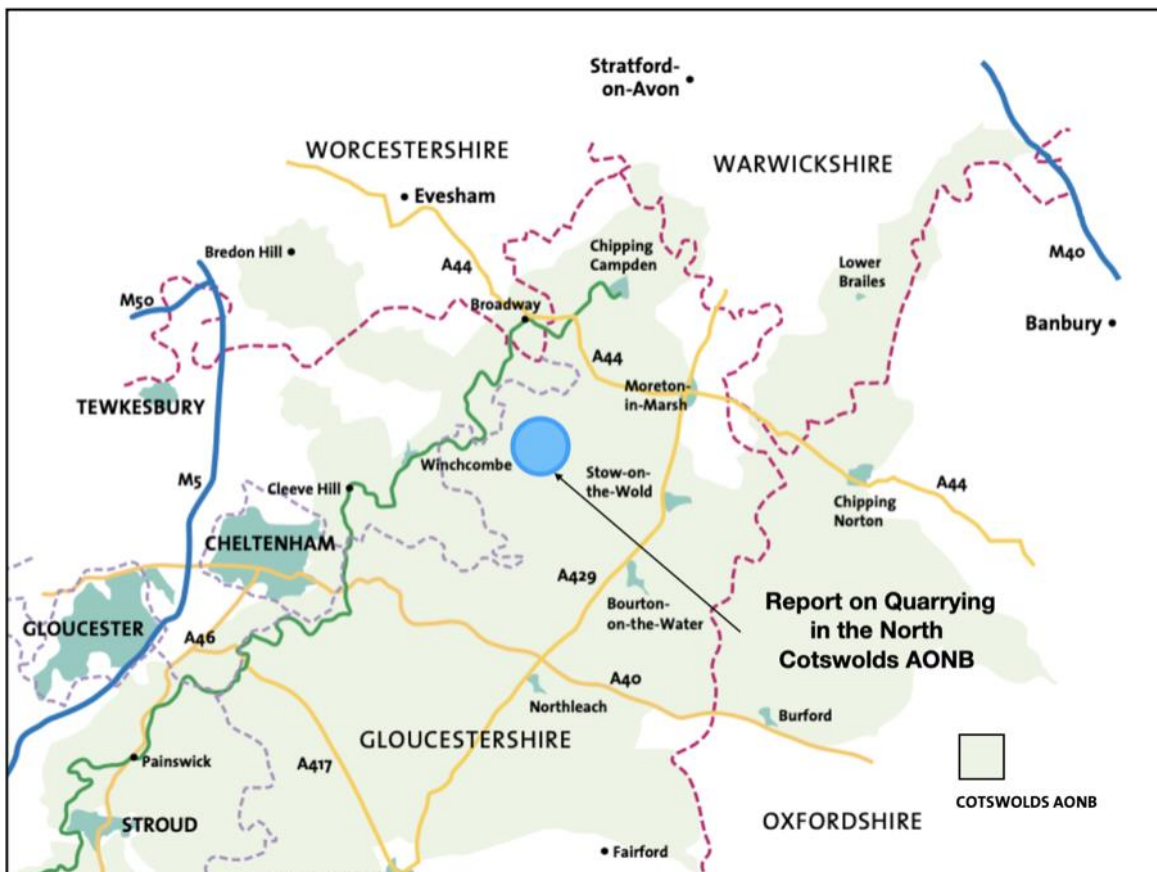


Temple Guiting Parish Council

Quarry Stakeholder Working Party Report

Noise and its effect on Tranquillity

Preliminary report for review and comment



Source: Cotswold Conservation Board

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Foreword

This report is one of a series being prepared by Temple Guiting Parish Council (TGPC) on the main elements of quarrying activity in the North Cotswolds. The series covers:

Planning permissions and production

Transport links

Environmental monitoring

Perspectives of local communities

Reinstatement

This Report forms one of a number of reports under the topic of Environmental Monitoring.

The reports are designed to support discussion and communication between governing bodies and local communities and to promote the development and use of best practices for quarrying operations in the area. Comments and feedback on the reports are welcome at templeguitingparishcouncil@yahoo.co.uk.

Temple Guiting Parish Council (TGPC) is fully supportive of minerals development where it supports and/or preserves the character and attributes of the Cotswolds AONB.

This report has been prepared by gathering together in one place as much publicly available information as possible. The information used in this report has been taken primarily from reports and guidelines issued by the World Health Organisation, the UK Government and the European Union.

Quarry Stakeholder Working Party Report

Noise and its effect on Tranquillity

Contents

1.	Summary	1
2.	What is the Issue?	1
3.	What do we mean by 'Tranquillity'?	2
4.	Measuring and Controlling Tranquillity	4
5.	Health and Wellbeing.....	5
6.	Planning	6
7.	Tranquillity in the North Cotswolds.....	7
8.	Conclusions	7
Appendix A		9
Appendix B		11

1. Summary

The North Cotswold Area of Outstanding Natural Beauty attracts visitors and residents drawn by the stunning beauty of the area and the promise of peace and tranquillity. These attributes are recognised in the Cotswold Conservation Board Management Plan and by the Campaign for the Protection of Rural England (CPRE), which has surveyed this quality.

Over the past 10 to 15 years, the tranquillity of the area has been negatively affected by the increased level of activity of the local cluster of quarries in the North Cotswold AONB. A cumulative impact assessment of these quarrying activities has not been carried out to date.

Although hard to define in precise terms, tranquillity is recognised as a benefit to wellbeing and health. In contrast, noise has been shown in studies to be a cause of poor physical and mental health. Studies are continuing and expected to conclude that even relatively low levels of noise are a risk to health where they exceed the general soundscape.

The UK Government recognises the value of tranquillity and the need to preserve it and states in the National Planning Policy Framework that planners should *'protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason'*.

The assessment of tranquillity is an area of emerging policy in several countries and is discussed in this report. Guidance for the assessment of noise at night is more developed than that for the impact which noise levels can have in otherwise quiet environments during the daytime. This report explores some of the current understanding and will help inform any cumulative impact assessment of the effects of noise generated by quarrying activities on the tranquillity of the North Cotswolds.

2. What is the Issue?

The Cotswolds is designated an Area of Outstanding Natural Beauty (AONB) and attracts residents and visitors who wish to enjoy the countryside for the sports, leisure activities, landscape and tranquillity that it offers. In particular, the northern area of the Cotswolds represents the most remote and rural area and attracts walkers, cyclists and horse riders, amongst others, who seek the peace and tranquillity of the rural setting. Over the past few decades, businesses catering for tourism have been started and developed successfully to capitalise on the charm of the rural setting for example, the Cotswold Farm Park.

However, the increase in quarrying activity over recent years affects both residents and local businesses as HGVs become an increasing proportion of traffic on our narrow roads. In addition to concerns about road safety, the noise these HGVs generate, particularly in the early mornings, affects both the health and amenity of local residents. This is particularly true for those who live adjacent to the principal transport links, and consequentially affects local businesses linked to tourism.

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Of equal concern is the noise generated by on-site quarrying activities. This can carry a significant distance from the site, depending on wind and weather conditions, with noise carrying along the valley of the River Windrush.

TGPC recognises the need for quarrying for Cotswold stone where for this protects the attributes of the landscape in the Cotswolds, particularly where the products are used in Cotswold stone buildings. Production of materials such as aggregate for the construction industry is addressed in the GCC Minerals Local Plan. The Plan does not cover production of dimensional Cotswold stone.

Each successive increase in mineral production across the cluster of quarries results in both increased HGV movements across the area and more noise being generated from each site. With each increase in production there is a corresponding increase in the general noise levels.

An analogy could be made here with dark-skies: Each incremental source of light-has the potential to degrade the quality of a dark-sky. Each individual change may not be noticeable, but the cumulative increase is obvious when you look back and realise what is missing. Increasing noise levels, over time, can and do progressively degrade levels of tranquillity.

A coordinated assessment of noise levels across the area is vital both to understanding the impact and to mitigating levels where appropriate. This is a key element of any Cumulative Impact Assessment.

3. What do we mean by 'tranquillity'?

The Cotswold Conservation Board (CCB) states, in its position statement on Tranquillity, that:

'Tranquillity is one of the 'special qualities' of the Cotswolds Area of Outstanding Natural Beauty (AONB). In other words, it is one of the features of the Cotswolds that makes the area so outstanding that it is in the nation's interest to safeguard it.'

As well as being a 'special quality' in its own right, tranquillity is also an important factor in people's understanding and enjoyment of the AONB's other special qualities, including its distinctive landscapes and settlements, its historic and cultural associations and its flower-rich grasslands and ancient broadleaved woodlands.

The Campaign to Protect Rural England (CPRE) defines tranquillity within the context of its 'Countryside Mandate' as *'the quality of calm experienced in places with mainly natural features and activities, free from disturbance from manmade ones'*.

The Landscape Institute qualifies this definition in the following terms:

'tranquillity cannot readily be defined as an environmental characteristic or quality as it is a state of mind that is being described and thus human perceptions as well as factual evidence must be considered in any studies relating to the term. Tranquillity is, in effect, an umbrella

Temple Guiting Parish Council

term used to refer to the effect of a range of environmental factors on our senses and our perception of a place.’¹

To a large extent, the perception of loss of tranquillity depends on the general background soundscape. For this reason, noise has to be regarded in relative terms. The impact of an HGV at 6:00 am within a rural environment is considerably greater than the impact of the same HGV at, say, midday when the level of ambient noise may be expected to be much greater. The World Health Organisation’s (WHO) Guidelines state:

‘If negative effects on sleep are to be avoided the equivalent sound pressure level should not exceed 30 dBA indoors for continuous noise. If the noise is not continuous, sleep disturbance correlates best with L_{Amax} and effects have been observed at 45 dB or less. This is particularly true if the background level is low. Noise events exceeding 45 dBA should therefore be limited if possible. For sensitive people an even lower limit would be preferred. It should be noted that it should be possible to sleep with a bedroom window slightly open (a reduction from outside to inside of 15 dB). To prevent sleep disturbances, one should thus consider the equivalent sound pressure level and the number and level of sound events. Mitigation targeted to the first part of the night is believed to be effective for the ability to fall asleep.’

.....

‘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 L_{Amax,F}, depending on the character and number of events per night. Sporadic noise events could require separate values.’²

The 2009 WHO Night Noise Guidelines³ takes this further and proposes 42 dB L_{Amax} as the ‘no observed effect level’ (NOEL) for conscious awakening by transport noise and suggests lower guidelines (32-35 dB L_{Amax}) for biological effects such as motility, EEG awakening and changes in sleep structure and fragmentation of sleep. It identifies children, the elderly, pregnant women, the sick and shift workers as requiring special consideration as their sleep patterns are likely to be subject to a greater impact from noise. They propose an interim standard of a 40 dB L_{night,outside} limit and recommend more research into the health effects of the 30 dB and 55 dB range.

The UK Government Mineral Planning guidelines define the night period as between the hours of 10:00pm and 7:00 am.⁴

The UK Government guidelines for mineral extraction state:

‘For operations during the evening (19:00-22:00) the noise limits should not exceed the background noise level (L_{A90,1h}) by more than 10dB(A) and should not exceed 55dB(A) L_{Aeq,1h} (free field). For any operations during the period 22:00 – 07:00 noise limits should be set to reduce to a minimum any adverse impacts, without imposing unreasonable burdens on the

¹ Source: Tranquillity – an overview | LI Technical Information Note 01/2017 (2.5, 2.10)
<https://landscapewpstorage01.blob.core.windows.net/www-landscapeinstitute-org/2017/02/Tranquillity-An-Overview-1-DH.pdf>

² WHO document: Guidelines for Community Noise (April 1999)

³ WHO Night Noise Guidelines for Europe (2009)

⁴ UK Government Guidance on the planning for mineral extraction in plan making and the application process. - <https://www.gov.uk/guidance/minerals#Noise-emissions> (ref Paragraph: 021 Reference ID: 27-021-20140306)

mineral operator. In any event the noise limit should not exceed 42dB(A) LAeq,1h (free field) at a noise sensitive property.

Where the site noise has a significant tonal element, it may be appropriate to set specific limits to control this aspect. Peak or impulsive noise, which may include some reversing beepers, may also require separate limits that are independent of background noise (eg Lmax in specific octave or third-octave frequency bands – and that should not be allowed to occur regularly at night.)⁴

An agreed definition of tranquillity which differentiates between day and night times (and possibly the time of year and day of the week) is an essential benchmark for managing noise and its effects on tranquillity.

Guidance on noise levels at night is relatively well developed, based on disturbance of sleep. However, daytime noise level guidance is more applicable to urban settings, where there is greater background noise. There is less guidance for quieter areas where the same level of noise is likely to have a proportionally greater impact.

4. Measuring and controlling tranquillity

In recent years, attempts have been made to develop tools and methodologies for the measurement and mapping of tranquillity to provide input and support for planning decisions. All attempts to date have been subject to limitations, largely relating to the subjectivity involved and the variation of environments, ranging from urban to the extremely remote. It seems that no single set of criteria can be found which can be applied to every environment.

In 2006, the European Noise Directive (END) was implemented within the UK. The stated aims of the directive are:

- *‘the determination of exposure to environmental noise*
- *ensuring that information on environmental noise and its effects is made available to the public*
- *preventing and reducing environmental noise where necessary and preserving environmental noise quality where it is good’⁵.*

The Environmental Noise (England) Regulations 2006 (END)⁶ introduced by the UK Government to enact the directive in England, have concentrated on urban areas and major transport routes with only vague reference to the countryside. The regulations suggest measures that *‘competent authorities intend to take to preserve quiet areas’*. Actions may include land use planning, systems engineering for traffic, traffic planning, and noise control of sources but the END does not provide any specific requirements regarding the protection of quiet areas in open country.

In 2014, the European Environment Agency issued a technical report entitled ‘Good Practice Guide on Quiet Areas’. This added little to the debate although it did identify four methods for assessing tranquillity in quiet locations:

⁵ European Noise directive (https://ec.europa.eu/environment/noise/directive_en.htm)

⁶ The Environmental Noise (England) Regulations 2006 - <https://www.legislation.gov.uk/uksi/2006/2238/contents/made>

- noise mapping
- measurement of sound pressure levels
- evaluation of user/visitor experiences
- expert assessments

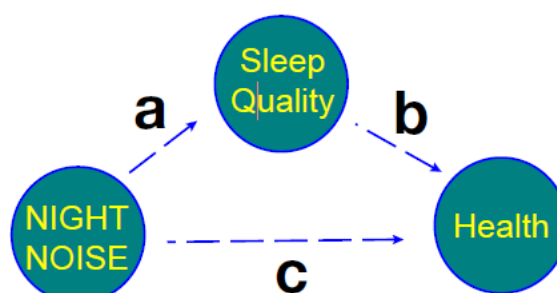
A study conducted in 2015 concluded that man-made noise contributed significantly to the degradation of tranquillity and suggested that noise should be regarded with equal importance to visual factors in landscape assessments. ⁷

5. Health and Wellbeing

The health aspects of exposure to noise is covered comprehensively in the WHO Night Noise Guidelines for Europe (2009)⁸.

The report argues relationship quality and although it identifying the and determining

difficult to resolve. However, noise at night is shown to be significantly more detrimental to health than daytime noise.



that there is a direct between noise, sleep general health, accepts that precise relationship cause and effect is

The report concludes that there is a great deal more research needed to fully understand the impact that noise has on health but the principle that it does have an impact is unquestionable. Studies have shown that both physical and mental health are impacted by noise, particularly in the more vulnerable groups, mentioned above. Although the effects are usually short term in nature, there is evidence to suggest that long term health also may be affected.

Effects of different levels of night noise on the population's health

Average night noise level over a year <i>L</i> _{night,outside}	Health effects observed in the population
Up to 30 dB	Although individual sensitivities and circumstances may differ, it appears that up to this level no substantial biological effects are observed. <i>L</i> _{night,outside} of 30 dB is equivalent to the no observed effect level (NOEL) for night noise.
30 to 40 dB	A number of effects on sleep are observed from this range: body movements, awakening, self-reported sleep disturbance, arousals. The intensity of the effect depends on the nature of the source and the number of events. Vulnerable groups (for example children, the chronically ill and the elderly) are more susceptible. However, even in the worst cases the effects seem modest. <i>L</i> _{night,outside} of 40 dB is equivalent to the lowest observed adverse effect level (LOAEL) for night noise.

⁷ Watts and Pheasant (2015)

⁸ WHO Night Noise Guidelines for Europe (2009)

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40 to 55 dB	Adverse health effects are observed among the exposed population. Many people have to adapt their lives to cope with the noise at night. Vulnerable groups are more severely affected.
Above 55 dB	The situation is considered increasingly dangerous for public health. Adverse health effects occur frequently, a sizeable proportion of the population is highly annoyed and sleep-disturbed. There is evidence that the risk of cardiovascular disease increases.

Source: WHO Night Noise Guidelines for Europe (2009)

6. Planning

The government's planning policies for England are set out in the National Planning Policy Framework (NPPF) in which tranquillity is referenced in the contexts of 'Promoting Healthy Communities' and 'Conserving and Enhancing the Natural Environment'. Under the heading of Conserving and Enhancing the Natural Environment, the Framework states:

'Great weight should be given to conserving and enhancing landscape and scenic beauty in National Parks, the Broads and Areas of Outstanding Natural Beauty, which have the highest status of protection in relation to these issues. The scale and extent of development within these designated areas should be limited. Planning permission should be refused for major development other than in exceptional circumstances, and where it can be demonstrated that the development is in the public interest. Consideration of such applications should include an assessment of:

- a) the need for the development, including in terms of any national considerations, and the impact of permitting it, or refusing it, upon the local economy;*
- b) the cost of, and scope for, developing outside the designated area, or meeting the need for it in some other way; and*
- c) any detrimental effect on the environment, the landscape and recreational opportunities, and the extent to which that could be moderated.'*

.....
'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; and*
- c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.'*⁹

⁹ National Planning Policy Framework (February 2009)

7. Tranquillity in the North Cotswolds

The Cotswold Conservation Board (CCB), describes tranquillity as:

‘Tranquillity is one of the ‘special qualities’ of the Cotswolds Area of Outstanding Natural Beauty (AONB). In other words, it is one of the features of the Cotswolds that makes the area so outstanding that it is in the nation’s interest to safeguard it.

As well as being a ‘special quality’ in its own right, tranquillity is also an important factor in people’s understanding and enjoyment of the AONB’s other special qualities, including its distinctive landscapes and settlements, its historic and cultural associations and its flower-rich grasslands and ancient broadleaved woodlands.

Natural England has identified relative tranquillity as one of six factors that contribute to the natural beauty of AONBs. As such, it is one of the factors that Natural England assesses when assessing landscapes for designation as a National Park or AONB in England.

CPRE’s tranquillity mapping (see Appendix 2), shows that the Cotswolds AONB has a relatively high level of tranquillity, especially when compared to the surrounding urban areas. The AONB therefore fulfils an important function for the populations of these areas as a ‘breathing space’ where they can ‘get away from it all’.

The relative tranquillity of the AONB is one of the reasons why the area is prized for its recreational and amenity value and why it attracts 23 million visitors a year. These visitors support a tourism industry that is estimated to be worth over £1 billion to the Cotswolds.’¹⁰

Tranquillity is one of the critical characteristics that the designation of the Cotswolds as an AONB aims to preserve. This is now under severe threat from the ‘perfect storm’ from the cluster of quarries in the North Cotswolds that have over recent years re-commenced or expanded their activities without the benefit of a co-ordinated planning process. Impacts from noise have now reached a critical level.

To enable the CCB statement regarding tranquillity to be implemented in the North Cotswolds in light of increased quarrying, noise levels from activity across the North Cotswold cluster should be assessed. Because noise doesn’t stop at the quarry boundary, an accurate picture would include measurements beyond the fence and across the wider affected area including along transport routes used to access the quarries.

Actual noise levels during the working week can then be compared with noise levels typical when there is no quarrying, for example, on a Sunday.

8. Conclusions

Tranquillity is a difficult concept to define in precise and unambiguous terms. Possibly the most effective way to define it is to consider it as the normal background soundscape, when quarrying is not taking place, profiled across the season of the year, day of the week and time

¹⁰ Cotswolds Conservation Board - Position Statement - Tranquillity

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of day. Any additional noise detected during the assessment can be compared with the 'snapshot' soundscape to determine its variance in terms of loudness and duration.

It is clear that noise, especially night time noise, is recognised as a significant risk to health. There are research projects under way which should start to clarify the precise nature of the impact as their results are published. Noise is already becoming an increasingly important factor in safeguarding health and wellbeing and this is likely to be reinforced by the publication of the results of these studies. The WHO and the EU have already issued guidelines, however vague, concerning the need to take account of noise in planning procedures.

The UK government's National Planning Framework touches on the subject in general terms. However, there seems to be little evidence that the subject receives any more than 'lip service' within the planning processes adopted in respect of minerals extraction. However, evidence suggests that the more progressive planning authorities are starting to wake up to the need to consider noise as an integral consideration.

The issues of noise and tranquillity are an integral part of any Cumulative Impact Assessment for the cluster of quarries in the North Cotswolds

Appendix A

Glossary of Terms

Ambient Noise The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant.

A Weighting A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.

C-Weighting Refers to noise measurement at different sensitivity levels. C-Weighting measurements are recorded as decibels and are typically used for higher peak noise level measurements.

Z-weighting Refers to a flat frequency response of 10Hz to 20kHz ± 1.5 dB. This response replaces the older "Linear" or "Unweighted" responses as these did not define the frequency range over which the meter would be linear.

Decibel (dB) The units of sound level and noise exposure measurement where a step of 10 dB is a ten-fold increase in intensity or sound energy and actually sounds a little more than twice as loud.

dB(A), dBA Decibels A-weighted.

dB(C), dBC Decibels C-weighted.

dB(Z), dB(L) Decibels Linear or decibels Z-weighted.

Hertz (Hz) The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.

LA10 The percentile sound pressure level exceeded for 10% of the measurement period with 'A' frequency weighting calculated by statistical analysis. Typically used to assess the impact of an existing operation on a receiver area and is referred to as the cumulative noise levels at the receiver attributable to the noise source.

LA90 The percentile sound pressure level exceeded for 90% of the measurement period with 'A' frequency weighting calculated by statistical analysis.

LMax The maximum of the sound pressure levels recorded of a measurement period.

LAeq T Equivalent continuous sound pressure level with 'A' frequency weighting - The value of the sound pressure level of a continuous steady noise that, a measurement interval of time (t), has the same mean square sound pressure as the sound under consideration whose level varies with time.
ENVIRONMENTAL RESOURCES MANAGEMENT ABLE UK LTD 16.1-3 LAN Percentile level - a measure of the fluctuation of the sound pressure level with 'A' frequency weighting which is exceeded 'N' per cent of the measurement time.

NOEL The 'no observed effect level' is the noise level at which there is no detectable effect on health and wellbeing

SPL, Lp Sound pressure level - The level of sound pressure; expressed in decibels, as measured by a standard sound level meter with a microphone. This differs from Lw in that this is the received sound

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as opposed to the sound 'intensity': where p is the rms sound pressure in pascals and p_0 is the sound reference pressure at $20 \mu\text{Pa}$ (2×10^{-5}).

SWL, L_w Sound power level - This is a measure of the total power radiated by a source. The Sound Power of a source is a fundamental property of the source and is independent of the surrounding environment: where W is the sound power in watts and W_0 is the sound reference power at 10-12 watts.

DRAFT

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Appendix B

Abbreviations

AONB	Area of Outstanding Natural Beauty
CCB	Cotswold Conservation Board
CPRE	Campaign to Protect Rural England
EU	European Union
END	European Noise Directive
HGV	Heavy Goods Vehicle
NPPF	National Planning Policy Framework (England)
TGPC	Temple Guiting Parish Council
UK Government	The Government of the United Kingdom
WHO	World Health Organisation