Land North of Radstone Fields, Brackley

Noise Assessment for Planning Application

6th November 2020

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1. INTRODUCTION

1.1. Overview

inacoustic has been commissioned to assess the impact of noise at a site north of Radstone Fields, Brackley, in respect of the site's suitability for residential development.

The following technical noise assessment has been produced to accompany an Outline Planning Application to South Northamptonshire Council and is based upon environmental noise measurements undertaken at the site and a 3-dimensional noise modelling exercise.

The assessment considers both the existing noise environment at the site, plus the future noise environment, taking account of the High Speed 2 Rail Link (HS2). The effects have been considered on an open site basis; without the screening effects of the built form of a masterplan layout. This approach is considered to represent a worst-case scenario and can be used to steer the design of any eventual development layouts on the site.

This noise assessment is necessarily technical in nature; therefore a glossary of terms is included in Appendix A to assist the reader.

1.2. Scope and Objectives

The scope of the noise assessment can be summarised as follows:

- A sound monitoring survey was undertaken at discrete locations around the Site;
- A detailed assessment of the suitability of the Site, in accordance with relevant standards in respect of sound from the existing sources; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of the National Planning Practice Guidance in England: Noise[1] and BS8233:2014[2].

[1] Department for Communities and Local Government (DCLG), 2019. National Planning Practice Guidance for England: Noise. DCLG.
[2] British Standard Institution. BS 8233:2014: Guidance on sound insulation and noise reduction for buildings.

2. LEGISLATION AND POLICY FRAMEWORK

The development proposals for the Site are guided by the following policy directives and guidance:

2.1. National Policy

2.1.1. National Planning Policy Framework, 2019

The *National Planning Policy Framework* (NPPF)[3] sets out the Government's planning policies for England. Planning policy requires that applications for planning permission must be determined in accordance with the development plan, unless material considerations indicate otherwise.

The NPPF is also a material consideration in planning decisions. It sets out the Government's requirements for the planning system and how these are expected to be addressed.

Under Section 15; *Conserving and Enhancing the Natural Environment*, in Paragraph 170, the following is stated:

"Planning policies and decisions should contribute to and enhance the natural and local environment by:

e) preventing both new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability".

Paragraph 180 of the document goes on to state:

"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."

As stated above, this document makes reference to avoiding noise generation from new developments that would adversely impact on health and quality of life. Paragraph 180 refers to the Noise Policy Statement for England, which is considered overleaf.

[3] Ministry of Housing, Communities & Local Government. February 2019. National Planning Policy Framework. HMSO. London.

2.1.2. Noise Policy Statement for England, 2010

The underlying principles and aims of existing noise policy documents, legislation and guidance are clarified in *DEFRA: 2010: Noise Policy Statement for England* (NPSE)[4]. The NPSE sets out the *"Long Term Vision"* of Government noise policy as follows:

"Promote good health and good quality of life through the effective management of noise within the context of Government policy on sustainable development".

The NPSE outlines three aims for the effective management and control of environmental, neighbour and neighbourhood noise:

- *"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 guidance states that it is not possible to have a single objective noise-based measure that defines *"Significant Observed Adverse Effect Level (SOAEL)"* that is applicable to all sources of noise in all situations and that not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.

2.1.3. National Planning Practice Guidance in England: Noise, 2019 (PPGNoise)

Paragraph: 002 of the PPGNoise states the following:

"Can noise override other planning concerns?

It can, where justified, although it is important to look at noise in the context of the wider characteristics of a development proposal, its likely users and its surroundings, as these can have an important effect on whether noise is likely to pose a concern."

As such, Paragraph: 003 of the NPPG states that:

"Plan-making and decision making need to 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 NPSE, this would include identifying whether the overall effect of the noise exposure … is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation."

Consequently, the *National Planning Practice Guidance in England: Noise* (NPPG Noise)[5] summarises the noise exposure hierarchy, based on the likely average response. The following three observed effect levels are identified below, as identified in Paragraph 004::

[4] Department for Environment, Food and Rural Affairs (DEFRA), 2010. Noise Policy Statement for England. DEFRA.
[5] Department for Communities and Local Government (DCLG), 2019. National Planning Practice Guidance for England: Noise. DCLG.

- **Significant Observed Adverse Effect Level**: This is the level of noise exposure above which significant adverse effects on health and quality of life occur;
- **Lowest Observed Adverse Effect Level**: This is the level of noise exposure above which adverse effects on health and quality of life can be detected; and
- **No Observed Adverse Effect Level**: This is the level of noise exposure below which no effect at all on health or quality of life can be detected.

Importantly, Paragraph: 004 of the PPGNoise states that:

"Although the word 'level' is used here, this does not mean that the effects can only be defined in terms of a single value of noise exposure. In some circumstances adverse effects are defined in terms of a combination of more than one factor such as noise exposure, the number of occurrences of the noise in a given time period, the duration of the noise and the time of day the noise occurs."

Paragraph: 005 of the PPGNoise expands the significant criteria related to each of these levels, which are reproduced in Table 1.

TABLE 1: SIGNIFICANCE CRITERIA FROM NPPG IN ENGLAND: NOISE

Perception	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not Noticeable	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Noticeable and Not Intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a 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, attitude or other physiological response, 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 small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and Disruptive	The noise causes a material change in behaviour, attitude or other physiological response, 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	Significant Observed Adverse Effect	Avoid

Perception	Examples of Outcomes	Increasing Effect Level	Action
	of life diminished due to change in acoustic character of the area.		
Present and Very Disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

2.2. British Standards

2.2.1. BS8233:2014

BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings* draws on the results of research and experience to provide information on achieving internal acoustic environments appropriate to their functions. The guideline values provided are in terms of an average (L_{Aeq}) level.

The standard advises that, for steady external noise sources, it is desirable for internal ambient noise levels to not exceed the guidance values, as detailed below in Table 2.

TABLE 2: BS8233:2014 AMBIENT NOISE LEVELS

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room	40 dB $L_{Aeq,16hour}$	-
Sleeping	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

BS8233:2014 goes on to suggest that where development is considered necessary or desirable, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions will still be achieved.

With regard to maximum noise levels, the standard identifies that regular individual noise events (such as passing trains or scheduled aircraft etc) can cause sleep disturbance. The standard does not provide a guideline design target, but simply goes on to suggest that a guideline value may be set in terms of SEL or $L_{Amax,F}$, depending upon the character and number of events per night. It goes on to suggest that more sporadic noise events could require separate values.

In respect of external noise levels, the guidance in BS8233:2014 suggests that "*it is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments*".

BS8233:2014 provides a much more detailed narrative on noise levels in external amenity areas and acknowledges that it may not always be necessary or feasible to ensure that noise levels remain within these guideline values.

In respect of gardens and patios, BS8233:2014 states;

"...it is *also recognized that these guideline values are not achievable in all circumstances where development might be desirable."*

BS8233: 2014 goes on to state, for 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".

In respect of balconies, roof gardens and terraces, BS8233:2014 states; *"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 $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space".*

It is clear from the narrative of BS8233:2014, that proposed development within noisy environments should be designed to ensure that the recommended internal design standards are achieved, and that noise levels in external amenity areas are designed to effectively control and reduce noise levels, although it acknowledges that in certain circumstance meeting the external design recommendations may not be feasible, or necessary, especially where the provision of such spaces is desirable for other technical, planning or policy reasons.

2.2.2. BS4142:2014+A1:2019

BS4142:2014+A1:2019 sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS4142:2014+A1:2019 for assessing the effect of sound on residential receptors is to compare the measured or predicted sound level from the source in question, the $L_{Aeq,T}$ *specific sound level*, immediately outside the dwelling with the $L_{A90,T}$ background sound level.

Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the $L_{Ar,Tr}$ *rating sound level*. A correction to include the consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

BS4142:2014+A1:2019 states: *"The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs".* An estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:

- *"Typically, the greater this difference, the greater the magnitude of the impact."*

- *"A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context."*
- *"A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context."*
- *"The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."*

During the daytime, the assessment is carried out over a reference time period of 1-hour. The periods associated with day or night, for the purposes of the Standard, are considered to be 07.00 to 23.00 and 23.00 to 07.00, respectively.

2.3. Pre-App Response from LPA

John Penny; Environmental Protection Officer has provided his pre-application comments, by means of a memorandum to Clare Caldwell (Planning Officer) dated 27th November 2019.

In this memorandum, Mr Penny acknowledges the previously submitted desktop noise assessment of potential impacts arising from the HS2 rail line and that this source of transport noise will not, in itself, constrain the residential development of the site. Mr Penny does, however, go on to state:

"....Environmental Protection are aware of other noise sources in that location and which need to be considered in terms of any adverse impact on the proposed noise sensitive residential amenities. This includes noise from road traffic using the A43, Halse Road and other local roads; noise from existing inverter plant serving a solar energy park on land forming part of Hall Farm, Radstone, Brackley as approved under planning permission S/2013/1228/MAF, noise from an existing electrical substation to the west of the proposed development site off Radstone Road Brackley and noise impact from a 5MW Flexible electricity generation facility installed at Hall Farm Brackley Road Radstone NN13 5PY as approved under S/2017/0345/FUL.

Whilst the desk top noise assessment study indicates that some of the recommended noise criteria can be achieved in respect of the approves HS2 development to the east of the proposed development site a more detailed noise survey and assessment is required in respect of all the noise sources affecting the site to demonstrate the aims of the using relevant guidance and criteria can be achieved as outlined in the at attached appendix below.

Also, potential conflicts of noise and light pollution associated with the proposed sports hub facility need to be considered as well. This is both in respect of impact on the proposed residential amenities and any existing noise sensitive receptors in the location that may be affected...."

Crucially, these comments relate to a larger scale development, which included closer adjacencies to the allocated sports and leisure facilities to the north, but are not, however, considered relevant to this smaller application. The other factors are considered individually, later in this report.

3. Site Description

3.1. Site and Surrounding Area

The Proposed Development comprises primarily agricultural land immediately to the north of the recently constructed Radstone Fields housing development.

The Proposed Development area can be seen in Figure 1.

The HS2 route corridor is proposed to run past the north-eastern boundary of the site at a distance of circa 800 metres, thus introducing an additional source of transport noise to the site and surrounding area.

Additionally, an electricity substation is located to the south-east of the eastern edge of the site; equidistant to its separation from the existing Radstone Fields development, so, while considered within this report, is not considered to be an acoustic constraint.

Due north of the north-eastern edge of the site lies a solar energy park, consented under planning permission S/2013/1228/MAF. Such sites include inverter stations, which are the only meaningfully potential source of noise and this unit lies at a distance of 260 metres from the closest point on the site boundary.

Located to the north-east of the site, at a distance of 350 metres from the north-eastern edge of the site boundary is a consented, but as yet undeveloped 5MW flexible energy generation site (gas peaking plant), benefitting from planning permission S/2017/0345/FUL. Despite the proximity of consented residential development (Radstone Fields), at the time of approval, no noise assessment was requested for the plant; however, a condition was applied (Condition 3) that states:

No development shall take place until a noise assessment and mitigation scheme for the approved Flexible Electric Generation Facility (FEGF) when in operation has been submitted to and approved in writing by the Local Planning Authority. The development shall thereafter be carried out and maintained in accordance with the approved mitigation scheme.

Reason: To ensure the creation of a satisfactory environment free from intrusive levels of noise in accordance with Policy G3 of the South Northamptonshire Local Plan.

A further condition (Condition 4) has been applied to this planning permission that requires the construction of a timber acoustic fence around the development.

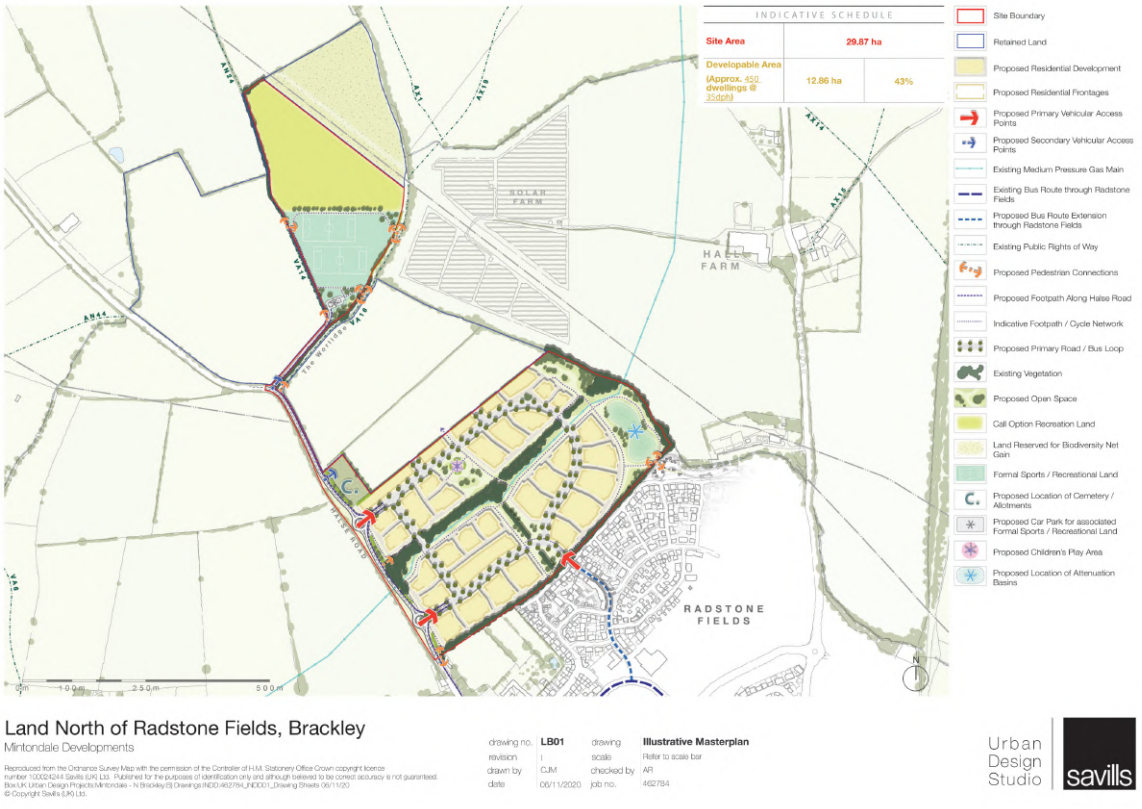
Crucially, the development proposed under this application will not locate residential development any closer to the consented flexible energy generation site than already exists at Radstone Fields, so no further constraint is considered to be added to this development and it consequently receives no further consideration within this report.

3.2. Proposed Development Overview

The site is proposed for redevelopment for residential purposes, providing 450 dwelling units; the Indicative Development Framework Plan for which is shown in Figure 2. This framework plan is subject to alteration; however, the changes will not affect the conclusions of the noise assessment.

FIGURE 1: PROPOSED DEVELOPMENT SITE AND SURROUNDING AREA

FIGURE 2: INDICATIVE DEVELOPMENT FRAMEWORK PLAN



4. Measurement Methodology

4.1. General

The prevailing noise conditions in the area have been determined by an environmental noise survey conducted during both daytime and night-time periods between Wednesday 14th and Friday 16th October 2020.

4.2. Measurement Details

All noise measurements were undertaken by a consultant certified as competent in environmental noise monitoring, and, in accordance with the principles of BS 7445[6].

All acoustic measurement equipment used during the noise survey conformed to Type 1 specification of British Standard 61672[7]. A full inventory of this equipment is shown in Table 3 below.

Table 3: Inventory of Sound Measurement Equipment

Measurement Position	Make, Model & Description	Serial Number	Calibration Certificate Number	Calibration Due Date
MP1	Rion NL-52 Sound Level Meter	00764926	TCRT18/1183	23/02/2020
	Rion NH-25 Preamplifier	65324	TCRT18/1183	23/02/2020
	Rion UC-59 Microphone	10223	TCRT18/1183	23/02/2020
MP2	Svantek 957 Sound Level Meter	21890	TCRT18/1428	17/05/2020
	Svantek SV12L Preamplifier	24215	TCRT18/1428	17/05/2020
	ACO 7052E Microphone	58524	TCRT18/1428	17/05/2020
MP3	Rion NL-31 Sound Level Meter	00110027	180453	20/09/2020
	Rion NH-21 Preamplifier	00129	180453	20/09/2020
	Rion UC-53A Microphone	100496	180453	20/09/2020
All	Cirrus CR:515 Acoustic Calibrator	72886	182959	22/11/2019

The sound measurement equipment used during the survey was field calibrated at the start and end of the measurement period. A calibration laboratory has calibrated the field calibrator used within the twelve months preceding the measurements. A drift of less than 0.2 dB in the field calibration was found to have occurred on all sound level meters.

The weather conditions during the survey were conducive to noise measurement it being dry, with low wind speeds wind, as confirmed by the results of a meteorological survey that ran throughout the period of the noise survey.

The microphones were fitted with protective windshields for the measurements, which are described in Table 3, with an aerial photograph indicating their respective locations shown in Figure 3.

[6] British Standard 7445: 2003: Description and measurement of environmental noise. BSI
[7] British Standard 61672: 2013: Electroacoustics. Sound level meters. Part 1 Specifications. BSI.

Table 3: Measurement Position Descriptions

Measurement Position	Description
MP1	A noise measurement of road traffic noise arising from vehicles using Halse Road, to the west of the site. The microphone was located under free-field conditions, at a height of 1.5 metres above local ground level and at a distance of circa 20 metres from the carriageway edge. The sound environment was dominated by natural sources, such as birdsong and moving vegetation, with occasional road traffic contributions.
MP2	A noise measurement at the closest part of the site to the nearby electricity substation. The microphone was located under free-field conditions, at a height of 1.5 metres above local ground level and at a distance of circa 100 metres from the substation compound. The sound environment was dominated by distant road traffic, general human activity within the adjacent housing estate and natural sources, such as birdsong and moving vegetation. The substation was entirely inaudible.
MP3	A noise measurement at a distance of circa 280 metres from the solar farm inverter substation. The microphone was located under free-field conditions, at a height of 1.5 metres above local ground level. The sound environment was dominated by distant road traffic, occasional farm activity and natural sources, such as birdsong and moving vegetation. The inverter substation was entirely inaudible.

Figure 3: Measurement Positions

The summarised results of the environmental noise measurements are presented in Table 4, with time histories presented under Appendix B. Spectral measurements are set out within Table 5.

Table 4: Summary of Noise Measurement Results

Measurement Position	Period	Noise Level, dB			
		$L_{Aeq,T}$	L_{A90}	L_{A10}	L_{AFmax}
MP1	Day	53.1	42.0	52.8	73.2
	Night	43.3	33.0	40.0	64.4
MP2	Day	46.8	39.0	45.6	68.3
	Night	39.4	31.0	36.1	46.0
MP3	Day	46.3	38.0	44.4	65.8
	Night	35.5	31.0	35.8	45.6

Table 5: Spectral Measurement Results

Period	dB(A)	Octave Band (Hz) Sound Level (dB)							
		63	125	250	500	1000	2000	4000	8000
MP1									
$L_{eq,T}$									
Day	53.1	59.1	59.9	53.1	46.8	49.2	44.7	38.4	34.4
Night	43.3	49.2	45.3	37.5	35.9	40.9	34.8	30.8	25.8
MP2									
$L_{eq,T}$									
Day	46.8	52.8	53.2	46.8	43.7	40.5	34.0	36.6	37.6
Night	39.4	46.6	36.8	32.3	33.6	32.9	28.4	35.1	24.9
MP3									
$L_{eq,T}$									
Day	46.3	52.4	53.2	45.6	44.8	40.6	33.6	34.4	30.6
Night	35.5	47.4	37.1	31.3	33.1	32.9	21.1	18.4	18.0

5. Noise Assessment

5.1. Noise Modelling

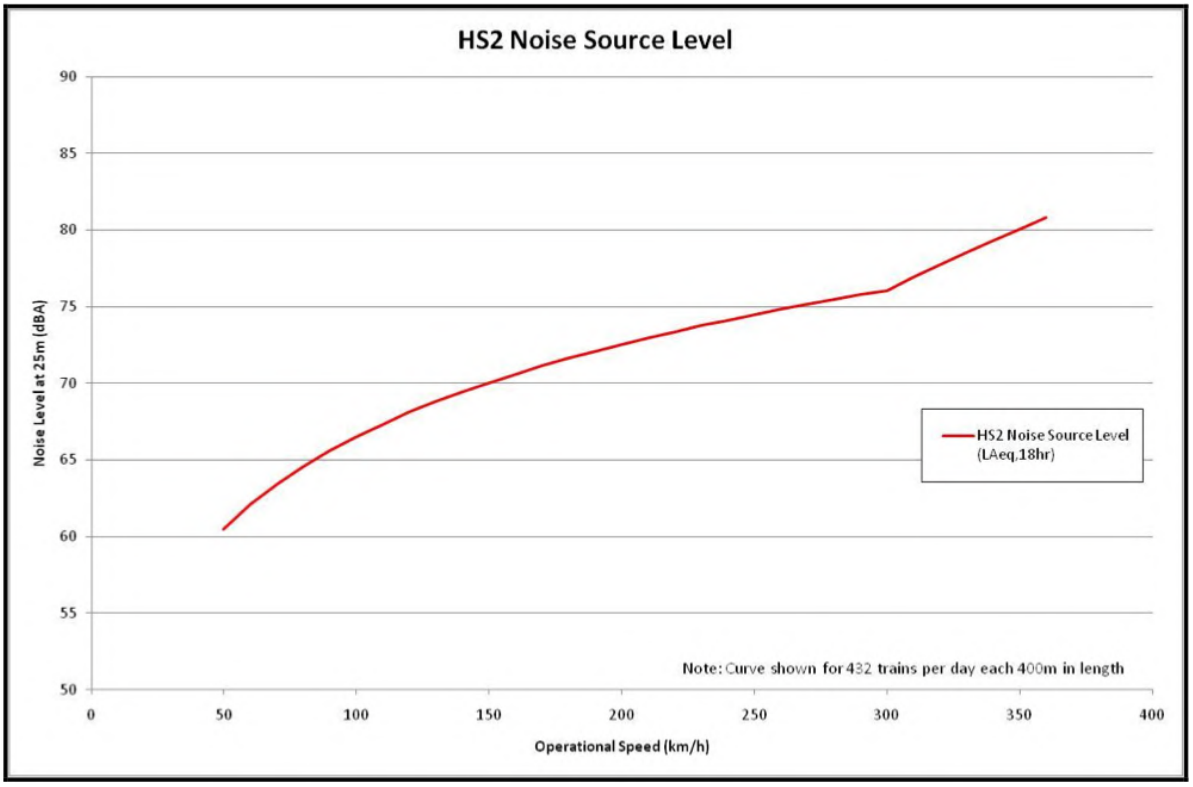
The baseline noise measurement results presented above have been used to assess noise levels across the site.

Furthermore; a scenario considering the influence of the planned HS2 line has been considered, which is based on the information contained within the Arup HS2 report. The prediction of noise from HS2 presented in this assessment assumes 432 HS2 movements per day (0600-2400), with source levels as per the extract from the HS2 Phase 1 noise study presented in Figure 4.

A speed of 300kph has been assumed, which in combination with the movement numbers is considered to represent a likely worst case for noise emissions from HS2.

This source has been modelled in isolation and considered alongside the measured sound levels, in order to quantify the cumulative effects at the site.

Figure 4: HS2 Source Noise Levels Used in the Assessment



On this basis, the potential future predictions have been carried out in accordance with the CRN prediction methodology for rail traffic.

In addition to the derived rail traffic source noise levels used in the predictions, the model also considers the effects of the topographical conditions throughout the area, ground absorption, atmospheric absorption, acoustic reflections, acoustic screening as well as applying a light downwind propagation correction to represent worst case.

The model has been used to determine the daytime $L_{Aeq,16\text{-}hour}$ (07:00 to 23:00) and night-time $L_{Aeq,8\text{-}hour}$ (23:00 to 07:00) HS2-attributed noise levels across the site.

The output from the daytime and night-time HS2-only noise models has been presented in the form of noise contours overlaid on a plan of the site, as presented below.

5.2. Predicted HS2 Noise Levels

This section considers the acoustic effects of the potential HS2 route corridor, in isolation.

Figure 5 and Figure 6 identify the predicted site-wide noise levels arising from for the 16-hour (07:00 to 23:00) daytime and 8-hour night-time (23:00 to 07:00) periods respectively.

FIGURE 5: DAYTIME $L_{AEQ,16\text{-}HOUR}$ HS2 NOISE LEVELS – dB

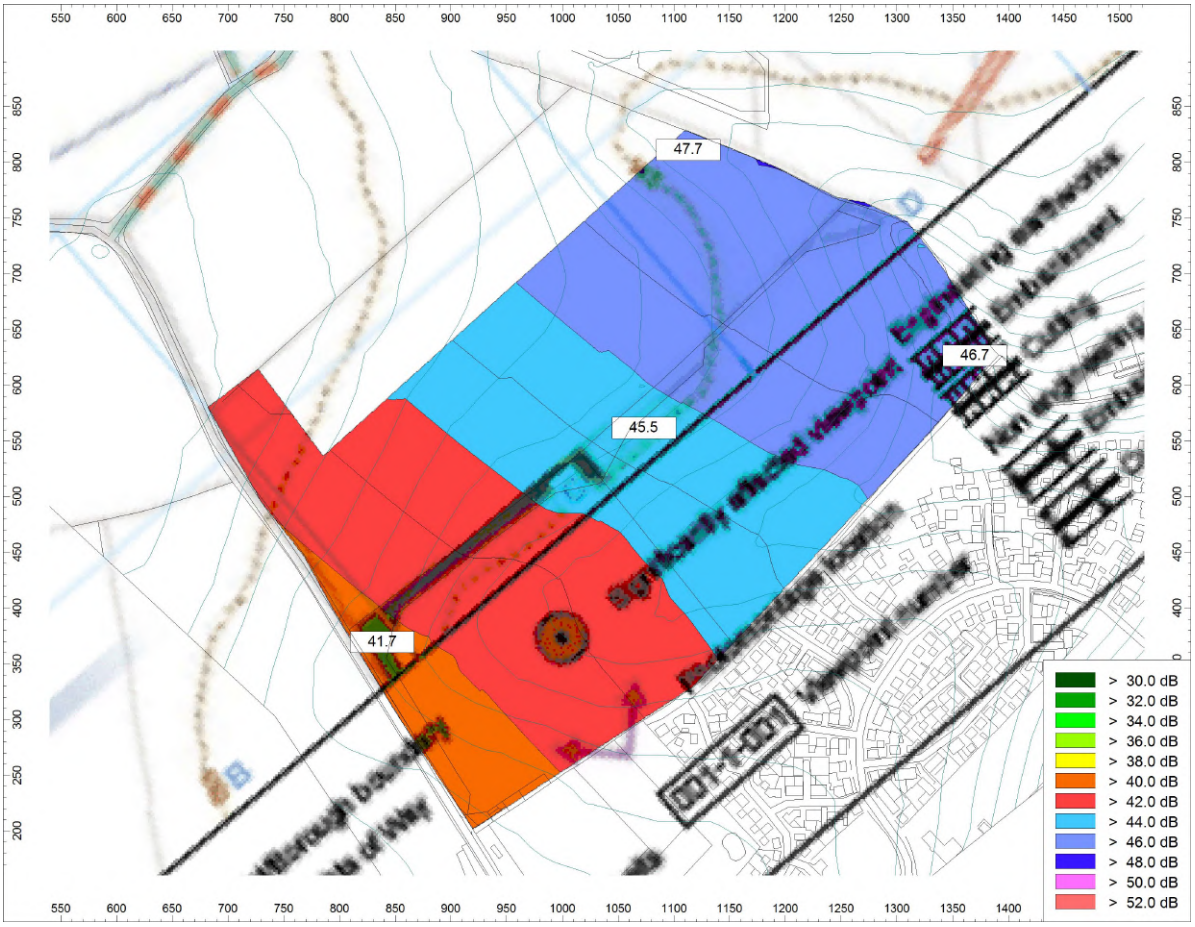
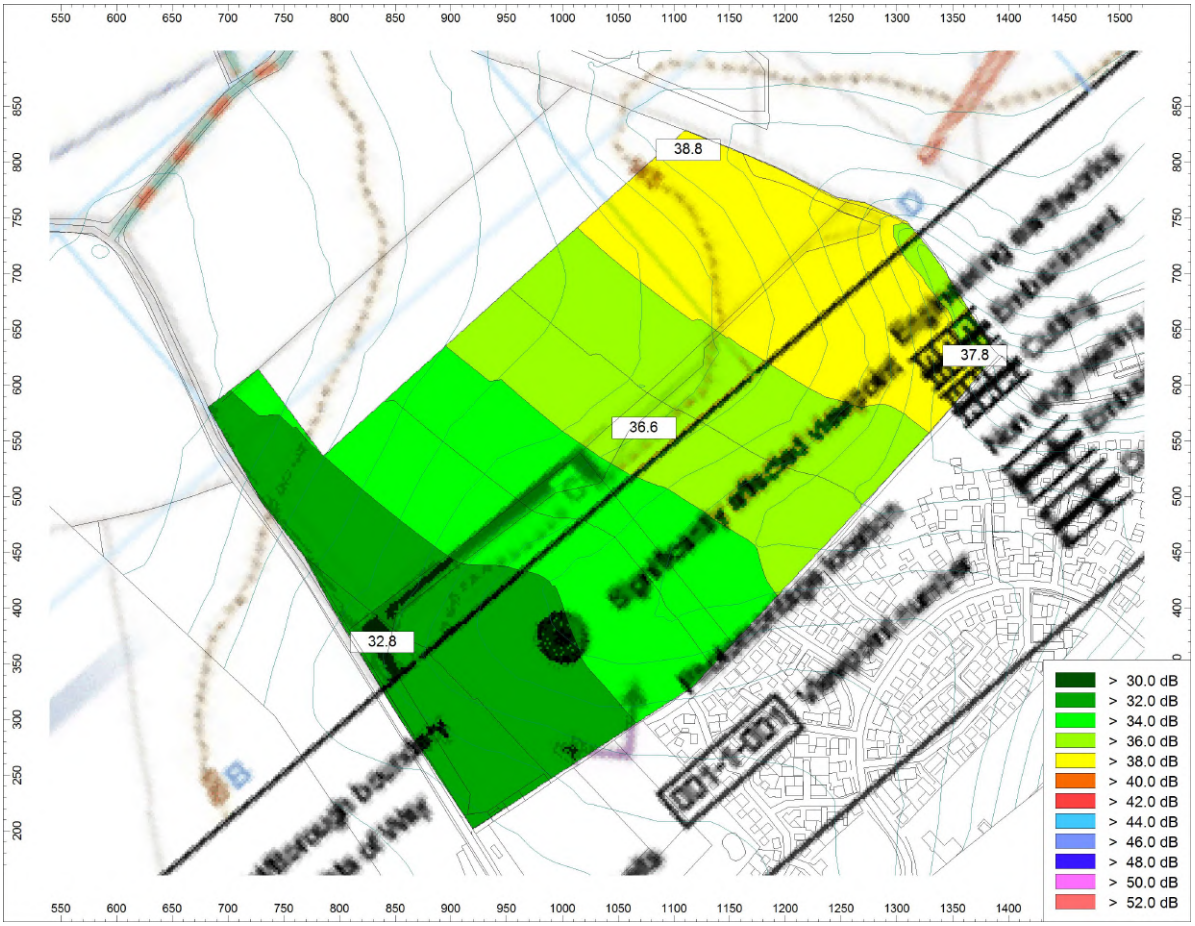


FIGURE 6: NIGHT-TIME $L_{AEQ,8\text{-}HOUR}$ HS2 NOISE LEVELS – dB



5.3. Cumulative Noise Levels

This section considers the cumulative effects of the measured noise levels and the predicted noise levels arising from the HS2 route corridor, in the context of national planning policy guidance and BS8233:2014.

In order to undertake this exercise, the measured sound levels at MP1, MP2 and MP3 have been added to the predicted HS2 noise level at each respective location, with levels also interpolated at the centre of the site, considering open site conditions. The calculated daytime and night-time levels are set out in Table 6.

TABLE 6: CUMULATIVE NOISE LEVELS

Position	Period	Sound Level – $L_{Aeq,T}$ - dB		
		Measured	Predicted HS2	Cumulative
Western Edge of Site (MP1)	Daytime	53	42	53
	Night-time	43	33	44
South-Eastern Edge of Site (MP2)	Daytime	47	47	50
	Night-time	39	38	42
North-Eastern Edge of Site (MP3)	Daytime	46	48	50
	Night-time	36	39	41
Centre of Site	Daytime	46	46	49
	Night-time	36	37	40

To place the predicted levels in context, they accord to the following, typically adopted consideration criteria of planning authorities throughout England:

- Daytime levels of below 50 dB(A) and night-time of 45 dB(A) are the threshold for NOAEL (suitable). BS8233-compliant internal noise levels achieved with windows open for ventilation. External amenity criteria comfortably met;
- 50 to 55 dB(A) by day and 45 to 50 dB(A) by night are LOAEL (suitable with mitigation). BS8233 plus 5dB relaxation internal noise levels achieved with windows open for ventilation. External amenity criteria met;
- 55 to 60 dB(A) by day and 50 to 55 dB(A) by night are SOAEL (mitigation required). BS8233-compliant internal noise levels readily achieved with standard thermally insulating windows shut and ventilation provided by an alternative means to an open window. External amenity criteria marginally exceeded;
- 60 to 65 dB(A) by day and 55 to 60 dB(A) by night are SOAEL (mitigation required). BS8233-compliant internal noise levels generally achieved with standard thermally insulating windows shut and ventilation provided by an alternative means to an open window. External amenity criteria marginally exceeded and
- Over 65 dB(A) by day and 60 dB(A) by night are USOAEL (normally unsuitable). Detailed facade consideration and design may be required in order to achieve BS8233-compliant internal noise levels and Part F (UK Building Regulations).

5.3.1. Results Analysis

In summary the data presented in Table 6 can be interpreted as follows:

- The site is unconstrained by noise under both baseline and future HS2 conditions.
- All areas of the site are able to achieve BS8233-compliant external amenity levels during the day, without the need for acoustic mitigation.
- No parts of the site will require acoustic mitigation, with the vast majority of the site being capable of providing BS8233-compliant internal sound levels, during both the daytime and night-time, with windows partially open for ventilation.

Consequently, a residential masterplan could be brought forward on this site with a minimal level of acoustical design input.

5.4. Summary

As stated above, the site is largely unaffected by noise, both under current conditions and future conditions, taking account of the presence of HS2.

Although noise levels are measured to be elevated towards the west of the site, adjacent to Halse Road, this is primarily as a result of the proliferation of broadleaf trees and associated wildlife activity. Road traffic along Halse Road was noted to be at a low level and not a significant acoustic contributor.

Concern has previously been raised with regard to the potential for noise arising from the existing electricity substation, to the south-east of the eastern extent of the site and existing solar farm inverter/substation to the north of the eastern extent of the site. Specific consideration has been given to both of these sources, but were noted to be both inaudible and immeasurable.

The issue of a consented flexible power generation plant to the north-east of the site has also been raised. While this was observed to have not yet been constructed, so could not be measured in operation, it is noted that planning conditions exist that require an appropriate level of noise assessment, such that it does not give rise to unacceptable noise impacts at residential receptors in the area. The development proposed under this planning application is equidistant from the consented power generation site to those dwellings already existing within the Radstone Fields development, so no further acoustic constraint is proposed to be introduced in this regard.

Another potential source of sound generation that has previously been a cause for discussion is the sports and leisure land allocation to the north of the footpath, crossing the Radstone Farm site. This site is earmarked for use as sports pitches and public open space and has the potential to become a hub for sports clubs. The boundary of this site lies in excess of 300 metres to the north of the currently proposed residential development, meaning that substantial distance separation will be afforded, thus substantially reducing any acoustic effects at the receptor location.

It is acknowledged that concentrated sporting activity in this location may be audible within the application site, given the low ambient sound levels; however, the effects in noise terms will be small in quantitative terms at this distance, and moving out of the definition of potential noise, into the category of the sound of a functioning community; much in the same way as human activity within the existing Radstone Fields development is audible within the site.

Consequently, the potential use of the allocated sports and leisure land is not anticipated to be acoustically significant, nor in any way change the acoustic requirements of the Proposed Development.

6. CONSTRUCTION

The precise construction method and phasing have not yet been determined; however, a Construction Environmental Management Plan (CEMP) will be prepared and submitted in due course to the Local Planning Authority for approval, which will be steered by the criteria set out in BS 5228: 2009+A: 2014[8].

With regard to vibration, the document sets a ground vibration limit, in terms of Peak Particle Velocity (PPV) of 1 mm per second at any occupied residential property and 3 mm per second at any other property in any orthogonal direction.

It is anticipated that construction hours will be limited by condition, agreed with the Local Planning Authority.

With respect to the minimisation of acoustic disruption arising from construction activity, the following techniques will be employed:

- effective co-ordination and time management of construction operations would be important in avoiding noise and vibration nuisance to surrounding uses. Early and helpful communications with the surrounding receptors would assist reducing potential for and in managing any complaints arising during the demolition and construction works of the Proposed Development; and
- contractors would be required to ensure that works are carried out in accordance with Best Practice Measures (BPM) as stipulated in the Control of Pollution Act 1974. A full explanation of measures to control construction noise would be incorporated within the CEMP and detailed in all construction method statements.

The Proposed Development in regards to general noise mitigation would be in accordance with Best Practicable Means (BPM) as specified in BS 5228 and would comprise the following, where possible:

- using 'silenced' plant and equipment;
- switching off engines where vehicles are standing for a significant period of time;
- fitting of acoustic enclosures to suppress noisy equipment;
- operating plant at low speeds and incorporating of automatic low speed idling;
- selecting electrically driven equipment in preference to internal combustion powered, hydraulic power in preference to pneumatic and wheeled in lieu of tracked plant;
- properly maintaining all plant (greased, blown silencers replaced, saws kept sharpened, teeth set and blades flat, worn bearings replaced, etc.);
- considering the use of temporary screening or enclosures for static noisy plant to reduce noise emissions;
- certifying plant to meet any relevant EC Directive standards; and
- undertaking awareness training of all contractors in regards to BS5228 (Parts 1 and 2) which would form a prerequisite of their appointment.

Typically, adopting BPM would reduce overall construction noise levels by approximately 5 dB.

Should any non-routine activities be identified that would make it impracticable to work to the adopted target criterion, provisions would be set out in advance and with the agreement of the Local Planning Authority, to reduce and control the effect. It is recommended that noise monitoring is carried out during particularly noisy phases of work close to the site boundary so that such situations can be actively managed in accordance with the CEMP.

[8] British Standard BS 5228: 2009+A: 2014 Code of practice for noise and vibration control on construction and open sites. BSI

For any proposed construction works to be undertaken outside of the permitted working day, particularly at night, prior consent would be sought from the Local Planning Authority. Dispensation procedures for works would be agreed in advance and included within Construction Method Statements and a CEMP.

Deliveries and removal of material off-site, would be subject to the following controls;

- ensuring that construction traffic is parked off the public highway;
- controlling the discharge of trucks from Site to avoid congestion; and
- implementing traffic management systems at the entrance to the site at all times to control the traffic into the site.

By implementing the aforementioned measures, it is anticipated that any noise impacts to nearby sensitive receptors during the demolition and construction works will be minimised.

7. CONCLUSION

inacoustic has been commissioned to assess the impact of noise at a site north of Radstone Fields, Brackley, in respect of the site's suitability for residential development.

The following technical noise assessment has been produced to accompany an Outline Planning Application to South Northamptonshire Council and is based upon environmental noise measurements undertaken at the site and a 3-dimensional noise modelling exercise.

The assessment considers both the existing noise environment at the site, plus the future noise environment, taking account of the High Speed 2 Rail Link (HS2). The effects have been considered on an open site basis; without the screening effects of the built form of a masterplan layout. This approach is considered to represent a worst-case scenario and can be used to steer the design of any eventual development layouts on the site.

The assessment has identified that:

- The site is unconstrained by noise under both baseline and future HS2 conditions.
- All areas of the site are able to achieve BS8233-compliant external amenity levels during the day, without the need for acoustic mitigation.
- No parts of the site will require acoustic mitigation, with the vast majority of the site being capable of providing BS8233-compliant internal sound levels, during both the daytime and night-time, with windows partially open for ventilation.

The noise effects of existing and proposed non-transport related sources potentially affecting the site have also been considered and discussed individually. It has been concluded that none of the identified existing or proposed non-transport related sources currently have nor are considered to have the potential to adversely affect the acoustic environment of the site under future conditions.

It is therefore considered that noise should not be considered an impediment to the approval of this Outlined Planning Application of residential development at the site.

8. APPENDICES

8.1. Appendix A – Definition of Terms

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa ($20x10^{-6}$ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

TABLE 7: TYPICAL SOUND LEVELS FOUND IN THE ENVIRONMENT

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source.

A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not be normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10}, the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq}.

This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound.

To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS 4142 specifies background noise measurement periods of 1 hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1hour}$ dB and $L_{A90,15mins}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125 ms.

8.2. Appendix B – Full Noise Measurement Results

FIGURE 7: MP1 MEASURED TIME HISTORY

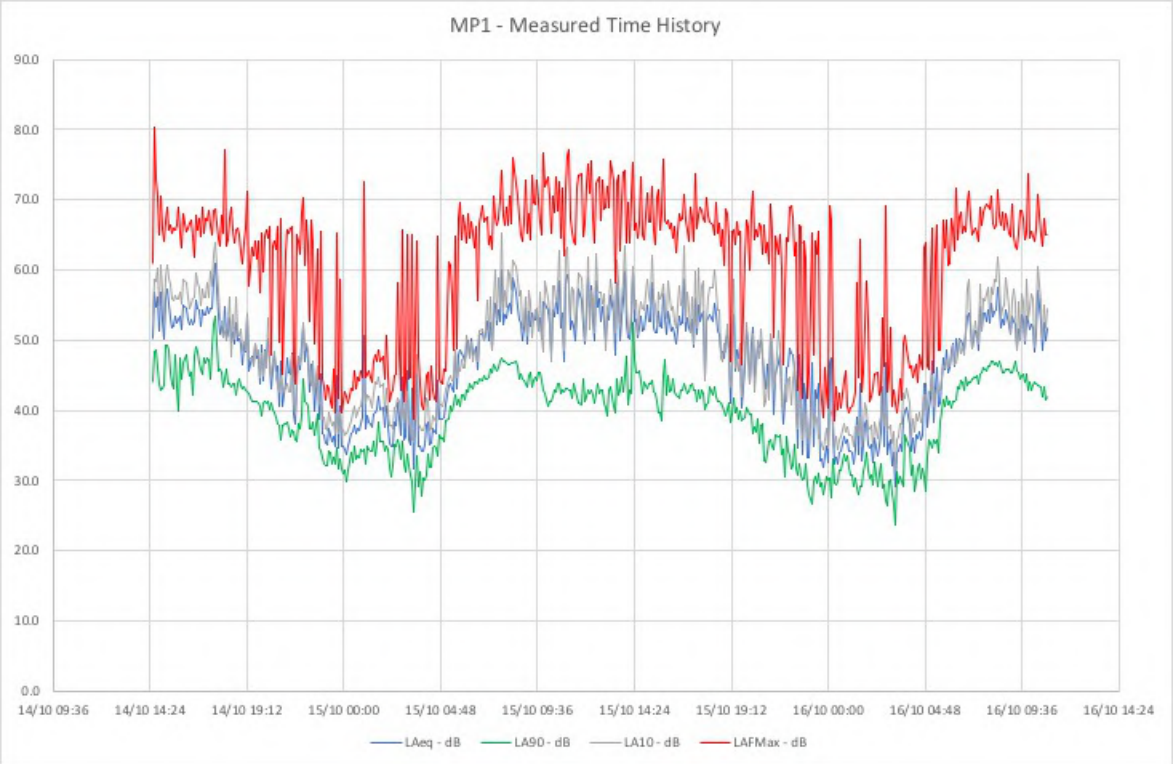


FIGURE 8: MP2 MEASURED TIME HISTORY

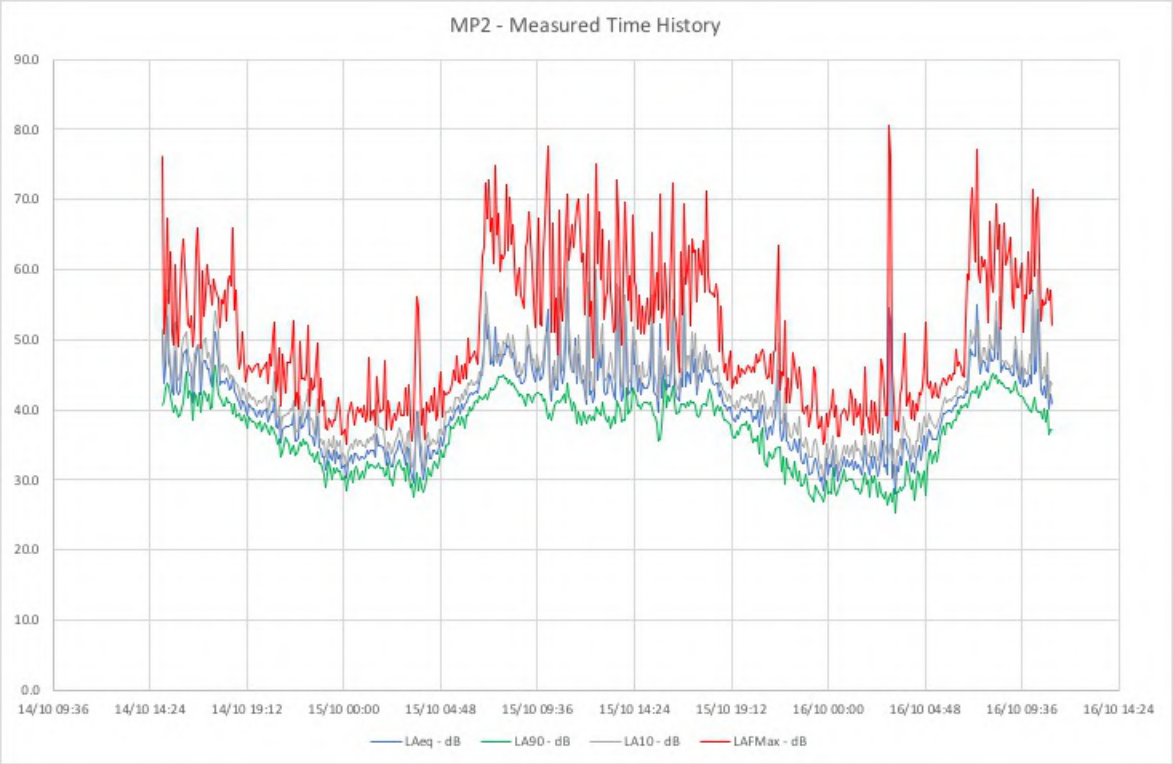
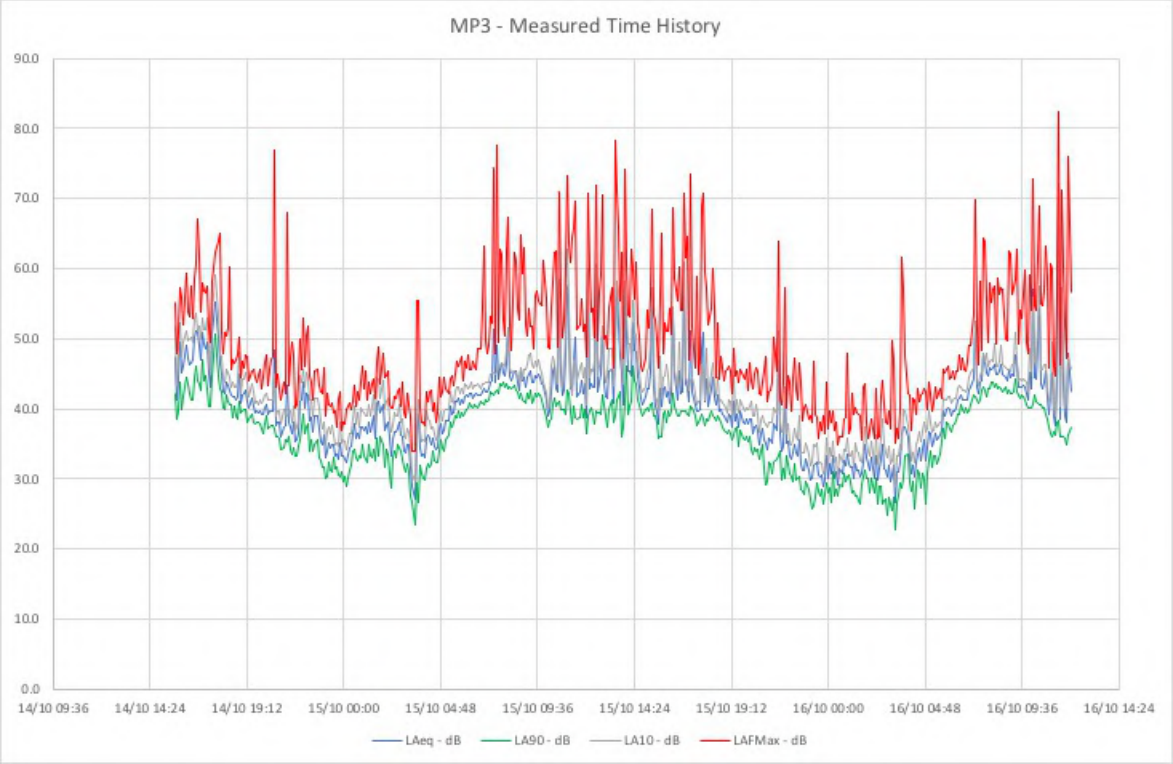


FIGURE 9: MP3 MEASURED TIME HISTORY



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