NOISE IMPACT ASSESSMENT

REPORT REFERENCE: **NCSL 1145**

DONELAN TRADING LIMITED.
CARR HALL, WHALLEY ROAD, WILPSHIRE, BB1 9LJ.
03/08/2022

Issue 1

NOISE CONTROL SOLUTIONS LIMITED

1 INTRODUCTION

Noise Control Solutions Limited (NCSL) have been commissioned by Donelan Trading Limited to undertake a noise impact assessment for the proposed electric quad bike track at Carr Hall, Whalley Road, Wilpshire, BB1 9LJ. The assessment is required in order to accompany the planning application reference 3/2022/0414 which is to be considered by Ribble Valley Borough Council (RVBC). The scope of the planning application is a proposed electric quad motorsport facility with an associated support building and a 16-bay car parking area.

Consultee comments were made by Ms. Hannah Kent, Environmental Health Officer (EHO) for RVBC, following submission of the planning application requesting a noise impact assessment for the proposed development.

The potential sources of noise are considered by NCSL to be;

1. Noise from 10no. electric quad bikes using the proposed track (source reference 'S1').

2. Noise from the proposed 16 bay car parking area (source reference 'S2').

3. Noise from the maintenance building (source reference 'S3').

The proposed development is located on land off Carr Hall, in a rural area with few residential premises.

In order to assess the noise impact at the nearest noise sensitive receptors, an environmental noise impact assessment has been conducted, details of which are shown within this report.

Report prepared by…… Andrew Todd BA(HONS) MSc MIOA CENG

2 COMPETENCE

This report has been prepared by Mr Andrew Todd, a corporate member of the Institute of Acoustics, a holder of a MSc in Acoustics and a Chartered Engineer registered with the United Kingdom Engineering Council. Andrew has over 14 years of experience as an acoustic consultant/engineer working in various aspects of acoustics.

3 SUMMARY OF TERMS, DESCRIPTORS & QUANTITIES

Within this report, several acoustic descriptors and quantities are referred to. Due to their specialised nature, the following summary is provided.

DECIBELS (dB): Ten times the logarithm (base 10) of the ratio between a measured quantity and a reference quantity. For sound pressure levels defined within this report, the reference quantity is 20 Micropascals (μPa).

A-WEIGHTING: The filtering of acoustic signals in order to provide a closer approximation to the human hearing response. Measurements with this weighting applied are denoted with "(A)", for example, "dB(A)".

N^{TH} PERCENTILE NOISE LEVEL ($L_{AN,T}$): The A-weighted sound pressure level, in decibels, exceeded for N% of the measurement duration (T). This metric is generally used to assess background noise levels (L_{A90}) as it allows for the removal of non-constant noise sources, for example, passing vehicles. The subscript 'T' defines the measurement duration.

EQUIVALENT CONTINUOUS NOISE LEVEL ($L_{AEQ,T}$): The logarithmically averaged sound pressure level, in decibels, over the measurement duration (T) with A-weighting applied. The subscript 'T' defines the measurement duration.

FAST TIME WEIGHTING: The integration time constant of the measurement. Fast time weighting, denoted by the subscript 'F', integrates sound pressure levels over 0.125 seconds.

MAX LEVEL ($L_{AF\ MAX}$): The maximum reported RMS sound pressure level during a measurement period. The level is A-weighted and is calculated with a Fast time weighting.

DAY-TIME AND NIGHT-TIME PERIODS: Following guidance contained within BS4142, the day-time period is defined as 07:00 to 23:00 and the night-time period is defined as 23:00 to 07:00.

NOISE SENSITIVE RECEPTOR (NSR): A premises or area which is sensitive to noise disturbance. This is generally an existing, or future residential premises close to a proposed development.

SOUND POWER LEVEL (L_W): The sound energy radiated per unit time by a sound source, measured in Watts (W) on a decibel scale with a reference value of 10^{-12} W.

4 APPLICABLE LITERATURE

4.1 NATIONAL PLANNING POLICY FRAMEWORK

The National Planning Policy Framework (NPPF), updated in 2021, outlines the Government's planning policies for England and how they are expected to be applied. In respect of noise, the document states that:

Planning policies and decisions should also ensure that new development is appropriate for its location, taking into account the 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:

- *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.*

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

Additionally, the policy states that:

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

- *Planning conditions should be kept to a minimum and only imposed where they are necessary, relevant to planning and to the development to be permitted, enforceable, precise and reasonable in all other respects. Agreeing conditions early is beneficial to all parties involved in the process and can speed up decision-making. Conditions that are required to be discharged before development commences should be avoided, unless there is a clear justification*

4.2 NOISE POLICY STATEMENT FOR ENGLAND (NPSE)

Published in March 2010 by DEFRA, this document defines the Government's policy on noise. It incorporates the long-term vision of promoting good health and quality of life through the effective management of noise in the context of Government policy on sustainable development. The long-term vision of the NPSE is supported by the following aims:

- *Avoid significant adverse impacts on health and quality of life.*
- *Mitigate and minimise adverse impacts of health and quality of life.*
- *Where possible, contribute to the improvement of health and quality of life.*

This document also defines three categories relating to noise impact:

- 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.
- LOAEL – LOWEST OBSERVED EFFECT LEVEL. This is the level above which adverse effects on health and quality of life can be detected.
- SOAEL – SIGNIFICANT OBSERVED ADVERSE EFFECT LEVEL. This is the level above which significant adverse effects on health and quality of life occur.

4.3 PLANNING PRACTICE GUIDANCE

Further detail is provided within the Planning Practice Guidance (PPG) regarding how the effect levels, set out within NPSE, can be recognised and the associated concern arising from each.

At the lowest extreme, when noise is not perceived to be present, there is by definition no effect. As the noise exposure increases, it will cross the 'no observed effect' level. However, the noise has no adverse effect so long as the exposure does not cause any change in behavior, attitude or other physiological responses of those affected by it. The noise may slightly affect the acoustic character of an area but not to the extent

there is a change in quality of life. If the noise exposure is at this level no specific measures are required to manage the acoustic environment.

As the exposure increases further, it crosses the 'lowest observed adverse effect' level boundary above which the noise starts to cause small changes in behavior and attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard. The noise therefore starts to have an adverse effect and consideration needs to be given to mitigating and minimising those effects (taking account of the economic and social benefits being derived from the activity causing the noise).

Increasing noise exposure will at some point cause the 'significant observed adverse effect' level boundary to be crossed. Above this level the noise causes a material change in behavior such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present. If the exposure is predicted to be above this level the planning process should be used to avoid this effect occurring, for example through the choice of sites at the plan-making stage, or by use of appropriate mitigation such as by altering the design and layout. While such decisions must be made taking account of the economic and social benefit of the activity causing or affected by the noise, it is undesirable for such exposure to be caused.

At the highest extreme, noise exposure would cause extensive and sustained adverse changes in behavior and / or health without an ability to mitigate the effect of the noise. The impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, this situation should be avoided.

Table 1 summarises the noise exposure hierarchy.

Response	Example of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not Noticeable	No Effect	No Observed Effect	No Specific Measures Required

Response	Example of Outcomes	Increasing Effect Level	Action
No Observed Adverse Effect Level			

Present & 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		
Present & 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 & Reduce to a Minimum
	Significant Observed Adverse Effect Level		
Present & 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 of life diminished due to change in acoustic character of the area.	Significant Observed Effect Level	Avoid
Present & 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

TABLE 1 – NOISE EXPOSURE HIERARCHY

4.4 BS4142:2014+A1:2019 METHODS FOR RATING AND ASSESSING INDUSTRIAL AND COMMERCIAL SOUND

British Standard 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound (BS4142) sets out a methodology to determine the potential impact of proposed industrial and commercial sound sources upon nearby dwellings or premises used for residential purposes. Furthermore, BS4142 is appropriate to consider the impact of existing sources of industrial and commercial sound on proposed receptors.

The methodology prescribes the measurement of the existing acoustic environment at noise sensitive receptor locations, termed the 'background sound level'.

A measurement or calculation of the noise generated by the proposed noise source at the receptor location is also required and is termed the 'specific sound level'. This value is then adjusted to reflect any acoustic characteristics which may increase audibility or annoyance to define the 'rating level'.

Once these values have been attained, an analysis can be conducted in order to assess the estimated noise impact that will occur with the introduction of the proposed source into the existing environment.

- In instances where the rating level exceeds background noise level by +10dB, this is an indication of a significant adverse impact, depending upon the context.

- In instances where the rating level exceeds background noise level by +5dB, this is an indication of an adverse impact, depending upon 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 cause an adverse noise 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.

The assessment of a noise impact at a receptor should consider the context in which the sound occurs. BS4142 states that the following factors be included in the context assessment;

- The absolute level of sound
- The character and level of residual sound

- The sensitivity of the receptor.

However, it is noted that BS4142 specifically excludes noise from *'recreational activities, including all forms of motorsport'* from its own applicable scope. Reference to this standard is therefore included for information only.

4.5 BS 8233:2014 GUIDANCE ON SOUND INSULATION AND NOISE REDUCTION FOR BUILDINGS

BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings (BS 8233) provides guidance on internal noise levels within dwellings allowing for sufficient resting and sleeping conditions, as shown in Table 2. However, it is also noted that these values may be relaxed by 5dB where a development is considered necessary or desirable with reasonable internal conditions still achieved.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35dB $L_{Aeq,16hour}$	N/A
Dining	Dining room	40dB $L_{Aeq,16hour}$	N/A
Sleeping	Bedroom	35dB $L_{Aeq,16hour}$	30dB $L_{Aeq,8hour}$ 45dB L_{Amax}

TABLE 2 - BS 8233:2014: RECOMMENDATIONS FOR INDOOR NOISE LEVELS

BS8233 also provides guidance as to acceptable external noise levels, as shown in Table 3.

Activity	Location	Desirable Noise Level	Upper Guideline Level
Relaxation	External Amenity Space	50dB $L_{Aeq,T}$	55dB $L_{Aeq,T}$

TABLE 3 - BS 8233:2014: RECOMMENDATIONS FOR EXTERNAL NOISE LEVELS

BS8233, however, does recognise that these external guideline values are not achievable in all circumstances where development may be desirable. The standard also provides guidance on estimated noise reduction levels of commonly used building materials and constructions.

4.6 WORLD HEALTH ORGANISATION – GUIDELINES FOR COMMUNITY NOISE 1999.

The World Health Organisation (WHO) provides guidance on maximum recommended noise levels in outdoor living areas. The noise guideline levels are shown in Table 4.

Specific Environment	Critical Health Effect	dB L_{Aeq}	Time (hr)	dB L_{AMax}
Outdoor living area	Serious annoyance daytime and evening.	55	16	NA
	Moderate annoyance daytime and evening.	50	16	NA
Outside bedroom	Sleep disturbance, window open (outdoor values).	45	8	60

TABLE 4 - WHO RECOMMENDATIONS FOR OUTDOOR NOISE LEVELS

5 LOCATION

5.1 SITE LOCATION

The development in question is located at Carr Hall, Whalley Road, Wilpshire, BB1 9LJ, (reference 'D1'). This is a commercial premises with a residential dwelling located on the site (occupied by the client). The area surrounding the site is comprised of sparse residential dwellings and open glass-land. Additionally, there is a relatively busy public highway (Whalley Road) located to the North-East.

5.2 NOISE SENSITIVE RECEPTOR LOCATION

One noise sensitive receptor has been identified in reference to this noise impact assessment, this residential dwelling is detailed in Table 5 below.

NSR Reference	NSR Address	Distance to Development
NSR1	Strathmore, Whalley Road, Wilpshire	~150m

TABLE 5 - NOISE SENSITIVE RECEPTOR DETAILS

5.3 MEASUREMENT LOCATIONS

Background & residual sound level measurements detailed within this report were taken using an outdoor microphone positioned at the rear garden boundary of NSR1 at a distance of >3.5m from the property façade and at a height of 1.5m. This location was chosen to provide partially screened traffic noise levels, as would be expected in the NSR1 rear garden.

Location Reference	Location Description	Measured Values
ML1	NSR1 Rear Garden Boundary	Background and Residual Sound Levels

TABLE 6 - MEASUREMENT LOCATIONS

5.4 LOCAL AREA MAP

FIGURE 1 - LOCAL AREA MAP

5.5 SUBJECTIVE APPRAISAL OF THE EXISTING ACOUSTIC ENVIRONMENT

During a site visit on Wednesday 27th July 2022 a subjective assessment of the existing acoustic environment was conducted by NCSL. At the noise sensitive receptor location, the residual sound is dominated by traffic noise along Whalley Road.

6 PROPOSED NOISE SOURCES

The proposed development (reference 'D1') comprises a proposed electric quad motorsport facility with an associated support building and 16-bay car park. The main operational times for the development will be Wednesday to Sunday, 0800hrs to 1200hrs and 1300hrs to 1600hrs.

As noted in Section 1 of this report, three potential noise sources have been identified for assessment by NCSL in order to satisfy RVBC that the proposed development will not cause an adverse impact at noise sensitive receptors.

Further details of the proposed noise sources relating to this planning application are defined below.

6.1 ELECTRIC QUAD BIKES (S1)

It is understood that 10no. electric quad bikes are proposed within the scope of the development. The supplier of the bikes is expected to be 'HiSun'.

The client has previously commissioned noise level measurements of typical electric quad bikes from this manufacturer, and the results have been provided to NCSL by the client. These measurements appear to have been conducted by a competent acoustician and are detailed within report reference 13387/1. It is understood that this measurement report has also been supplied to RVBC within the planning application pack.

Based upon the findings of the report supplied to us by the client, the measured noise level of a typical HiSun electric quad bike is 45dB L_{Aeq} at a distance of 15 metres on a grass surface. This surface is believed to be the most representative for the assessment of noise from D1 as the proposed track runs through grassy woodland. It is noted, however that the specific model to be used within the development is to be confirmed.

The proposed route for the quad bike track is shown below in Figure 2.

FIGURE 2 - PROPOSED QUAD BIKE TRACK

6.2 CAR PARKING AREA (S2)

The development incorporates a parking area for up to 16 vehicles. It is noted that the existing industrial area is used frequently by passenger vehicles and HGVs, therefore the vehicle movement associated with the proposed development are not likely to cause a noise impact at NSR1 and are in keeping with surrounding uses.

6.3 SUPPORT BUILDING (S3)

It is understood that the proposed development includes provision for a small support building. This is expected to be used for storage purposes, sales and maintenance of the quad bikes when necessary. Following discussion with the client, it is the understanding of NCSL that infrequent maintenance work will be undertaken with hand-held electric power tools (likely impact drivers for removal of wheels etc).

The building will also incorporate a roller shutter door. However, the roller shutter will be located on the South-eastern façade of the building which faces away from NSR1.

7 EQUIPMENT & MEASUREMENT CONDITIONS

7.1 EQUIPMENT DETAILS

All measurements detailed within this report relating to the assessment of environmental noise levels were made using a Class 1 NTi Audio XL2 sound level meter (serial number A2A-19038-E0). Field calibration of the meter was conducted using a Class 1 Norsonic Type 1251 114dB acoustic calibrator (serial number 33421). Pre and post measurement sensitivity checks were conducted and showed no significant deviation to the nominal sound level meter sensitivity of 40.2mV/Pa or reference signal levels. Details of these tests are documented in Table 7.

Test Reference	dB Level	Sensitivity	Comments
Pre-test calibration	114.0dB	40.2 mV/Pa	NA
Post-test check	114.0dB	40.2 mV/Pa	No significant variance

TABLE 7 - FIELD CALIBRATION DETAILS (S/N A2A-19038-E0)

All equipment is calibrated in accordance with IEC 61672-3, IEC 61260 and BS EN 60942:2003 where applicable. Calibration certificates are available upon request.

7.2 GROUND CONDITIONS

Ground conditions between D1 and NSR1 consist of undulating grassland and woodland. The ground was dry throughout the survey period.

7.3 WEATHER CONDITIONS

Weather conditions during survey measurements were clement and dry. A maximum wind speed of 2.4 ms-1 was recorded.

Parameter	Survey Start	Survey End
Barometric Pressure	757 mmHg	757 mmHg
Temperature	14º Celsius	21º Celsius
Wind Velocity	2.3 ms^{-1}	2.1 ms^{-1}
Cloud Cover	25%	50%

TABLE 8 - ENVIRONMENTAL CONDITIONS

8 ACOUSTIC MEASUREMENTS & DEFINED SOUND LEVELS

8.1 BACKGROUND SOUND LEVELS

The background sound level characterises the existing acoustic environment at a specific location without the influence of the noise source under assessment.

Measurements have been taken in order to define the existing background sound level at the noise sensitive receptor location (NSR1). An 8-hour hour acoustic survey was selected to reflect the proposed operational times of the development. The survey commenced on 0800hrs Wednesday 27th July 2022 and was completed on 1600hrs Wednesday 27th July 2022.

The proposed development has not yet been constructed and is not operational, therefore the background sound levels has been measured without influence from the proposed development 'D1'. These measurements were taken at ML1.

The background sound level has been measured as a 90th percentile sound pressure level ($L_{A90,T}$) logged at 15-minute measurement intervals. Following the methodology described in BS4142, the statistical mode of the day-time measurement values has been taken as the day-time background sound level between 0800hrs Wednesday 27th July 2022 and 1600hrs Wednesday 27th July 2022.

The results of this acoustic survey are shown in Figure 3 and the results are summarised in Table 9.

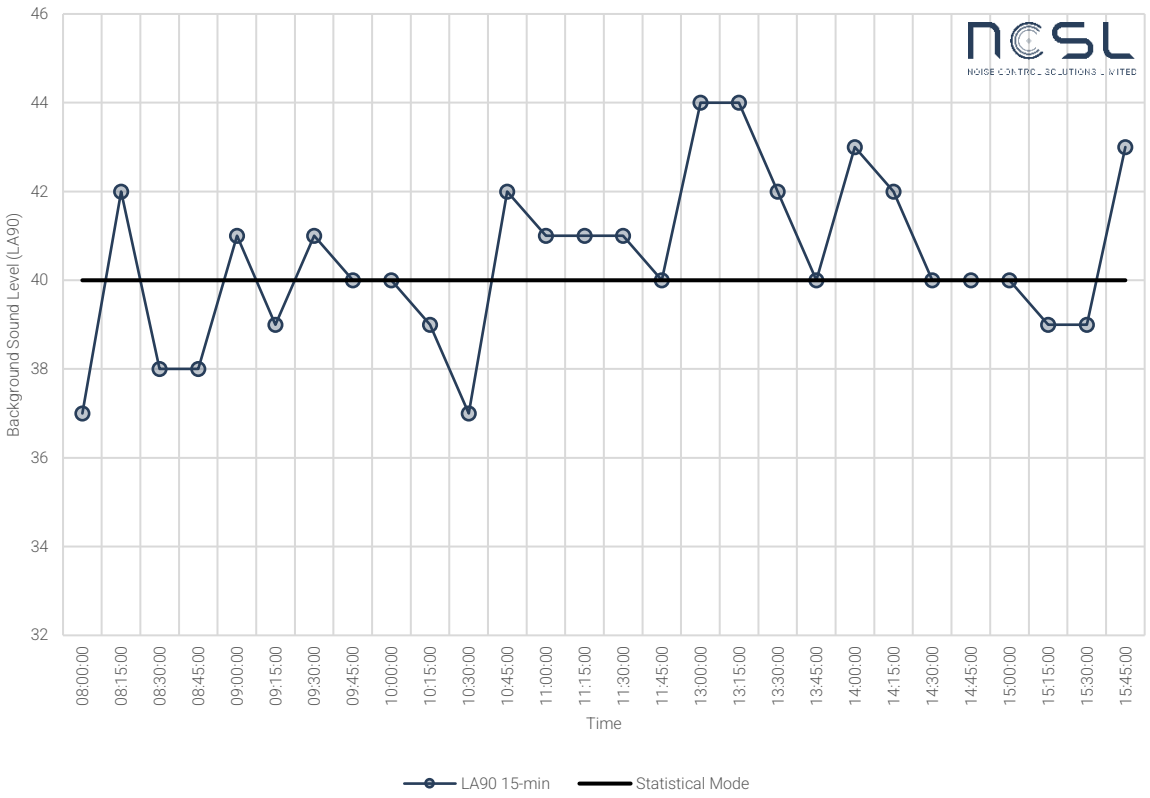


FIGURE 3 – DAY-TIME BACKGROUND SOUND LEVEL VALUES ($L_{A90,15MIN}$)

Time Period	Measurement Location	Representative Receptor	Measurement Date & Time	Background Sound Level (dB $L_{A90,T}$)
Day-Time	ML1	NSR1	0800hrs Wednesday 27th July 2022	40

TABLE 9 - BACKGROUND SOUND LEVEL

These background sound levels are considered to be representative of the background sound level at NSR1 and have been used within this report. Further details are shown in Appendix A.

8.2 RESIDUAL SOUND LEVEL

The residual sound level defines the acoustic environment when specific noise sources are suppressed or inactive. In the case of this noise assessment, the residual sound has been measured simultaneously with the background sound level.

Measurements have been taken in order to define the existing residual sound level at the noise sensitive receptor location (NSR1). An 8-hour hour acoustic survey was selected to reflect the proposed operational times of the development. The survey commenced on 0800hrs Wednesday 27th July 2022 and was completed on 1600hrs Wednesday 27th July 2022.

The proposed development has not been constructed and is not operational, therefore the residual sound level has been measured without influence from the proposed development 'D1'. These measurements were taken at ML1.

The residual sound level has been measured as an equivalent continuous A-weighted sound pressure level ($L_{Aeq,T}$) logged at 15-minute intervals. These discrete logged values have been logarithmically averaged over a measurement time interval of 8-hours between 0800hrs Wednesday 27th July 2022 and 1600hrs Wednesday 27th July 2022.

The results of this acoustic survey are shown in Figure 4 and Table 10.

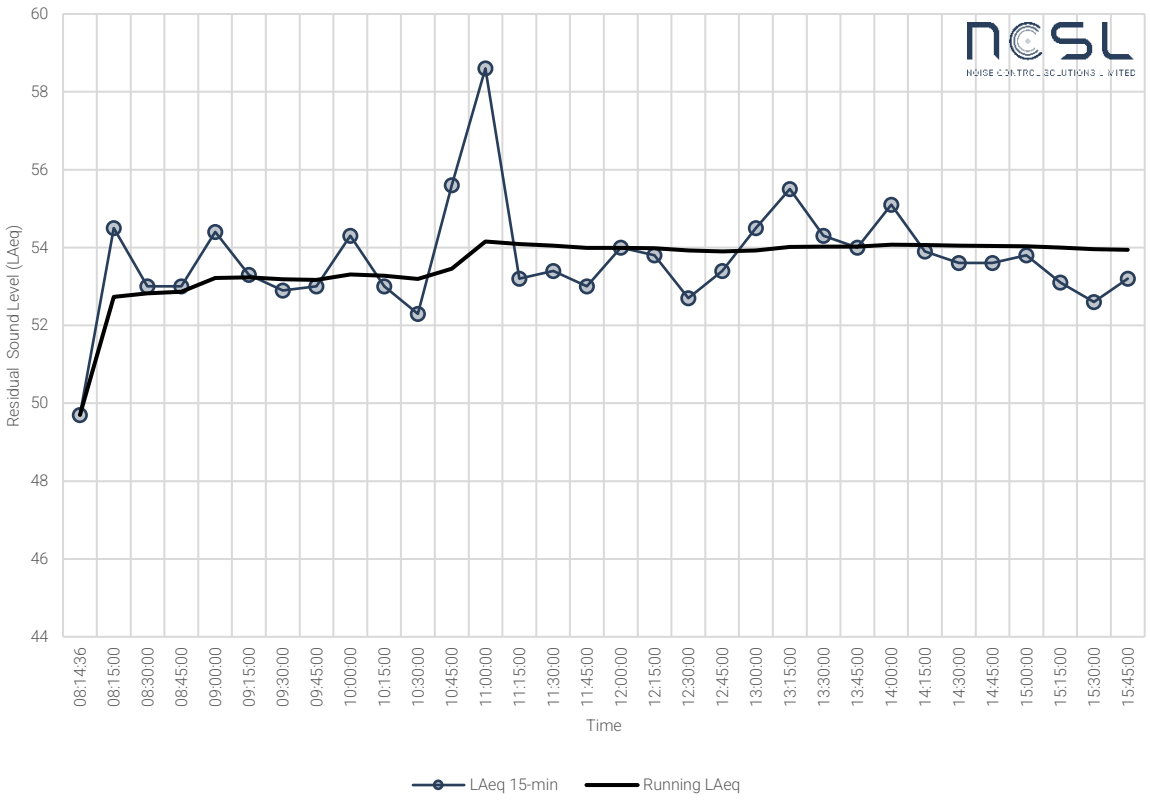


FIGURE 4 - RESIDUAL SOUND LEVEL

Time Period	Measurement Location	Representative Receptor	Measurement Date & Time	Residual Sound Level (dB, L_{Aeq})
Day-Time	ML1	NSR1	0800hrs Wednesday 27th July 2022	54

TABLE 10 - RESIDUAL SOUND LEVEL SUMMARY

In this case, the day-time residual sound level has been measured to be 54dB $L_{Aeq,8hrs}$. This level is considered to be representative of the day-time residual sound level at NSR1 and has been used within this report.

8.3 SPECIFIC SOUND LEVEL

The specific sound level is the calculated noise level generated at a NSR1 due exclusively to the noise source under investigation.

In order to assess the cumulative specific sound level generated by the proposed development at NSR1, a computer noise model has been developed within the sound propagation simulation software SoundPLAN Essentials 5.1. Details of the input data to this noise model are shown in the following sections.

8.3.1 QUAD BIKES SPECIFIC SOUND LEVEL – (S1)

As discussed in Section 6.1 of this report, the client has previously commissioned the measurement of noise from a typical electric quad bike from the proposed supplier. This results in a noise level of 45dB L_{Aeq} at a distance of 15m on a grass surface.

It is possible for this noise level to be converted to an approximate sound power level, as defined in Table 11.

Parameter	Value
Measured Noise Level at 15m	45dB L_{Aeq}
Predicted Noise Level at 1m (assumed point source radiation)	69dB L_{Aeq}
Predicted Sound Power Level (assumed measurement over reflecting plane)	77dB L_{WA}
Correction for 10no Quad Bikes (+10*log(10))	87dB L_{WA}

TABLE 11 - QUAD BIKES LWA CALCULATION

This sound power level has been incorporated into the noise model for development 'D1'.

8.3.2 CAR PARKING AREA SPECIFIC SOUND LEVEL – (S2)

The development incorporates a 16-bay car parking area. Noise from this source has been incorporated within the computer noise model of D1, assuming 2 vehicle movements per hour, per bay.

8.3.3 SUPPORT BUILDING – (S3)

The development includes provision for a small support building which is to be used for storage, sales and quad bike maintenance.

It is the understanding of NCSL that maintenance activities will be conducted with the use of electric hand tools only. In order to inform this assessment, noise levels of a 'typical' hand-held impact driver have been sourced (Makita 40Vmax impact driver BL XGTTD001GZ) which states a sound power level of 107dB L_{WA}. Further details are shown in Appendix B. An on-time correction has been applied to this value in order to reflect the predicted operating time of 15-minutes within the 1-hour reference period.

It is understood that the support building walls will be of a combined masonry and panel construction. The anticipated sound reduction provided by the walls of the building fabric has been estimated within the sound insulation performance prediction software INSUL 9.1. The panel performance is based upon a Kingspan KS1000 wall panel system. This results in a noise reduction value (Rw) of 27dB. Further details are shown in Appendix C.

It is understood that the support building roof will be of panel construction. The anticipated sound reduction provided by the roof of the building fabric has been based upon the sound insulation performance of a Kingspan KS1000 roof panel system, estimated by the manufacturer as 25dB (Rw). Further details are shown in Appendix D.

This sound reduction performance has been used in conjunction with the source sound power level to estimate the support building's façade sound power level, which in turn has been incorporated within the computer noise model. Calculations of the sound pressure levels at the external façade, including contributions from internal direct and reverberant fields, are shown in Appendix E & F.

8.4 COMPUTER NOISE MODEL RESULTS

As discussed above, in order to define the specific sound level of each defined source at the receptor location (NSR1) a computer noise model has been developed within the sound propagation simulation software SoundPLAN Essentials 5.1. The output of this noise model is shown in Figure 5 and the resulting specific sound levels are shown in Table 12.

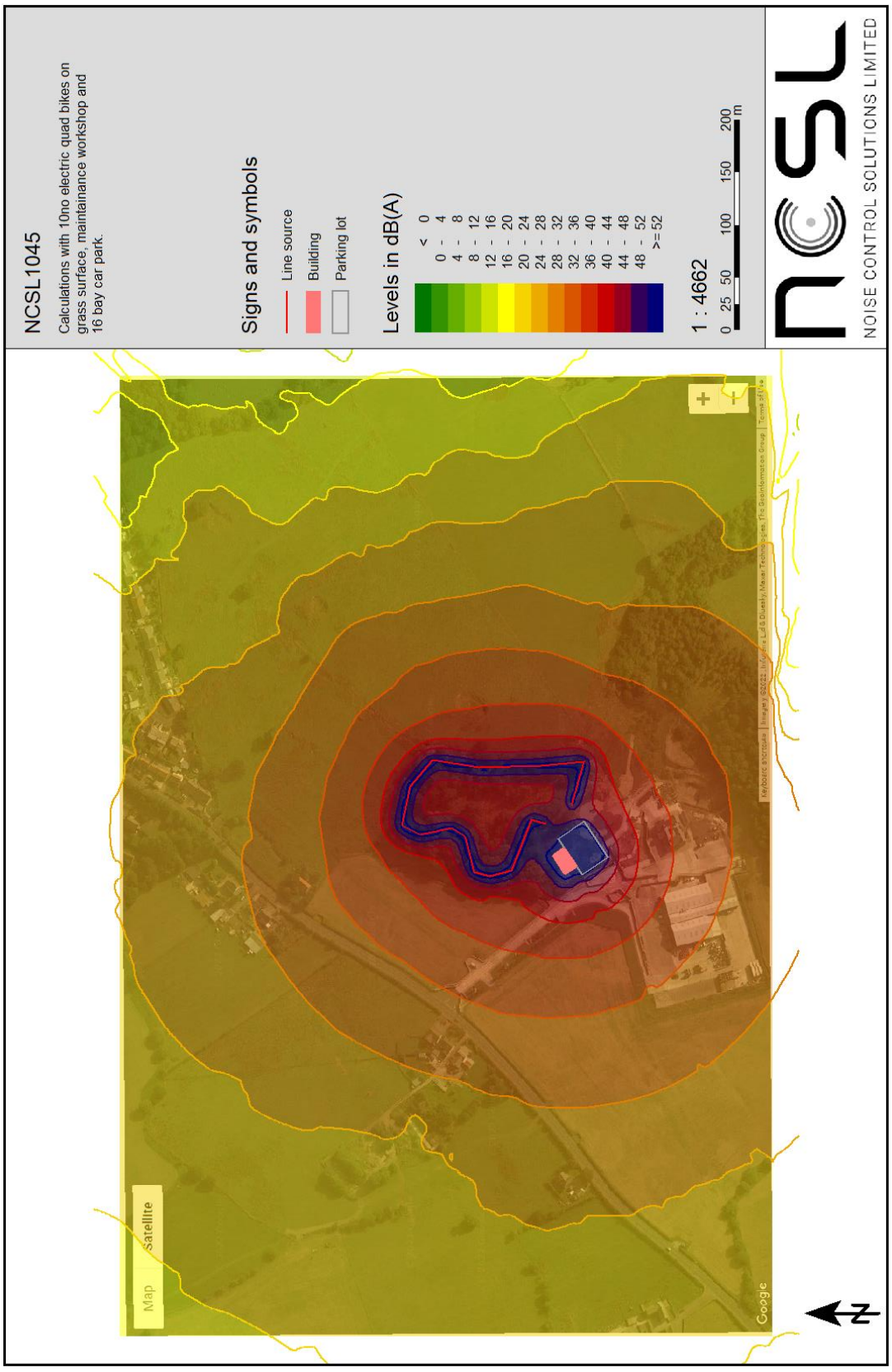


FIGURE 5 - D1 NOISE MODEL

8.5 DEFINED SOUND LEVEL SUMMARY

The defined sound levels are summarised in Table 11.

Time Period	Source Reference	NSR	Residual Sound Level (dB, L_{Aeq})	Background Sound Level (dB $L_{A90,T}$)	Specific Sound Level (dB, L_{Aeq})
Day-Time	S1 Electric Quad Bikes	NSR1	54	40	30
Day-Time	S2 Car Park	NSR1	54	40	14
Day-Time	S3 Support Building	NSR1	54	40	19
Day-Time	**Cumulative Noise**	**NSR1**	**54**	**40**	**31**

TABLE 12 - DEFINED SOUND LEVEL SUMMARY

8.6 RATING LEVEL

The rating level is calculated as the specific sound level plus any correction required for the characteristic features of the sound.

BS4142 states that: "for sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.

A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to

a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible."

It has not been possible for NCSL to assess the noise generated by the proposed electric quad bikes, however, to provide a robust assessment, a penalty has been applied for the potential tonality of the motor system. Following this guidance, a penalty of 4dB has been applied for tonal characteristics and 0dB has been applied for impulsive characteristics.

Due to the low specific sound level of S2 and S3, it is not expected that any acoustic characteristics will be perceptible at NSR1 and therefore no penalty is applied.

The calculated Rating Level is shown in Table 13.

Time Period	Specific Sound Level (dB(A))	Tonal Penalty (dB)	Impulse Penalty (dB)	Rating Level (dB)
Day-Time	31	4	0	35

TABLE 13 - RATING LEVEL SUMMARY

9 NOISE IMPACT ASSESSMENT

As discussed within the literature review detailed within Section 4 of this report, BS4142 explicitly excludes the assessment of noise from *'recreational activities, including all forms of motorsport'* from its applicable scope.

However, an assessment based upon the BS4142 method is included within this report for the purposes of completeness (see Section 9.1). It is however recommended that this noise impact assessment is based upon the guideline recommended noise levels defined within BS8233 and the existing residual sound level as measured at ML1 (see Section 9.2).

9.1 BS4142 NOISE IMPACT ASSESSMENT

In order to assess noise impact following the method described in BS4142, the specific sound level from the proposed noise sources must be corrected for acoustic features in order to produce a rating level.

BS4142 states that: *"for sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.*

A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible."

It has not been possible for NCSL to assess the noise generated by the proposed electric quad bikes, however, to provide a robust assessment, a penalty has been applied for the potential tonality of the motor system. Following this guidance, a penalty of 4 dB has been applied for tonal characteristics and 0 has been applied for impulsive characteristics.

Due to the low specific sound level of S2 and S3, it is not expected that any acoustic characteristics will be perceptible at NSR1 and therefore no penalty is applied. This results in a cumulative rating level of 35dB.

BS4142:2014 provides the following guidance on the expected impact to the local environment based upon rating levels:

- In instances where the rating level exceeds background noise level by +10dB, this is an indication of a significant adverse impact, depending upon the context.

- In instances where the rating level exceeds background noise level by +5dB, this is an indication of an adverse impact, depending upon 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 cause an adverse noise 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.

The assessment of a noise impact at a receptor should consider the context in which the sound occurs. BS4142:2014 states that the following factors be included in the context assessment.

- The absolute level of sound.

- The character and level of residual sound.

- The sensitivity of the receptor.

Our calculation in terms of BS4142 shows that the sound from the proposed development is expected to be 5dB below the measured background sound level. Based upon the guidance from BS4142:2014, noise from D1 is anticipated to produce a low impact at NSR1 during the day-time periods depending upon context.

9.1.1 CONTEXT ASSESSMENT

BS4142:2014 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 sources exceeds the background sound level and the context in which the sound occurs".

The first requirement of this statement has been determined within the noise impact assessment section above. To determine the context in which the industrial sound will reside, three factors must be considered, these are.

- *The absolute level of sound.*
- *The character and level of the residual sound compared to the character and level of the specific sound; and,*
- *The sensitivity of the receptor.*

9.1.2 ABSOLUTE LEVEL OF SOUND

To determine the first context test in BS4142 it is necessary to determine whether the residual and background sound levels are high or low. Section 11 of BS4142 states:

"Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.
Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse."

The rating level is calculated at 35dB(A), and the background sound level is measured at 40 dB(A) L_{A90}. These noise levels are all relatively low. This is a good indication that noise impact from the development will be low.

9.1.3 CHARACTER AND LEVEL OF RESIDUAL & SPECIFIC SOUND

The 10no electric quad bikes are expected to produce an acoustic character which will be similar to that of the residual sound at NSR1 due to the significant traffic noise. Both the residual and specific noise are expected to include a contribution from tyre noise and motor noise and therefore D1 is not expected to introduce any new acoustic characteristics into the local soundscape. This is a good indication that noise impact from the development will be low.

In addition, the residual sound level is relatively high (54dB(A)) due to local road traffic. This is likely to mask noise from D1 and further reduce the likely noise impact.

9.1.4 SENSITIVITY OF RECEPTOR

With regard to pertinent factors to be taken into consideration in the context assessment, Section 11 of BS4142 states:

"The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:

i) facade insulation treatment.
ii) ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and
iii) acoustic screening."

NSR1 is believed to be old housing stock and from observations taken during site visits does not appear to have any acoustically attenuated ventilation installed. Therefore, the dwelling will likely rely on open windows for ventilation.

However, due to the low specific noise levels of D1 at NSR1, it is expected that even with windows open for ventilation, the noise from the proposed development D1 will be below the recommended day-time indoor noise levels as defined within BS8233. This is based upon a 13dB attenuation provided by an open window, as defined within the recent AVO guidelines (January 2020). Furthermore, the specific sound level from D1 is expected to be below the outdoor noise level guidelines provided within BS8233.

9.1.4 BS4142 ASSESSMENT SUMMARY

A BS4142 assessment has been undertaken to assess the potential noise impact from the proposed development at receptors.

The assessment indicates that the noise associated with D1 will have a low impact at noise sensitive receptor, and therefore noise should not be a reason for refusal for the planning application.

9.2 RESIUAL SOUND LEVEL NOISE IMPACT ASSESSMENT

In order to provide an alternative noise impact assessment method to the BS4142 assessment detailed in Section 9.1, the anticipated specific sound level from D1 has been compared with the existing residual sound levels and BS8233 guidance values.

A summary of this comparison is shown below in Table 14.

Source Reference	NSR	Cumulative Noise Level from D1 (dB, L_{Aeq})	Residual Sound Level at NSR1 (dB, L_{Aeq})	BS8233 Recommended External Noise Level (dB, L_{Aeq})
Cumulative	NSR1	31	54	50

TABLE 14 – SPECIFIC SOUND LEVELS VS RESIDUAL SOUND LEVELS AND BS8233 GUIDANCE

As shown in Table 14, the expected cumulative noise from D1 is 23dB below the existing residual sound level at NSR1.

Furthermore, the expected noise from D1 at NSR1 is 19dB below the guideline noise level for outdoor amenity spaces, as defined within BS8233. In addition, noise from D1 is estimated at 18dB(A) when assessed within NSR1 with an open window for ventilation. This is a very low noise level, and significantly below the internal noise guideline levels for noise sensitive rooms of dwellings.

Based upon these values, it is expected that the noise from D1 will produce a low impact at NSR1, and therefore noise should not be a reason for refusal for the planning application.

10 CONCLUSIONS & RECOMMENDATIONS

A noise impact assessment has been commissioned in order to accompany planning application reference 3/2022/0414 for the proposed electric quad bike facility at Carr Hall, Whalley Road, Wilpshire, BB1 9LJ, which is to be considered by Ribble Valley Borough Council

The noise impact assessment includes data from a background sound level survey which was conducted between 0800hrs Wednesday 27th July 2022 and 1600hrs Wednesday 27th July 2022 at the rear boundary of the nearest residential premises. The results of this background sound level survey result in a statistical modal value of 40dB L_{A90} and a residual sound level of 53dB L_{Aeq}.

Three noise sources have been identified within this noise impact assessment, these are as follows:

1. Noise from 10no. electric quad bikes using the proposed track (source reference 'S1').

2. Noise from the proposed 16 bay car parking area (source reference 'S2').

3. Noise from the maintenance building (source reference 'S3').

The specific sound level of each source has been defined as described in Section 8.3 of this report, with the results integrated into a computer noise model in order to define the expected noise level at the receptor (NSR1). This computer noise model was developed within the sound propagation simulation software SoundPLAN Essentials 5.1. The cumulative specific sound level at NSR1 has been calculated to be 31dB(A).

Although BS4142 is not applicable to noise from *'recreational activities, including all forms of motorsport'* an assessment using this method has been included for completeness.

Following the BS4142 method, a cumulative rating level of 35dB has been defined, due to a tonality penalty of 4dB relating to the motor system of the proposed electric quad bikes.

This results in a difference between the background sound level and rating level of -5dB. Based upon the guidance contained within BS4142, this is likely to produce a low impact at NSR1.

An alternative noise impact assessment methodology has also been conducted, due to the ineligibility of the BS4142 method for this particular noise source. This second noise impact assessment method is

based upon the existing residual sound level, as measured at NSR1, and the guidance internal and external noise levels defined within BS8233.

- The predicted cumulative specific sound level is expected to be 23dB below the existing residual sound level at NSR1.

- The predicted cumulative specific sound level is expected to be 19dB below the outdoor amenity space guideline noise level (set out in BS8233) at NSR1.

- The predicted cumulative specific sound level is expected to be 17dB below the daytime, indoor guideline noise level (set out in BS8233) at NSR1.

Based upon the results of these two noise impact assessment methodologies, it is expected that the proposed development will result in a low noise impact at residential receptors.

Based upon the findings of this assessment, it is the recommendation of NCSL that the planning application reference 3/2022/0414 is approved regarding noise impact.

11 UNCERTAINTY

All measurements within this report have been taken under repeatable conditions and therefore any uncertainty in the result will be low.

To reduce measurement uncertainty, the following steps have been taken.

- The background noise measurements were undertaken during dry weather and with wind speeds of less than 5m/s.
- The results of each measurement period were reported to the nearest 0.1dB.
- Noise measurements were made using one Class 1, integrating sound level meter.

All noise impact assessments and similar acoustic assessments inherently rely upon estimations and assumptions. This report should therefore be considered within this context.

APPENDIX A: ACOUSTIC SURVEY DATA

Time	LAeq	LAF90.0%	LAF10.0%	LAFmax	LAFmin	LZeq	LCeq
08:14:36	49.7	37.3	54.4	57.1	36.3	61.1	59.3
08:15:00	54.5	41.7	58.2	77.6	32.1	64.2	62.4
08:30:00	53	38.4	57.7	64.6	32	62.3	60.8
08:45:00	53	38.2	57.5	66.9	30.7	63.6	62.1
09:00:00	54.4	40.5	58.1	70.7	33.9	63.4	62.1
09:15:00	53.3	39.2	57.1	73.4	32.3	62.1	60.6
09:30:00	52.9	40.8	56.9	67.8	34.3	64	62.4
09:45:00	53	39.7	57.2	67.8	33.7	63.5	61.9
10:00:00	54.3	40.4	58.5	69.7	35	64.3	61.8
10:15:00	53	38.8	57	65.7	32.9	63.7	61.5
10:30:00	52.3	37.2	56.8	63.5	31.5	65.3	61.6
10:45:00	55.6	42.1	60.3	71	33.3	69.1	67.8
11:00:00	58.6	40.7	61.3	66.5	34.2	72.3	71.1
11:15:00	53.2	41.4	57	66.4	35.5	72.4	63.1
11:30:00	53.4	40.8	57.3	70	33.1	64	62.2

11:45:00	53	40.1	57.1	64.8	35.6	64.2	61.8
12:00:00	54	44.4	57.6	65.2	33	63.7	61.2
12:15:00	53.8	41.9	57.5	67.4	34.4	64.6	62.4
12:30:00	52.7	36.4	57.1	68.6	30.8	64.8	61.7
12:45:00	53.4	42.7	57.3	66.3	34	65.2	61.3
13:00:00	54.5	44.3	58.4	66	36.8	69.6	62.6
13:15:00	55.5	43.8	59.3	67.4	36.1	73.9	65.4
13:30:00	54.3	41.7	58.2	67.1	35.5	69.9	63.6
13:45:00	54	39.8	58.2	64.6	34.7	68.3	63
14:00:00	55.1	43	58.2	69.9	37.5	66.8	64
14:15:00	53.9	41.5	58	64.2	34.3	66.9	61.6
14:30:00	53.6	39.5	57.3	65.4	35.1	65.1	63.3
14:45:00	53.6	40.1	57.6	66.5	34.3	65.2	63.8
15:00:00	53.8	40.4	57.9	67	34.4	64.6	63.1
15:15:00	53.1	39.1	56.9	66.7	33.1	64.4	62.9
15:30:00	52.6	38.5	56.6	67.5	31.3	63.2	61.6
15:45:00	53.2	42.5	56.4	64.8	39.4	63.6	62.3

APPENDIX B: TYPICAL IMPACT DRIVER ACOUSTIC DATA

TECHNICAL INFO:

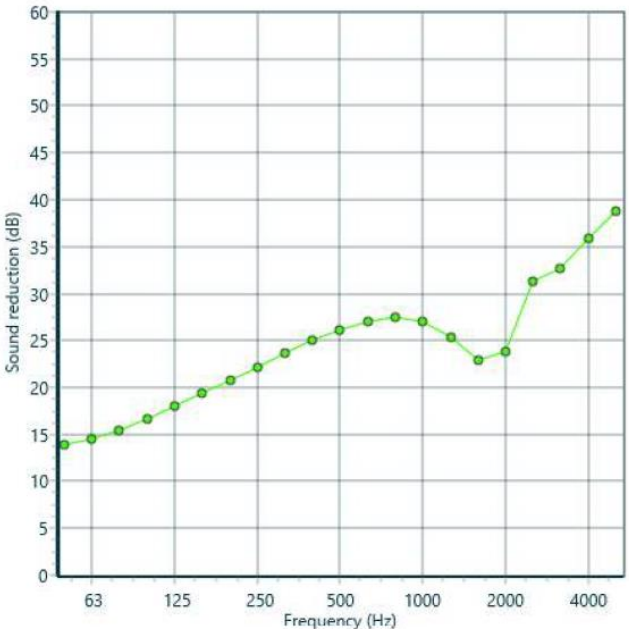
Voltage	40 v
Standard Bolt	M5-M16
High Tensile Bolt	M5 – M14
Coarse thread (length)	22 - 125 mm
Max Fastening Torque	220 Nm
Blows per Minute (Max) - ipm	0 - 4,400 ipm
Battery Type	Lithium-ion
Vibration K factor	1.5 m/sec^2
Noise sound pressure	96 dB(A)
Noise sound power	107 dB(A)
Noise K factor	3 dB(A)
Body only machine	✔
No Load Speed (max/hard/med/soft)	0- 3700 / 3200 / 2100 / 1100 rpm
Vibration: Impact tightening of fasteners @ max capacity	10.0 m/sec^2
Driving Shank	6.35mm (1/4") Hex
Blows per Minute (Hi) - ipm	0 - 3,600 ipm
Blows per Minute (Med) - ipm	0 - 2,600 ipm
Blows per Minute (Lo) - ipm	0 - 1,100 ipm
Machine Screw	M4 – M8

APPENDIX C: SUPPORT BUILDING WALL STRUCTURE

Composite TL calculator (v9.0.24)

Program copyright Marshall Day Acoustics 2017
Margin of error is generally within Rw ±3 dB
Noise Control Solutions Limited - Key No. 5597
Job Name:
Job No.: Initials:conta
Date:03/08/2022
File Name: Notes:

NOISE CONTROL SOLUTIONS LIMITED



Rw 27 dB
C -1 dB
Ctr -2 dB

		Octave band centre frequency (Hz)																							
Element	Area	63			125			250			500			1k			2k			4k			Rw	C;Ctr
Blockwork	76.2	11	12	12	14	15	16	18	19	21	22	23	24	24	24	22	20	21	28	30	33	36	24	-1;-2
Insulated Panel	76.2	41	42	43	44	44	43	41	43	45	48	50	53	55	58	60	62	63	65	67	68	70	55	-1;-5
Total	152.4	14	15	15	17	18	19	21	22	24	25	26	27	27	27	25	23	24	31	33	36	39	27	-1;-2

APPENDIX D: SUPPORT BUILDING ROOF STRUCTURE

Acoustic

Sound Reduction Index (SRI)

Hz*	63	125	250	500	1K	2K	4K	8K
SRI	20	18	20	24	20	29	39	47

* Frequency

KS1000RW Roof Panels have a single figure weighted sound reduction Rw = 25dB. Results are based on panels of similar profile and core material.

APPENDIX E: WALL SOUND POWER LEVEL CALCULATION

LwA Calculated	**107.0**	**dB(A)**

Time Correction

Reference Time Period (15 or 60 minutes)	60	m
On-time (per reference period)	15	m
Time Correction	-6.0	**dB**

	Value	
LwA (Time Corrected)	**101.0**	

Internal Façade SPL

	Value	
Distance to façade (m)	10	m
Directivity Factor (Q)	2	m
Q correction	3	dB
Room Constant (RC)	94.4	
Overall SPL at internal façade	**87.4**	**dB(A)**

External SPL @ 1m

	Value	
Interior façade SPL	87.4	dB(A)
R value of façade	27.0	dB
Diffuse to free-field correction	6.0	dB
Overall SPL at external façade (1m)	**54.4**	**dB(A)**

APPENDIX F: ROOF SOUND POWER LEVEL CALCULATION

LwA Calculated	**107.0**	**dB(A)**

Time Correction

Reference Time Period (15 or 60 minutes)	60	m
On-time (per reference period)	15	m
Time Correction	-6.0	**dB**

	Value	
LwA (Time Corrected)	**101.0**	

Internal Façade SPL

	Value	
Distance to façade (m)	10	m
Directivity Factor (Q)	2	m
Q correction	3	dB
Room Constant (RC)	94.4	
Overall SPL at internal façade	**87.4**	**dB(A)**

External SPL @ 1m

	Value	
Interior façade SPL	87.4	dB(A)
R value of façade	25.0	dB
Diffuse to free-field correction	6.0	dB
Overall SPL at external façade (1m)	**56.4**	**dB(A)**

TERMS AND CONDITIONS OF BUSINESS

1. GENERAL

Work done or services undertaken are subject to the terms and conditions detailed below and all other conditions, warranties and representations, expressed or implied are hereby excluded.

2. PRICES

Prices are based on current costs, exchange rates, duty and freight and are subject to change without notice. The quoted price does not cover the cost of attending meetings, telephone calls or email exchanges. This is charged separately at a pro rata hourly rate of £75 per hour.

3. TIMING ESTIMATES

Timing estimates are made in good faith and date from receipt of a written order and full information to enable us to proceed. While NCSL makes every effort to fulfil them, such estimates are subject to unforeseen events and if not maintained, cannot give rise to any claim.

4. CANCELLATION AND RETURNS

Cancellation of orders for services, training or consultancy is only acceptable by prior agreement of NCSL and a charge will normally be made. NCSL reserve the right to cancel any work at any time.

5. CLAIMS

Claims for errors etc should be notified within 10 days of date of receipt.

6. PAYMENT TERMS

Full payment is required before any work is undertaken by NCSL. Failure to comply with the terms of payment may result in delayed delivery of services and a review of the Customer's credit account (if applicable). Should the customer become subject to an administration order, or becomes bankrupt or goes into liquidation, NCSL has a right to cancel any contract and discontinue any work.

7. RETENTION OF TITLE

All reports & data remain the property of NCSL. Under no circumstances will a customer's purchase order override our Retention of Title clause. In the case of software and data, the ownership remains with NCSL. Payment of invoices in full will entitle the customer to use reports or other services under licence until (a) a set expiry date is passed (b) they cease trading. In both instances, the licence shall then revert to NCSL. All measurement data and reports are the sole property of NCSL and shall not be reproduced or distributed without written consent from NCSL.

8. TEST REPORTS

NCSL shall not be liable for any subsequent loss or damage incurred by the client as a result of information supplied in a test report.
Any specifications or targets supplied by NCSL are to be considered as guidance only. No guarantee is offered by NCSL that the meeting of any supplied targets or specifications will solve the relevant issue or prevent future issues.

9. RESPONSIBILITY

Every effort is made to ensure accuracy in description, drawings and other information in correspondence etc but no warranty is given in this respect and NCSL shall not be liable for any error therein. NCSL carries out all tests and/or advises only on the basis that the same are carried out, made or given without any responsibility whether for negligence or otherwise. NCSL and its servants or agents will not be liable for any damage or loss direct or indirect of whatsoever kind, whether or not the same results directly or indirectly from negligence on the part of NCSL or its servants or agents.

10. CONFIDENTIALITY

Unless specifically excluded in the terms of an individual contract between NCSL and its Customer, the following shall apply to all reports, advice, drawings, photographs, specifications or data:

i. The above shall not be disclosed to third parties or used in litigation without the consent of NCSL.
ii. Where NCSL has given consent to disclosure, the Customer shall draw the attention of the third party to these terms of business and the basis on which NCSL undertakes test, reporting and advising. The Customer shall indemnify NCSL for any failure to do so.
iii. The above items are submitted to the Customer as confidential documents. Confidentiality shall continue to apply after completion of the business but shall cease to apply to information or knowledge which may come into the public domain.

11. CONSTRUCTION AND ARBITRATION

The laws of England shall govern all contracts and the parties submit to exclusive jurisdiction of the courts of England, unless otherwise agreed.

12. JOB SPECIFIC TERMS

NCSL will not be held responsible for any adverse impact arising from the introduction of proposed palliative measures. Furthermore, no guarantee is given regarding the effectiveness of any proposed palliative and/or mitigation measures. The client is responsible for any palliative measures, including, but not limited to, the sourcing of suppliers, the quality of installation, the cost of all materials / installation, maintenance and safety. All advice given should be taken as guidance only. It is the responsibility of the client to ensure the safe operation of any mitigation measures, including but not limited to, adequate fire safety and ventilation requirements. NCSL provide no guarantee that adherence to provided specifications will result in no further noise and/or vibration complaints and/or the elimination of noise and/or vibration issues. NCSL do not supply, procure, install or maintain any materials. We reserve the right to publicise the work conducted by NCSL, including, where appropriate, client logos etc. On occasion, work may be conducted by sub-contract partners.