



Environmental Noise Survey, Noise Break-In Assessment & Sound Insulation Scheme

Client: MSJ Garage

Client Address: Lower Road, Halewood, Liverpool, L36 3UB

Site Address: Land off, Lower Road, L26 3UB

Date: 26/08/2022



Authorisation and Version Control

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Date	26/08/2022
Project Number	8166MG
Version Reference	002
Previous Project Numbers	6725PM

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Executive summary

An environmental noise survey and noise impact assessment have been undertaken to assess the suitability of the site at Lower Road, L26 3UB for residential development. The measured ambient sound levels have allowed a BS8233:2014 noise assessment to be carried out.

A sound insulation scheme has been provided in Section 5.0, including glazing and an alternative ventilation strategy. These recommendations should be sufficient to achieve the internal and external noise levels for the proposed development according to the BS8233:2014 internal noise criteria. An overview of all recommendations can be found in the table below:

Recommendations and Mitigation Overview

- All glazing along the facades requires the sound reduction required in Table 5.0.
- External amenities are evaluated in Table 6.0, section 4.0.
- Appropriate glazing specifications can be found in Table 7.0
- Appropriate acoustically treated alternative ventilation can be found in Table 8.0.

The findings of this report will require written approval from the Local Authority prior to work commencing.

1. Introduction

Overview

NOVA Acoustics Ltd has been commissioned to prepare a noise assessment for a residential development ('the Proposed Development') at Lower Road, L26 3UB ('the Site').

The applicant is preparing a planning application to be submitted ('the Application') to Knowsley Metropolitan Borough Council.

The following technical noise assessment has been prepared to support the planning application to Knowsley Metropolitan Borough Council. This report details the ambient sound climate at the proposed development site and provides a sound insulation scheme to protect the amenity of the occupants of the proposed residential dwelling.

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

Scope & Objectives

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

- Ambient sound monitoring survey to evaluate the prevailing ambient and maximum sound levels incident on the proposed development;
- A detailed assessment of the suitability of the Site, in accordance with relevant standards in respect of sound from the surrounding noise sources; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of the National Planning Policy Framework (2021), Noise Policy Statement for England (2010) and British Standard BS8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings. Further information on the legislation can be found in Appendix B.

2. Environmental Noise Survey

Measurement Methodology

In order to characterise the sound profile of the area at the proposed development, an environmental sound survey has been carried out from 6th to 7th of October 2021. The monitor was located on a drainpipe facing the road to the south at a height of 2.5m. The monitoring position was chosen in order to collect representative sound levels at the proposed development during the day and night. The monitoring location is shown in Figure 1.0.

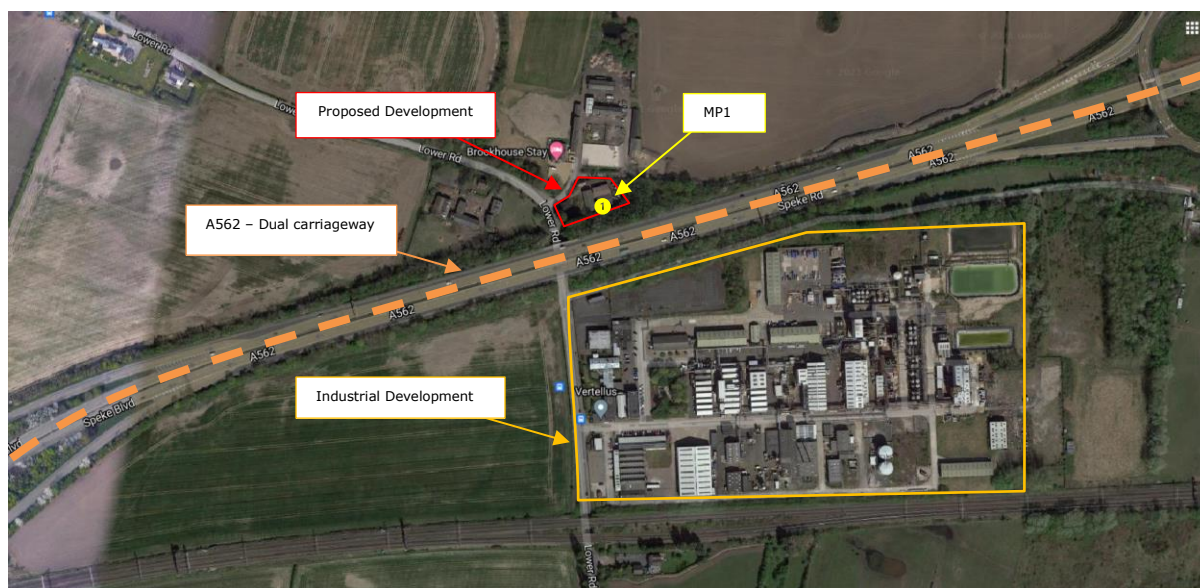


Figure 1.0 - Indicative Site Layout

Context & Subjective Impression

The area surrounding the site is primarily farmed land combined with a commercial/industrial area to the south of the site.

The road noise from the A562 is the main noise source in the surrounding area. To the south of the site over the A562 is "Vertellus" and the associated commercial/industrial complex. Vertellus is assumed to operate 24 hours a day however this cannot be confirmed. Assumed industrial activities include HGV going in/out, machinery and mechanical plant including fans, motors and extraction systems. The noise coming from this industrial complex was not perceptible in the immediate area surrounding the site and was considered inaudible at the proposed development.

Lower Road has low to moderate levels of traffic flow being barely audible on site due to the influence of the A562. To the North of the proposed development can be found a Holiday home called "Brookhouse Stay".



Figure 2.0 – Microphone location located on a drain pipe from the existing development.

Background

The existing buildings on site consist of a laboratories associated with the former users. It is proposed to be demolished to erect a residential dwelling.

The layout of the proposed residential development is outlined in the figure below:



Figure 3.0 – Proposed Development

Environmental Noise Survey Results

The following table outlines the averaged $L_{eq,1hour}$ sound levels measured during the day and night periods that will be used in the noise break in assessment and external noise level assessment. A full summary of all results can be found in Appendix D.

Measurement Position MP1				
Measurement Period ('t')	$L_{Aeq,t}$	$L_{Amax,t}$	$L_{A90,t}$	$L_{A10,t}$
Night 1	61.0	75.0	54.0	64.0
Day 2	67.0	77.0	65.0	68.0

Table 1.0 – Sound Level Summary Results

In the following section, the maximum noise level events are assessed. ProPG states:

"...in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night."

The following table shows a summary of the maximum sound level results.

Measurement Position MP1			
Measurement Period ('t')	$L_{AFMax,15min}$	*SMR $L_{AFMax,15min}$	10 th Highest $L_{AFMax,15min}$
Night 1	76.0	70.0	70.0

Table 2.0 – Maximum Sound Level Summary Results

*Statistically Most Repeated

3. SoundPLAN 8.2

Based on the measured noise levels a sound map has been generated using SoundPLAN 8.2, which undertakes its calculation in accordance with the guidance given in ISO9613 – 1:1993 and ISO9613 – 2:1996. The following assumptions have been made within the calculation software:

- To accurately model the land surrounding the development the topographical data has been taken from Google Maps, it is assumed this has an accuracy within the last 3 years.
- The ground between the source and receiver is modelled as mostly acoustically 'soft'.
- A 2.7m to 3m and 1.5m acoustic closed board timber fence has been installed in the location indicated on the plans in Figure 3.0.
- The sound map is shown at a height of 1.5m.
- A façade correction has been applied to the noise level from the sound plan receivers to establish a free field noise level as stipulated in BS8233.

The sound maps showing the average noise emissions at each façade of the proposed development are shown below.



Figure 4.0 – L_{Aeq} Day Noise Map



Figure 5.0 – L_{Aeq} Night Noise Map

The sound maps showing the maximum noise emissions at each façade of the proposed development are shown below.

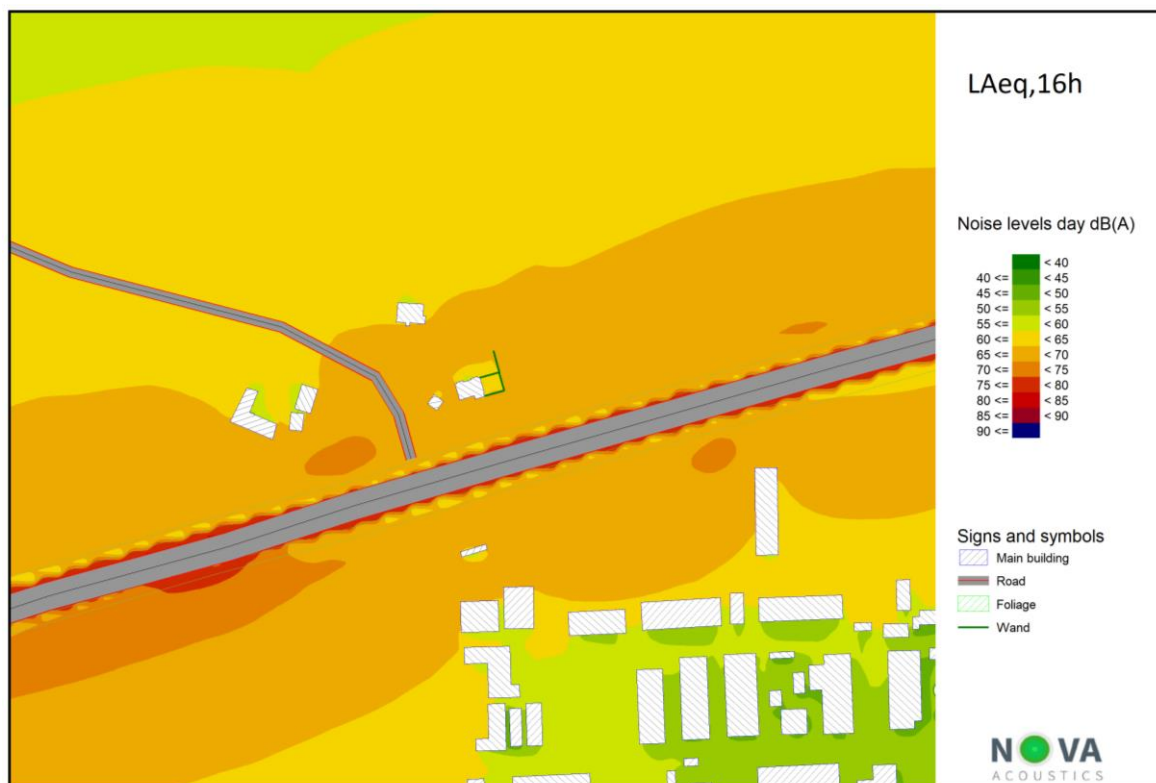


Figure 6.0 – $L_{A_{fmax}}$ Night Noise Map

The table below indicates the noise levels incident on each façade as well as the noise levels within the external amenity areas.

Location	L_{Aeq} Day Sound Level (dBA)	L_{Aeq} Night Sound Level (dBA)	L_{AMax} Night Sound Level (dBA)
South	67.0	61.0	70.0
East	62.0	56.0	65.0
North	56.0	50.0	59.0
West	65.0	58.0	68.0
Garden	59.0		

Table 3.0 – Sound Level Summary at the Proposed Development

4. Noise Break In & Noise Break-In & External Noise Level Assessment

BS4142 and BS8233

Given the proximity of the industrial complex to the south of the site and the assumption that this site may operate 24 hours a day, further consideration to the possible industrial noise needs to be given. BS8233 stipulates that when assessing the effect of non-anonymous noise sources such as industrial noise on proposed residential dwellings the assessment should be undertaken using a rating noise level as stipulated in BS4142. The industrial noise from the complex to the south was not audible at the site during the site visits however it may become audible during the nighttime when the road noise reduces. Given this, the table below shows the rating noise level during the nighttime. This has been derived by adding BS4142 Rating Penalties to the loudest 1-hour period during the night time taken from the sound plan models above.

Description	Night time Sound Level Front Façade (dBA)	Night time Sound level Rear Façade (dBA)
Loudest $L_{Aeq,1hour}$ at the facade	61.0	50.0
BS4142 Rating Penalty for Tonality	+2.0	+2.0
BS4142 Rating Penalty for Intermittency	+3.0	+3.0
BS4142 Rating Noise Level at Facade	66.0	55.0

Table 4.0 – BS4142 Rating Noise Levels - Night

The rating noise levels above will be used in the subsequent noise breakin assessment to ensure any future residents are fully protected from any noise produced by the nearby industrial units.

Façade Layout

The required sound reduction has been separated into facades. The following figure shows the façade allocation.

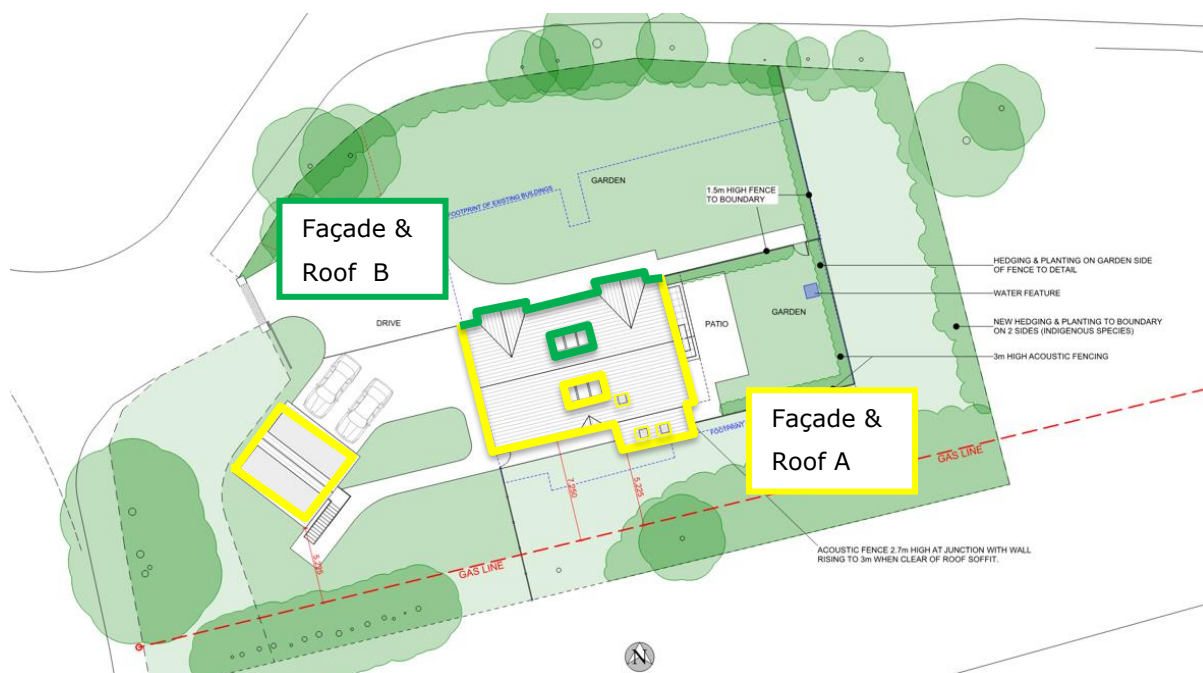


Figure 7.0 - Facade Layout

Noise Break-In Assessment

The following section analyses the ambient sound levels incident on the development compared with the internal noise level criteria presented within BS8233:2014.

To ensure a robust analysis the following considerations have been taken:

- The $L_{AFmax,15min}$ during the night exceeded fewer than ten times predicted using the SoundPlan Model.
- The highest $L_{Aeq1hour}$ sound levels for each façade in the day time predicted using the SoundPlan model.
- The BS4142 Rating Noise Levels during the night

The following table outlines the minimum sound reduction required of the building envelope in order to achieve appropriate internal noise levels.

Façade Colour	Location	Time Period	Façade Noise Level (dB)	BS8233:2014 Criteria	Min. SRI Required (dB)
Façade & Roof A	Bedroom / Living Room	Day time	67.0	35.0 dB $L_{Aeq,16hour}$	32.0 $R_w + C_{tr}$
	Games Room	Day Time	67.0	40.0 $L_{Aeq,16hour}$	27.0 $R_w + C_{tr}$
	Bedroom	Night time	66.0*	30.0 dB $L_{Aeq,8hour}$	36.0 $R_w + C_{tr}$
	Bedroom	Night time	70.0	45.0 dB $L_{Amax,8hour}$	25.0 R_w
Façade & Roof B	Bedroom / Living Room	Day time	56.0	35.0 dB $L_{Aeq,16hour}$	21.0 $R_w + C_{tr}$

	Bedroom	Night time	55.0*	30.0 dB $L_{Aeq,8hour}$	25.0 $R_w + C_{tr}$
	Bedroom	Night time	59.0	45.0 dB $L_{Amax,8hour}$	14.0 R_w

Table 5.0 – Internal Noise Level Analysis

*BS4142 Rating Noise Level

External Noise Level Assessment

The following table analyses the predicted external noise levels within the external amenity areas of the Proposed Development considering the loudest 1-hour period in the day and that standard 2.7m to 3m acoustic closed board fencing is installed around the rear garden area as per Figure 2.0.

Measurement position	Time Period	Garden Noise Level	BS8233 Criteria	Min. Attenuation Required (dB)
Garden Receiver Patio Garden	Day time	59.0	50 - 55 dB $L_{Aeq,16hour}$	+4.0

Table 6.0 – External Noise Level Analysis

Discussion

As can be seen above the noise levels considering the loudest 1-hour period are above the criteria stated. A review of possible mitigation measures including further fencing around the perimeter of the garden areas indicates the minimal impact on the noise levels in the patio garden area.

Further to the above BS8233 outlines the following in relation to garden noise levels:

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

Given the above, it is assumed that provided the best practicable means of reducing the noise levels within gardens is implemented such as the proposed fencing indicated on the plans the site will be suitable for development.

It is also noted that there is a balcony situated on the eastern side of the dwelling. The noise levels in this area exceed the criteria. However, mitigation measures are limited, BS8233 States the following in relation to noise levels in balconies:

'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.'

Given the above, it is assumed that provided the best practicable means of reducing the noise levels within the balcony are implemented such as the proposed balustrade indicated on the plans the site will be suitable for development.

5. Sound Insulation Scheme

The following section outlines the required sound insulation scheme that should be installed at the proposed development to protect the amenity of the future residents. The sound insulation scheme should be installed prior to occupation and be retained thereafter.

Building Envelope

The noise levels within the proposed dwellings will be dictated by the configuration, materials, and elements of the façade. The non-glazed elements of the facade will contribute significantly to the reduction of ambient noise levels. The façade construction for lightweight or heavyweight constructions will provide ample levels of sound insulation, for the purposes of this report it is assumed the façade provides a minimum sound reduction of 50dB R_w . The following section provides a sound insulation scheme based on the weakest elements of the façade, including the glazing, ventilation and roof construction.

a) Roof Specification

If the development has rooms within the roof space the roof system will require additional sound insulation to achieve appropriate internal noise levels. Where the roof, is being utilized as a voided loft space with thermal insulation the following detailing is not required. Where rooms are within the roof, the ceilings should consist of standard roofing slates, 100mm 45kg/m³ insulation fitted tightly between the 200mm roof joists and 1no. 15mm SoundBloc plasterboard fixed to British Gypsum RB1 resilient bars to achieve a minimum sound reduction of 50dB R_w . Any other configuration of roof that would achieve at least 50dB R_w will be suitable for the development.

b) Glazing Specification

Windows can be considered the weakest point of a façade in terms of noise reduction from external noise. The glazed elements installed in all the living rooms and bedrooms require the minimum sound reduction as shown in table 5.0, figure 7.0, section 4.0, which indicates the facades where acoustic glazing is required.

Windows can be considered the weakest point of a façade in terms of noise reduction from external noise. The glazed elements installed in all the living rooms and bedrooms require the minimum sound reduction as shown in Section 4.0. The glazing units shown in the following table provide a suitable sound reduction, however, any other window capable of providing this attenuation will be suitable. The performance is specified for the whole window unit, including frame and other design features. The glazing specifications have been taken from the Pilkington Optiphon Range.

Façade Colour	Location	Glazing Configuration	Attenuation (dB)
Façade and Roof A	Bedrooms	Double Glazing 10mm Glass – 16mm Argon Cavity – 8.8mm Optiphon Glass	38.0 R_w + C_{tr} 44.0 R_w

Façade & Roof A	Living rooms, Dining/kitchen and Study	<i>Double Glazing</i> 6mm Glass – 16mm Argon Cavity – 6.8mm Optiphon Glass	34.0 $R_w + C_{tr}$ 40.0 R_w
Façade & Roof A	Games Room	<i>Double Glazing</i> 6mm Glass – 16mm Air Cavity – 4mm Glass	28.0 $R_w + C_{tr}$ 32.0 R_w
Façade and Roof B	Living Room, Dining/Kitchen, Study & Bedrooms	<i>Double Glazing</i> 4mm Glass – 16mm Air Cavity – 4mm Glass	25.0 $R_w + C_{tr}$ 29.0 R_w

Table 7.0 – Glazing Specification

The glazing suppliers are required to demonstrate the acoustic performance of their proposed system either by providing an acoustic test report in accordance with BS EN ISO 10140-2:2010 or an evidence-based calculation.

c) Ventilation Specification

BS8233 States:

"If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level."

and

"The Building Regulations' supporting documents on ventilation [48, 49, 50] recommend that habitable rooms in dwellings have background ventilation. Where openable windows cannot be relied upon for this ventilation, trickle ventilators can be used and sound attenuating types are available. However, windows may remain openable for rapid or purge ventilation, or at the occupant's choice. Alternatively, acoustic ventilation units are available for insertion in external walls. These can provide sound reduction comparable with double glazed windows. However, ducted systems with intakes on the quiet side of the building might be required in very noisy situations, or where appearance rules out through-the-wall fans."

An alternative ventilation system should be installed within habitable rooms to fully protect the amenity of future residents. As stated in BS8233:2014 section 5.4.4, having complete enclosure of the noise source or receiver is the most effective barrier of sound. An alternative ventilation strategy allows for maximum sound insulation from the noise source whilst still maintaining a sufficient level of ventilation. It is recommended that the alternative ventilation should provide the same resistance to sound as the glazed elements. The following table provides ventilation system options that meet the above recommendations.

Background Ventilation		
Location	Model	Attenuation (dB)
Façade A	Titon Trickle Vent SF Xtra V50 + standard canopy	Open 36.0 dB / 50.0 dB $D_{n,e,w} + C_{tr}$ Closed
Façade B	Titon Trickle Vent SF Xtra Standard vent + standard SF canopy	Open 32.0 dB / Closed 48.0 dB $D_{n,e,w} + C_{tr}$

Table 8.0 – Ventilation Specification

d) External Amenities

To ensure the external noise levels are as low as practicable the following should be implemented:

- The 2.7m to 3m and 1.5m acoustic closed board timber fencing should be installed as located per the plans in Appendix C. The fence should have no gaps or holes and a minimum surface mass of 10kg/m²
- A 1.2m Balustrade with no gaps or holes and a minimum density of 10kg/m² should be installed around the balcony perimeter.

Appendix A – Acoustic Terminology

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 s_1 and s_2 is given by $20 \log_{10} (s_1 / s_2)$. 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.

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, BS4142:2014 specifies background noise measurement periods of 1 hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1\text{hour}}$ dB and $L_{A90,15\text{mins}}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125ms.

Appendix B – Legislation, Policy and Guidance

This report is to be primarily based on the following legislation, policy and guidance.

B.1 - National Planning Policy Framework (2021)

Government policy on noise is set out in the National Planning Policy Framework (NPPF), published in 2021. This replaced all earlier guidance on noise and places an emphasis on sustainability. In section 15, Conserving and enhancing the natural and local environment, paragraph 174e, it states:

Preventing 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. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;

Paragraph 185 states:

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 impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
- b) Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
- c) Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.*

B.2 - Noise Policy Statement for England (2010)

Paragraph 185 of the NPPF also refers to advice on adverse effects of noise given in the Noise Policy Statement for England (NPSE). This document sets out a policy vision to:

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

To achieve this vision the Statement identifies the following three aims:

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

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

In achieving these aims the document introduces significance criteria as follows:

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur. It is stated that “significant adverse effects on health and quality of life should be avoided while also considering the guiding principles of sustainable development”.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected. It is stated that the second aim above lies somewhere between LOAEL and SOAEL and requires that: “all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also considering the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.”

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. This can be related to the third aim above, which seeks: “where possible, positively to improve health and quality of life through the pro-active management of noise while also considering the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.”

The NPSE recognises that it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations and provides no guidance as to how these criteria should be interpreted. It is clear, however, that there is no requirement to achieve noise levels where there are no observable adverse impacts but that reasonable and practicable steps to reduce adverse noise impacts should be taken in the context of sustainable development and ensure a balance between noise sensitive and the need for noise generating developments.

Any scheme of noise mitigation outlined in this report will, therefore, aim to abide by the above principles of the NPPF and NPSE whilst recognizing the constraints of the site.

B.3 - BS8233:2014` Guidance on sound insulation and noise reduction for buildings`

The British Standard BS 8233: 2014, Guidance on Sound insulation and noise reduction for buildings provides additional guidance on noise levels from sources without specific character in the built environment, based on the recommendations of the World Health Organization; specifically, WHO Guidelines on Community Noise, 1999. The criteria desirable levels of steady state, “anonymous” noise in unoccupied spaces within dwellings, from sources such as road traffic, mechanical services and other continuously running plant, are tabulated below:

Activity	Location	07:00 – 23:00	23:00 – 07:00
Resting	Living Room	35 dB L _{Aeq,16hour}	--

Dining	Dining Room/Area	40 dB $L_{Aeq,16hour}$	--
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Table 9.0 - BS8233 Internal Noise Level Criteria

It is noted, however that where development is considered necessary or desirable, despite external noise level above WHO guidelines, the above target levels may be relaxed by up to 5 dB.

The standard also recommends that for traditional external amenity areas, such as gardens, it is desirable that external noise levels do not exceed 50 dB $L_{Aeq,T}$, and that 55 dB $L_{Aeq,T}$ would be acceptable in noisier environments. However, it is recognised that these values may not be achievable in all areas where development is desirable and in such locations, development should be designed to achieve the lowest practicable levels.

General recommendations for mitigation to enable these targets to be achieved are provided, including the use of bunds and barriers to reduce external noise and space planning and sound insulation for the control of internal noise levels.

For this assessment, the above criteria are considered to be the LOAEL as defined in the NPSE above.

Site plan of a residential property showing proposed acoustic fencing and landscaping. The plan includes a house, driveway, garden, and surrounding roads. Key features include a 1.8m high fence to the boundary, new hedging and planting on two sides, and 3m high acoustic fencing. A north arrow and scale bar are provided.

Labels on the plan include:

- DRIVE
- GARDEN
- 1.8m HIGH FENCE TO BOUNDARY
- NEW HEDGING & PLANTING TO BOUNDARY ON 2 SIDES (INDIGENOUS SPECIES)
- 3m HIGH ACOUSTIC FENCING
- ACOUSTIC FENCE 2.1m HIGH AT JUNCTION WITH WALL, RISING TO 3m WHEN CLEAR OF ROOF SOFFIT.
- PERIMETER OF EXISTING BUILDING
- WATER FEATURE
- HEDGING & PLANTING ON GARDEN SIDE OF FENCE TO DETAIL
- BASELINE
- CRS LINE
- SPR ROAD

Appendix D – Environmental Survey

D.1 Tabulated Summary Noise Data

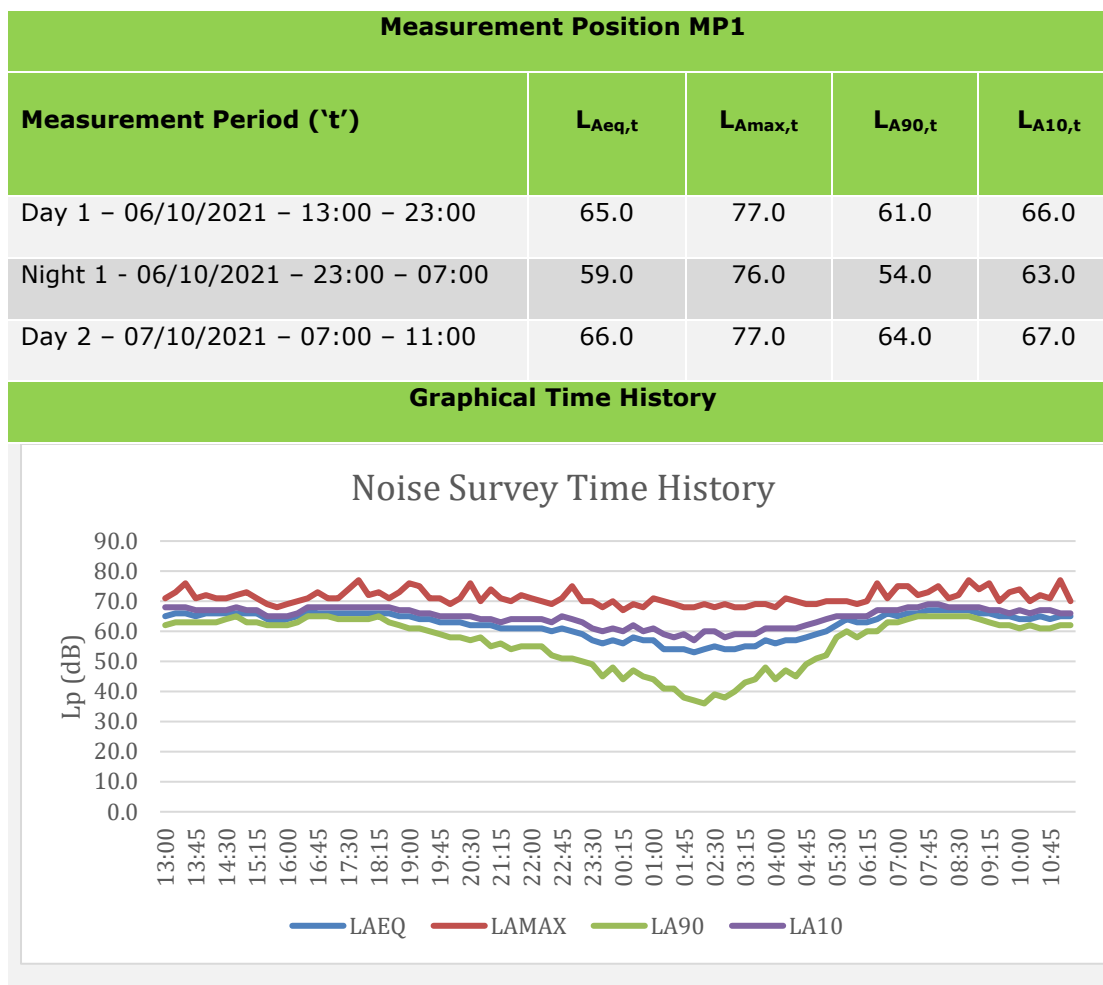


Table 10.0 – Summary Sound Levels Results

D.2 Surveying Equipment

Piece of Equipment	Serial No	Calibration Deviation
Svantek 977 Class 1 Sound level meter	34826	≤0.5
Svantek SV31 Class 1 Calibrator	32569	

Table 11.0 – Measurement Equipment

All equipment used during the survey was field calibrated at the start and end of the measurement period with a negligible deviation of ≤ 0.5 dB. All sound level meters are calibrated every 24 months and all calibrators are calibrated every 12 months, by a third-party calibration laboratory. All microphones were fitted with a protective windshield for the entire measurements period. Calibration certificates can be provided upon request.

D.3 Meteorological Conditions

As the environmental noise survey was carried out over a long un-manned period no localized records of weather conditions were taken. However, during the set up and collection of the

monitoring equipment the weather conditions have been documented in the following table. All measurements have been compared with met office weather data of the area, specifically the closest weather station, the data from the weather station is outlined in the table below. When reviewing the time history of the noise measurements, any scenarios that were considered potentially to be affected by the local weather conditions have been omitted. The analysis of the noise data includes statistical and percentile analysis and review of minimum and maximum values, which aids in the preclusion of any periods of undesirable weather conditions. The weather conditions were deemed suitable for the measurement of environmental noise in accordance with BS7445 Description and Measurement of Environmental Noise. The table below presents the average temperature, wind speed and rainfall range for each 24-hour period during the entire measurement.

Weather conditions – Widnes Weather, 10km				
Time period	Air temp (°C)	Rainfall mm/h	Prevailing Wind Direction	Wind Speed (m/s)
Day 1 – 06/10/2021 – 13:00 – 23:59	16.0 – 13.0	0.0	SW	2.1 – 0.0
Day 2 – 07/10/2021 – 00:00 – 11:00	18.0 – 14.0	0.0	SE	1.5 – 0.0

Table 12.0 – Weather Summary