

Noise Impact Assessment for the Proposed Light Industrial Development

Client: Global Technologies Racing Limited

Client Address: Denmans Lane, Fontwell, West Sussex, BN18 0SU

Site Address: Land East of Fontwell Avenue, Fontwell, West Sussex, BN18 0SB

Date: 06/09/2021



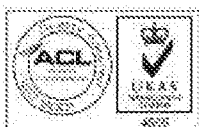
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Executive summary

An environmental noise survey and noise impact assessment have been undertaken at Land East of Fontwell Avenue, Fontwell, West Sussex, BN18 0SB to assess the potential increase in noise levels from the proposed Light Industrial Development on the surrounding Noise Sensitive Receptors. The measured ambient sound levels have allowed a BS4142:2014 and IEMA Increase in Ambient Noise level Assessment to be carried out.

The BS4142 assessment shows that the rating noise level does not exceed the lowest statistically most repeated measured background sound level during the proposed operational times. This indicates 'Low Impact' when assessed in accordance with BS4142 and 'No Observed Effect Level' when assessed in accordance with the NPSE and NPPF.

An overview of the recommendations can be found below:

Recommendations and Mitigation Overview

- The internal activities associated with the Proposed Development can operate at any time.
- The HGV deliveries and the usage of forklifts to carry out the deliveries must occur only between 07:00 – 19:00 from Monday to Friday and from 08:00 to 13:00 on Saturday.
- All the doors and windows must remain closed while the noisy activities are being carried out.
- Optional fencing could be installed along the southern and eastern perimeters of the site to further reduce the noise levels at the noise sensitive receptors. Assuming the fencing is 2.5m in height and closed boarded with a minimum density of 10kg/m³ we would expect a 2-5 dB drop in noise levels at the most exposed NSR.

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

1. Introduction

1.1 Overview

NOVA Acoustics Ltd has been commissioned to prepare a noise assessment for the proposed Light Industrial Development ('the Proposed Development') at Land East of Fontwell Avenue, Fontwell, West Sussex, BN18 0SB ('the Site').

The applicant has received conditional planning approval, WA/22/15/OUT - Outline application with some matters reserved to provide up to 400 No. new dwellings, up to 500 sqm of non-residential floorspace (A1, A2, A3, D1 and/or D2), 5000 sqm of light industrial floorspace (B1 (b)/(c)) & associated works including access, internal road network, highway works, landscaping, selected tree removal, informal & formal open space & play areas, pedestrian & cyclist infrastructure utilities, drainage infrastructure, car & cycle parking & waste storage. This application is a departure from the Development Plan & also lies within the parish of Eastergate from Arun District Council. The following planning condition requires discharging;

"Condition 21

Prior to the commencement of development of the commercial area of the development, a scheme shall be submitted to and approved in writing by the local planning authority which specifies the provisions to be made for the control of noise emanating from the commercial area of the development. Prior to the commercial area of the development coming into operation, all agreed physical measures for the control of noise will be implemented. The use of the commercial area will be operated in accordance with any agreed continuing requirements for the control of noise from the site."

The following technical noise assessment has been prepared to support the planning application and to assess the light industrial units to allow Arun District Council to discharge Condition 21.

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 dwellings.

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 & Objectives

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

- Baseline sound monitoring survey to evaluate the prevailing background sound levels at the nearest sensitive receptor ('NSR') to Site;
- Detailed sound modelling, acoustic calculation and analysis in accordance with; ISO9613 – 1 ISO 9613-2 - Attenuation of sound during propagation outdoors prediction methodology, to predict sound levels at the NSR;
- A detailed assessment of the suitability of the Site, in accordance with relevant standards in respect of sound from the proposed 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 BS 4142:2014+A1:2019 - Methods for rating and assessing industrial and commercial sound. Further information on the legislation can be found in Appendix B.

2.2 Environmental Noise Survey Results

The client has advised that the proposed new industrial buildings will have associated vehicle movements that will occur from 07:00 to 19:00 from Monday to Friday and from 08:00 to 13:00 on Saturday. Sunday and Bank Holiday will have no vehicle movements. In addition, the client has advised that the activities carried out internally very rarely occur during weekends and even more rare to occur during a Sunday night. Therefore, it has been agreed that the operation during a Sunday night can be negligible. The table below outlines the ambient and background sound levels during the operational period of the Proposed Development that will be used as the baseline for the noise assessment. Further summary results for the entire measurement period can be found in Appendix D.

Measurement Position MP1					
Measurement Period ('t')	L _{Aeq,t}	L _{A90,15min}	*SMR L _{A90,15min}	Min. L _{A90,15min}	Max. L _{A90,15min}
Day 4 – 02/08/2021 – 07:00 – 11:30	62.0	58.0	57.0	57.0	59.0
Night 1 – 30/07/21 – 23:00 – 07:00	55.0	48.0	41.0	30.0	55.0

Table 1.0 – Sound Level Summary Results

*Statistically Most Repeated

Day time - As can be seen in Table 1.0 above the lowest statistically most repeated L_{A90,15min} value during the day is 57.0 dB. The range of measured background sound levels is relatively low and the SMR value sits at the bottom of that range, as such, the statistically most repeated L_{A90,15min} value is deemed 'Typical' as well as providing a robust analysis which will be used for the analysis providing a robust assessment.

Night time - As can be seen in Table 1.0 above the lowest statistically most repeated L_{A90,15min} value during the night is 41.0 dB. The range of measured background sound levels is relatively high, but the SMR value sits below the average L_{A90,15min}, therefore, the statistically most repeated L_{A90,15min} value is deemed 'Typical' as well as providing a robust analysis which will be used for the analysis providing a robust assessment.

3. BS4142:2014 Noise Assessment

The following section of the report assesses the expected noise emissions of the proposed Light Industrial Development.

3.1 On-Site Activities

3.1.1 Specific Sound Level

Internal Sources

NOVA Acoustics Ltd has been advised by the client the following regarding the internal noise sources:

"Products being produced by GTR on the site do not require the use of heavy plant or equipment with the majority of the work being carried by hand with the use of small hand held tools. However, products are finished in 'auto-claves', which require a vacuum supply. Some of the raw materials are stored in walk-in freezers, therefore a compressed air supply is also required.

All plant and machinery required for the manufacturing process wherever possible to reduce and control of noise emanating from the development will have a rating not greater than 65 dB(A) externally".

However, to provide a robust and conservative analysis an internal sound level of 85.0 dB(A), which falls in line with the upper limit stated in the Control of Noise at Work Regulations 2005, will be assumed. This is thought to be representative of a light industrial unit and will provide a robust assessment when considering the client's comments.

Internal Measurement Positions	
Description	Sound Pressure dB(A)
Internal Light Industrial	85.0

Table 2.0 – Specific Noise Levels

Vehicle Movements

NOVA Acoustics Ltd has been advised that a total of 208 movements are expected throughout the operational period of the site (07:00-19:00). It is understood that around 190 are expected to be car movements from staff and around 18 movements will be deliveries, assumed all to be HGV deliveries as a worst-case scenario. Looking at the data provided by the client (see Appendix E), we can assume that during peak time there will be about 43 cars and 3 HGVs moving per hour. The client has advised that the deliveries will occur only during the proposed operation hours and that the cars movements will be negligible during night time.

The table below shows the noise levels for car/HGV movements, taken from BS5228:2009. Corrections have subsequently been applied to account for movement time per hour, considering a site speed limit of 10mph (16kph) and the distance travelled in total. The distance from the site entrance to the furthest parking bay has been used in the assessment, thus representing a worst-

case scenario as the majority of the vehicles will need to drive through a smaller distance. Each movement time has been rounded up to the nearest minute.

Description	L _w (dB)	Maximum No. of Movements Per Hour	Maximum Distance (m)	Speed (km/h)	Approximate Movement Time (minutes)	Time Corrected L _w (dB)
Cars	81.0	43.0	225.0	16.0	36.0	79.0
HGVs	98.0	3.0	225.0	16.0	3.0	85.0

Table 3.0 – Vehicle Time Corrected Movement Noise Levels

Forklift Movements

The forklift will operate at the 'Unloading Areas' shown in Appendix C and they will be used to load and unload the deliveries. Therefore, the forklift will only operate during the operational hours established for the deliveries. No information of the make and model of the forklift has been yet specified so noise data from a gas forklift has been taken from Sound Plan 8.2 library.

3.1.2 Building Structure

The client has advised that the proposed building will be comprised of

1. 100mm Vertical Kingspan Box for the upper section of the walls
2. 100 brickwork for the bottom section of the walls
3. 115mm Vertical Kingspan Box for the roof
4. Double Glazing
5. 0.6mm Steel Rolled Shutter Door
6. 0.6mm Steel Door

The existing build-up has been modelled in INSUL 9.0 Sound Insulation Prediction Software. The table below shows the calculation of the noise levels breaking out of the proposed development.

ID	Internal L _{Acq,t}	SRI Façade element	External Noise Level L1-R-6
2	85.0	41.0	38.0
1 & 3	85.0	25.0	54.0
4	85.0	29.0	50.0
5 & 6	85.0	20.0	59.0

Table 4.0 – Noise Breakout Calculations

3.2 BS4142 Assessment – Day Time

3.2.1 Noise Modelling

The specific sound level at the NSR has been calculated using SoundPlan Essential 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 mixed, 'soft' and 'hard', for the purpose of the assessment the ground has been considered as 'hard'.
- The noise levels presented above have been used to calibrate the sound model.
- The sound power of each façade has been calculated within the Sound Plan software which assumes the formula External Level + 10log(s).
- The sound map below has been run at a grid height of 1.5m. However, the noise levels of the most exposed floors of the NSRs will be used in the subsequent assessment.
- All the doors of the Proposed Development have been assumed closed.
- HGV and forklift movements have been modelled at a height of 1m.

The sound map showing the specific sound level emissions from the Proposed Development can be seen below in Figure 2.0.

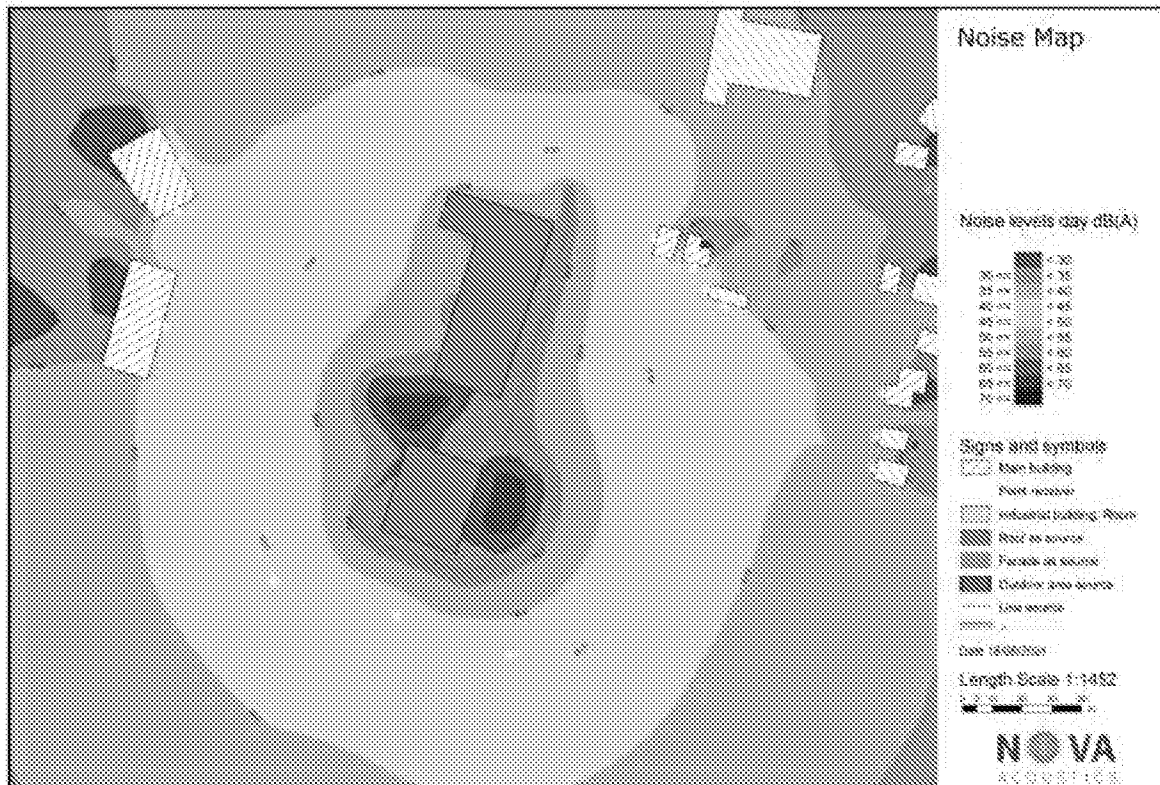


Figure 2.0 – Proposed Building Specific Sound Level Map

The table below shows the noise levels presented taken from the most exposed window of the NSRs which is located on the 1st floor.

NSR	Specific Sound Level (dBA)
1	44.0
2	38.0
3	41.0
4	46.0

Table 5.0 - Specific Sound Level at NSR Summary

3.2.2 Rating Level

Rating Penalty Assessment

Considering the requirements of the rating penalty, an assessment of the various sound sources associated with the Proposed Development, in terms of whether any rating penalties are applicable, and has been detailed in the following table.

Tonality	Impulsivity	Intermittency	Other Sound Characteristics	Discussion
+2	+3	+3	--	Possible tonal and intermittent components due to vehicle movements. Possible impulsivity due to forklift loading operations.

Table 6.0 – Rating Penalty Assessment

Rating Level

Incorporating the rating penalties with the specific sound levels, the rating sound levels have been derived and have been detailed in the following table.

NSR	Rating Sound Level (dB)
4	54.0

Table 7.0 – Summary of Rating Sound Levels

3.2.3 Assessment

The rating sound level has been assessed in accordance with BS4142:2014 at the closest NSR. The BS4142:2014 assessment at the NSR, during day time operational periods can be seen in the table below.

Results	Sound Level (dB)	Notes
Rating Sound Level	54.0	As shown in Table 7.0
Operational Period Background Sound Level	57.0	As shown in Table 1.0
Excess of Rating over Background Sound Level	-3.0	Assessment Indicates a 'Low Impact' Dependent on Context

Table 8.0 – BS4142:2014 Assessment

Discussion

As can be seen in the assessment above the rating noise level is below the lowest statistically most repeated measured background sound level by 3 dB during the proposed operational times. This indicates 'Low Impact Dependent on Context' when assessed in accordance with BS4142 and 'No Observed Effect Level' when assessed in accordance with the NPSE and NPPF.

3.2.4 Increase in Ambient Noise Level Assessment – Day Time

The following section of the report assesses the expected increase in noise levels of the area due to the noise emanating from the Proposed Development. The specific noise levels at the NSR are logarithmically added to the lowest measured ambient noise level presented in Table 1.0. The higher the increase in noise levels the higher the expected impact.

Description	NSR Levels (dB)
Specific Noise Level at NSR	46.0
Lowest Ambient Noise Level	62.0
Resulting Noise Level	62.1
Increase in Noise Levels	0.1
IEMA Impact Rating	'Not Significant'

Table 9.0 – Increase in Ambient Noise Level Assessment

Discussion:

The assessment above indicates that the expected increase in noise levels from the proposed development is considered as 'Not Significant' when assessed in accordance with the IEMA Guidelines on Noise Impact'. This equates to 'No Observed Effect Level' when assessed in conjunction with the NPPF and NPSE.

3.3 BS4142 Assessment – Night Time

3.3.1 Noise Sources

NOVA Acoustics Ltd has been advised that there are not time restrictions for the activities therefore, it is assumed as a worst-case that the internal activities could produce a noise level of 85.0 dB also during the night time.

The client has stated that no external activities associated with the deliveries will occur during the night, as these activities are restricted to occur only between 07:00 -19:00. Therefore, no forklift will be used during the night neither. Also, it is considered that the car movements during the night time is negligible.

3.3.2 Noise Modelling

The specific sound level at the NSR has been calculated using SoundPlan Essential 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 mixed, 'soft' and 'hard', for the purpose of the assessment the ground has been considered as 'hard'.
- The noise levels presented above have been used to calibrate the sound model.
- The sound power of each façade has been calculated within the Sound Plan software which assumes the formula External Level + 10log(s).
- The sound map below has been run at a grid height of 1.5m. However, the noise levels of the most exposed floors of the NSRs will be used in the subsequent assessment.
- All the doors of the Proposed Development have been assumed closed.

The sound map showing the specific sound level emissions from the Proposed Development can be seen below in Figure 2.0.

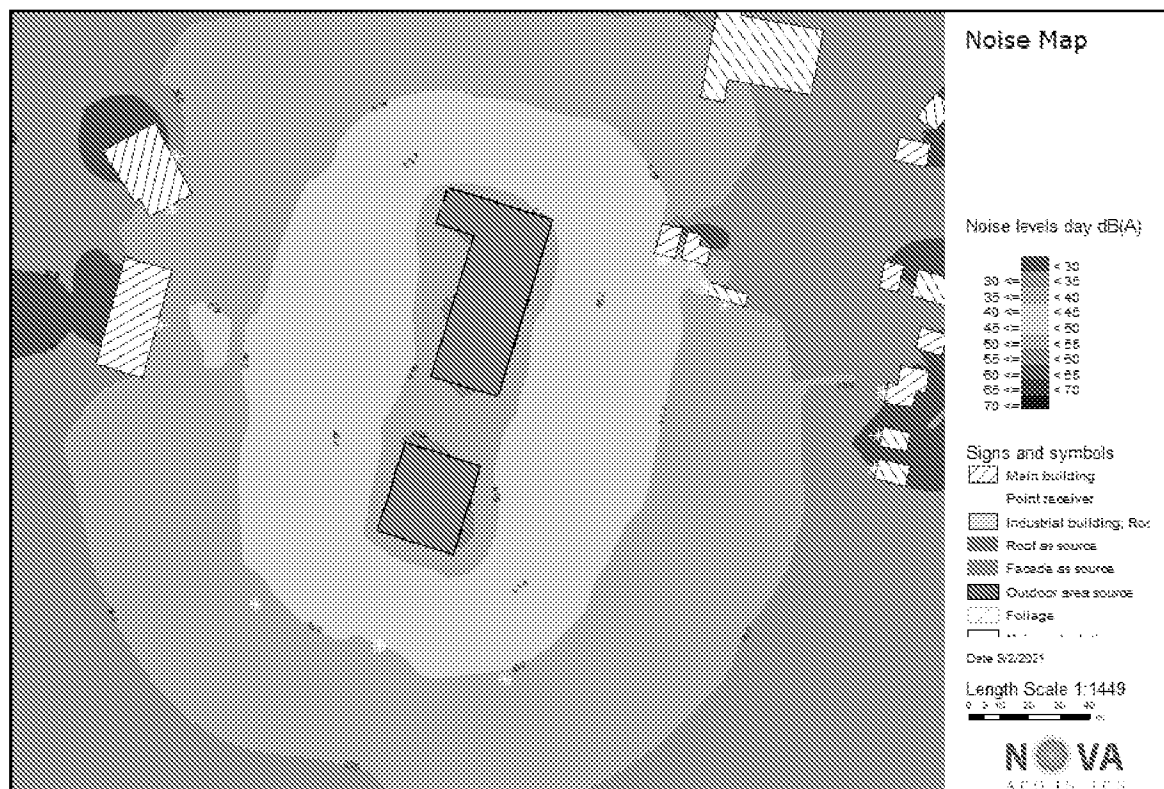


Figure 3.0 – Proposed Building Specific Sound Level Map

The table below shows the noise levels presented taken from the most exposed window of the NSRs which is located on the 1st floor.

NSR	Specific Sound Level (dBA)
1	41.0
2	34.0
3	37.0
4	41.0

Table 10.0 - Specific Sound Level at NSR Summary

3.3.3 Rating Level

Rating Penalty Assessment

Considering the requirements of the rating penalty, an assessment of the various sound sources associated with the Proposed Development, in terms of whether any rating penalties are applicable, and has been detailed in the following table.

Tonality	Impulsivity	Intermittency	Other Sound Characteristics	Discussion
--	--	--	--	No character associated to the noise breaking out the sheds.

Table 11.0 – Rating Penalty Assessment

Rating Level

Incorporating the rating penalties with the specific sound levels, the rating sound levels have been derived and have been detailed in the following table.

NSR	Rating Sound Level (dB)
1 & 4	41.0

Table 12.0 – Summary of Rating Sound Levels

3.3.4 Assessment

The rating sound level has been assessed in accordance with BS4142:2014 at the closest NSR. The BS4142:2014 assessment at the NSR, during day time operational periods can be seen in the table below.

Results	Sound Level (dB)	Notes
Rating Sound Level	41.0	As shown in Table 7.0
Operational Period Background Sound Level	41.0	As shown in Table 1.0
Excess of Rating over Background Sound Level	-0.0	Assessment Indicates a 'Low Impact' Dependent on Context

Table 13.0 – BS4142:2014 Assessment

Discussion

As can be seen in the assessment above the rating noise level does not exceed the lowest statistically most repeated measured background sound level during the proposed operational times. This indicates 'Low Impact Dependent on Context' when assessed in accordance with BS4142 and 'No Observed Effect Level' when assessed in accordance with the NPSE and NPPF.

3.3.5 Increase in Ambient Noise Level Assessment – Night Time

The following section of the report assesses the expected increase in noise levels of the area due to the noise emanating from the Proposed Development. The specific noise levels at the NSR are logarithmically added to the lowest measured ambient noise level presented in Table 1.0. The higher the increase in noise levels the higher the expected impact.

Description	NSR Levels (dB)
Specific Noise Level at NSR	41.0
Lowest Ambient Noise Level	55.0
Resulting Noise Level	55.2
Increase in Noise Levels	0.2
IEMA Impact Rating	'Not Significant'

Table 14.0 – Increase in Ambient Noise Level Assessment

Discussion:

The assessment above indicates that the expected increase in noise levels from the proposed development is considered as 'Not Significant' when assessed in accordance with the IEMA Guidelines on Noise Impact'. This equates to 'No Observed Effect Level' when assessed in conjunction with the NPPF and NPSE.

3.4 Recommendations and Mitigation

The following section outlines the mitigation measures that are necessary to further reduce the impact of the proposed development.

- The internal activities associated with the Proposed Development can operate at any time.
- The HGV deliveries and the usage of forklifts to carry out the deliveries must occur only between 07:00 – 19:00 from Monday to Friday and from 08:00 to 13:00 on Saturday.
- All the doors and windows must remain closed while the noisy activities are being carried out.
- Optional fencing could be installed along the southern and eastern perimeters of the site to further reduce the noise levels at the noise sensitive receptors. Assuming the fencing is 2.5m in height and closed boarded with a minimum density of 10kg/m³ we would expect a 2-5 dB drop in noise levels at the most exposed NSR.

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 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.

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 $L_{A90,1hour}$ dB and $L_{A90,15mins}$ 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 2019. 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 - BS 4142:2014

BS4142:2014 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 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 $L_{A,T,r}$ '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 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 negligible impact, depending on the context."

Interpreting the guidance given in BS4142:2014, with consideration of the guidance given in the NPSE and NPPG Noise, an estimation of the impact of the rating sound is summarised in the following text:

- A rating sound level that is +10 dB above the background sound level is likely to be an indication of a Significant Observed Adverse Effect Level;
- A rating sound level that is +5 dB above the background sound level is likely to be an indication of a Lowest Observed Adverse Effect Level;
- The lower the rating sound 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 sound level does not exceed the background sound level, this is an indication of the specific sound source having a negligible impact, and would therefore be classified as a No Observed Adverse Effect Level.

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 07.00 to 23.00 and 23.00 to 07.00, respectively.

Rating Penalty

Section 9 of BS4142:2014 describes how the rating sound level should be derived from the specific sound level, by deriving a rating penalty.

BS4142:2014 states:

"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features

are present at the assessment location, add a character correction to the specific sound level to obtain the rating level. This can be approached in three ways:

- a) subjective method;
- b) objective method for tonality;
- c) reference method."

Due to the nature of the development, the subjective method has been adopted to derive the rating sound level from the specific sound level. This is discussed in Section 9.2 of BS4142:2014, which states:

"Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed. Correct the specific sound level if a tone, impulse or other characteristics occurs, or is expected to be present, for new or modified sound sources."

BS4142:2014 defines four characteristics that should be considered when deriving a rating penalty, namely; tonality; impulsivity; intermittency; and other sound characteristics, which are defined as:

a) *Tonality*

A rating penalty of +2 dB is applicable for a tone which is "just perceptible", +4 dB where a tone is "clearly perceptible", and +6 dB where a tone is "highly perceptible".

b) *Impulsivity*

A rating penalty of +3 dB is applicable for impulsivity which is "just perceptible", +6 dB where it is "clearly perceptible", and +9 dB where it is "highly perceptible".

c) *Other Sound Characteristics*

BS4142:2014 states that where "the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinct against the residual acoustic environment, a penalty of +3 dB can be applied."

d) *Intermittency*

BS4142:2014 states that when the "specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on-time if the intermittency is readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied."

ISO 9613-2 Attenuation of sound during propagation outdoors

The ISO 1996 series of standards specifies methods for the description of noise outdoors in community environments. Part 2 of ISO 9613 is intended to enable noise levels in the community to be predicted from sources of known sound emission. The method is general in the sense that it may be applied to a wide variety of noise sources, and cover most of the major mechanisms of attenuation.

This standard provides guidance on the outdoor propagation of sound. It is widely used to establish the different attenuations that occur during the transmission of the sound from the sources to the receivers. The total attenuation is the sum of the following: geometrical divergence, atmospheric absorption, ground effect, barriers, and miscellaneous other effects.

BS EN 12354-4 Building Acoustics

Estimation of acoustic performance of buildings from the performance of elements – Transmission of indoor sound to the outside

This European Standard describes a calculation model for the sound power level radiated by the envelope of a building due to airborne sound inside that building, primarily by means of measured sound pressure levels inside the building and measured data which characterize the sound transmission by the relevant elements and openings in the building envelope. These sound power levels, together with those of other sound sources in or in front of the building envelope, form the basis for the calculation of the sound pressure level at a chosen distance from a building as a measure for the acoustic performance of buildings.

B.4 – IEMA Guidelines on Noise Impact Assessments

The IEMA Guidelines for Environmental Noise Assessment address the key principles of noise impact assessment and are applicable to all development proposals where noise effects may occur. The guidelines set out key principles for noise impact assessment relevant to all types of project regardless of size. The guidance provides advice with regards to the collection of baseline noise data, prediction of noise levels and how noise should be assessed. The guidance recognizes that the effect associated with a noise impact will be dependent on a number of factors including but not limited to the sensitivity of the receptor, frequency and duration of the noise source and time of day. The Guidelines accept that a simple change in noise levels using a single noise indicator may fail to adequately reveal the actual noise impact of the proposal. The character of the noise must be considered and the Guidelines suggest comparing several noise indicators such as the LAeq, LAm_{ax} and LA90 as a more rigorous approach.

Absolute levels such as those set out in WHO Guidelines are also considered and the Guidelines suggest that a change in noise levels in an area where the existing levels are above WHO Guidelines should be considered as having more of an adverse effect than a change in noise levels in an area where existing levels are well below.

The Guidelines stop short of providing specific assessment criteria which developments should achieve but instead suggests that the methodology adopted should be selected on a site-by-site basis regarding relevant national and local standards.

The Guidelines contain effect descriptors for changes in noise levels and for noise effect levels. These are summarized below:

Effect Descriptors	
Very substantial	Greater than 10 dB L_{Aeq} change in sound level perceived at a receptor of great sensitivity to noise
Substantial	Greater than 5 dB L_{Aeq} change in sound level at a noise sensitive receptor, or a 5 to 9.9 dB L_{Aeq} change in sound level at a receptor of great sensitivity to noise
Moderate	A 3 to 4.9 dB L_{Aeq} change in sound level at a sensitive or highly sensitive noise receptor, or a greater than 5dB L_{Aeq} change in sound level at a receptor of some sensitivity
Slight	A 3 to 4.9 dB L_{Aeq} change in sound level at a receptor of some sensitivity
None/Not Significant	Less than 2.9 dB L_{Aeq} change in sound level and/or all receptors are of negligible sensitivity to noise or marginal to the zone of influence of the proposals

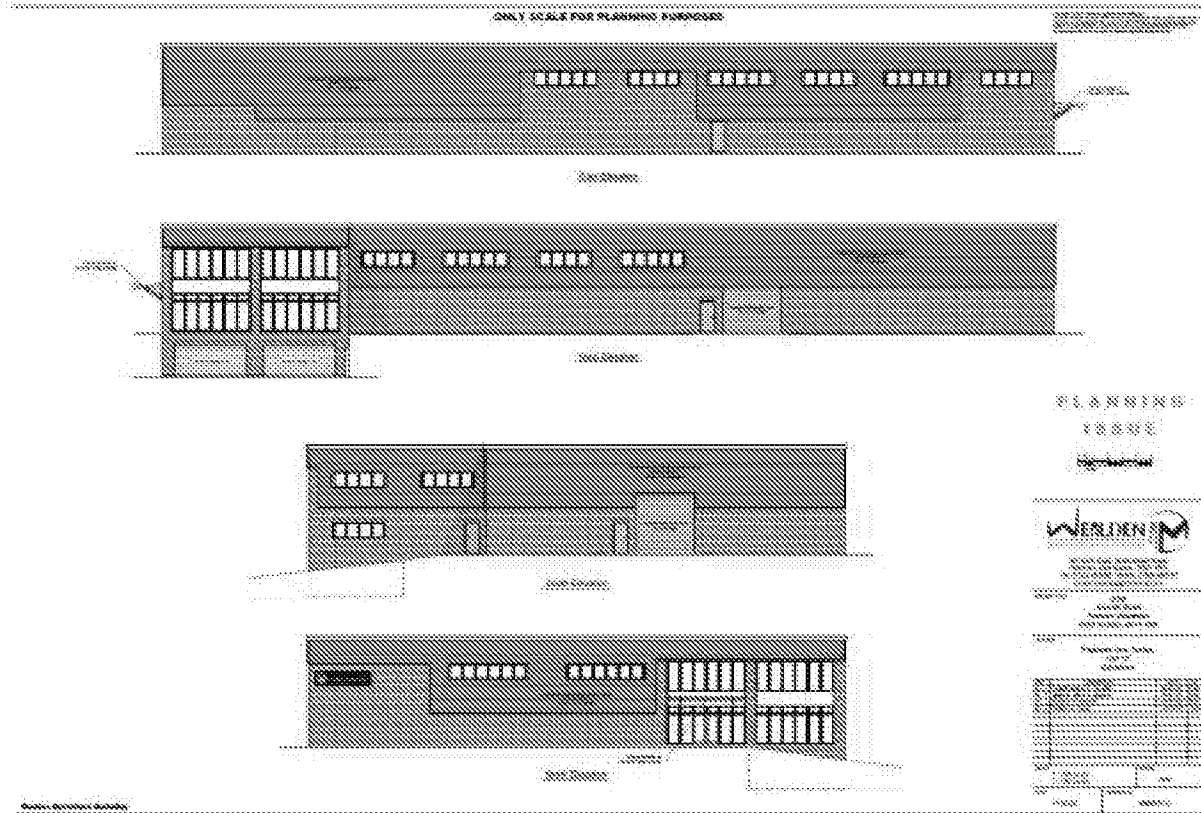
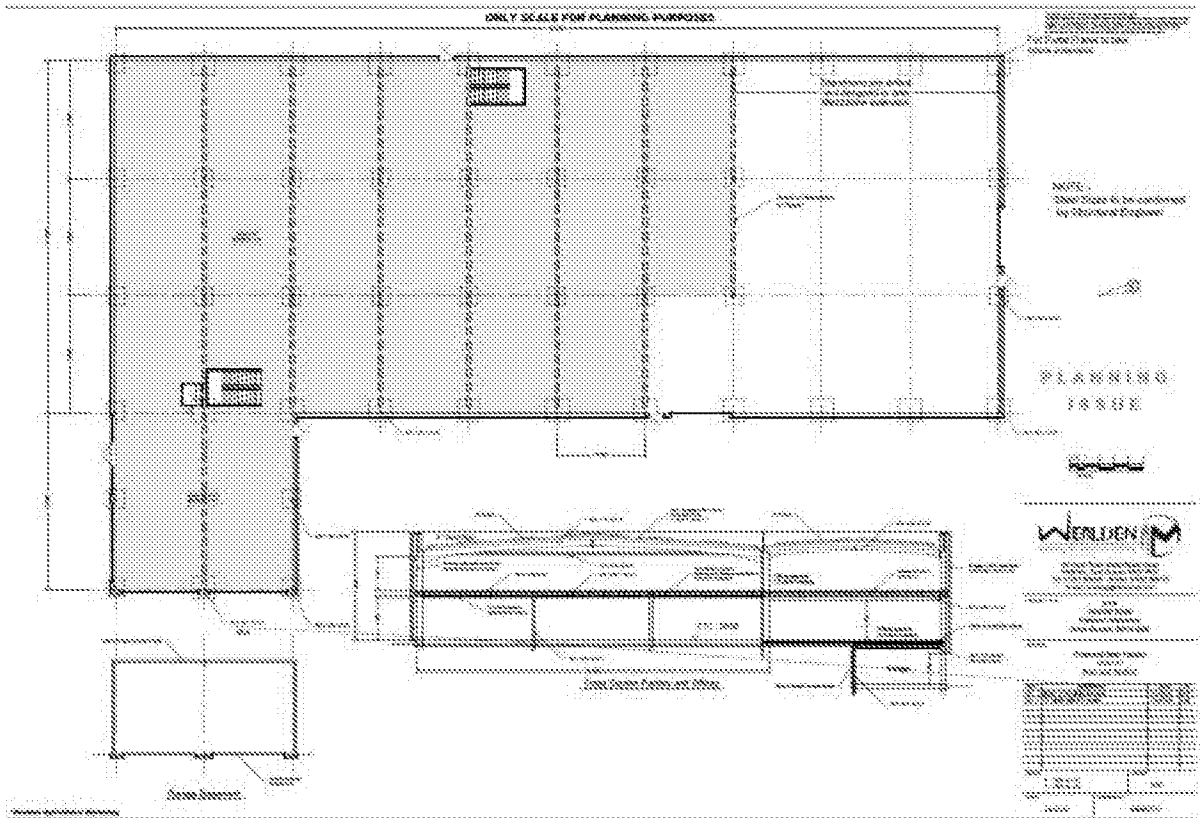
Table 15.0 – IEMA Guidelines effect descriptors

Noise Effect Level		
Time	Lowest Observed Adverse Effect Level	Significant Observed Adverse Effect Level
07:00 - 23:00	50 dB $L_{Aeq,16\text{ hour}}$	60 dB $L_{Aeq,16\text{ hour}}$
23:00 - 07:00	40 dB $L_{Aeq,8\text{ hour}}$	55 dB $L_{Aeq,8\text{ hour}}$
	60 dB L_{AFMax} (at the facade)	80 dB L_{AFMax} (at the facade)

Table 16.0 – IEMA Guidelines noise effect level

The Guidelines are not prescriptive as to how a noise impact assessment should be carried out and allow assessors to consider factors such as frequency spectra, days and times of operation, frequency of operation and any other factor which allows the noise to be assessed in context.

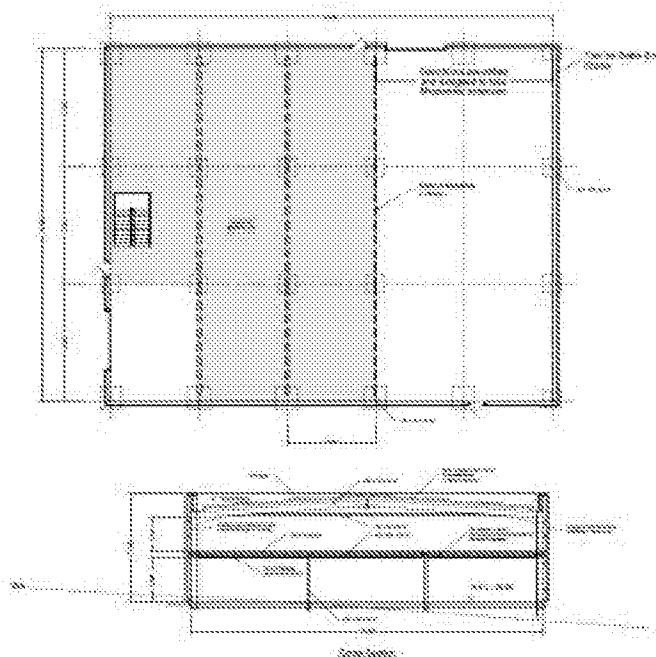
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ONLY SCALE FOR PLANNING PURPOSES



NOTE:
Steel Deck to be confirmed
by Structural Engineer

PLANNING
ISSUE

WILKINSON

ARCHITECTS
100-102 WEST 10TH AVENUE
DENVER, CO 80202

PROJECT NO. 100-102
DATE: 01/15/2021

PROPOSED WORK
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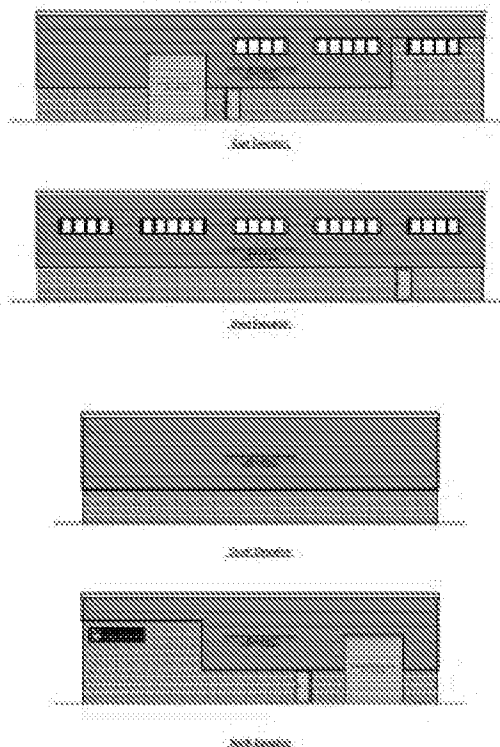
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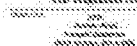
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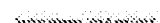


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Appendix D – Environmental Survey**3.5 D.1 Tabulated Summary Noise Data**

Measurement Position MP1				
Measurement Time Period ('t')	L _{Aeq,t}	L _{Amax,t}	L _{A90,t}	L _{A10,t}
Day 1 – 30/07/2021 – 11:30 – 22:59	66.0	95.0	59.0	68.0
Night 1 – 30/07/2021 – 23:00 – 06:59	55.0	87.0	48.0	58.0
Day 2 – 31/07/2021 – 07:00 – 22:59	62.0	88.0	59.0	63.0
Night 2 – 31/07/2021 – 23:00 – 06:59	54.0	83.0	48.0	57.0
Day 3 – 01/08/2021 – 07:00 – 22:59	62.0	97.0	57.0	65.0
Night 3 – 01/08/2021 – 23:00 – 06:59	55.0	83.0	44.0	59.0
Day 4 – 02/08/2021 – 07:00 – 11:30	62.0	82.0	61.0	62.0
LA90 Analysis				
Measurement Period ('t')	L _{A90,t}	SMR L _{A90,t}	Min. L _{A90,t}	Max. L _{A90,t}
Day 1 – 30/07/2021 – 11:30 – 22:59	59.0	64.0	53.0	65.0
Night 1 – 30/07/2021 – 23:00 – 06:59	48.0	41.0	30.0	55.0
Day 2 – 31/07/2021 – 07:00 – 22:59	59.0	59.0	50.0	61.0
Night 2 – 31/07/2021 – 23:00 – 06:59	48.0	48.0	34.0	53.0
Day 3 – 01/08/2021 – 07:00 – 22:59	57.0	58.0	48.0	60.0
Night 3 – 01/08/2021 – 23:00 – 06:59	44.0	35.0	33.0	58.0
Day 4 – 02/08/2021 – 07:00 – 11:30	58.0	57.0	57.0	59.0
Noise Survey Time History				

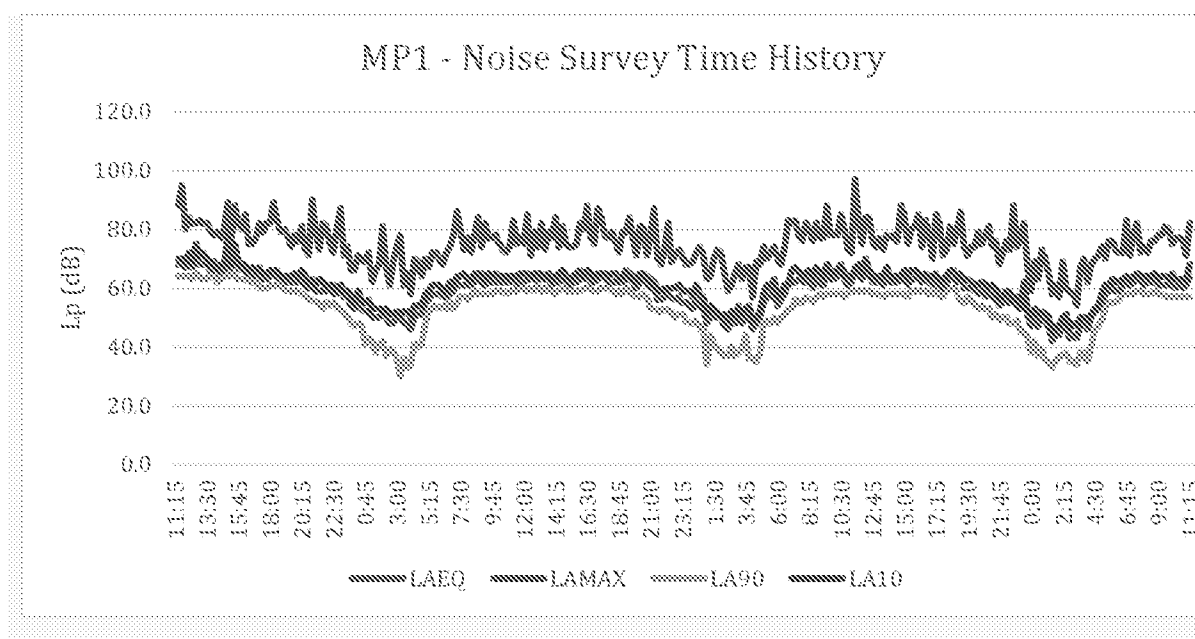


Table 17.0 – Sound Survey Summary Results

3.6 D.2 Surveying Equipment

Piece of Equipment	Serial No	Calibration Deviation
CESVA SC420 Class 1 Sound level meter	T238593	≤0.5
CESVA CB006 Class 1 Calibrator	901013	

Table 18.0 – 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.

3.7 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 – Lavant				
Time period	Air temp (°C)	Rainfall mm/h	Prevailing Wind Direction	Wind Speed (m/s)
Day 1 - 30/07/2021 – 00:00 – 23:59	14.2 – 19.3	0.0 – 10.8	WSW	0.0 – 7.8
Day 2 - 31/07/2021 – 00:00 – 23:59	13.2 – 20.2	0.0 – 10.8	WNW	0.0 – 4.7
Day 3 - 01/08/2021 – 00:00 – 23:59	11.8 – 20.9	0.0 – 4.8	WNW	0.0 – 4.1
Day 4 - 02/08/2021 – 00:00 – 23:59	11.4 – 17.8	0.0 – 1.8	SW	0.0 – 2.6

Table 19.0 – Weather Summary

Appendix E – Vehicle Movements

GTR	Movements	INWARD	OUTWARD	IN/OUT	Daily total
Time					
AM peak	7am-9am	85		5	
Non peak		10	10	8	
Pm peak	4pm-6pm		85	5	
Totals		95	95	18	208
Hours/day 11	7am-6pm				