Noise Impact Assessment of an Extension to a Vehicle Workshop Facility and Associated Car Park

Client:	JM & JK Alpe Properties
Address:	Lincoln Way Salthill Industrial Estate Clitheroe BB7 1QD
Date:	22/03/2019

Version	1	2	3
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Date	22/03/2019	--	--
Project Number	3262VK	--	--

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Executive summary

A noise impact assessment has been undertaken to assess the noise impact of an extension to existing workshop and creation of parking area ('the Proposed Development') at James Alpe Accident Repair Centre, Lincoln Way, Clitheroe, BB7 1QD. The measured sound levels have allowed BS4142:2014 and IEMA noise assessments to be carried out.

The assessment has been completed considering two separate scenarios; in scenario 1, the extension houses a body shop area, and in scenario 2 the extension houses a valeting area. In both scenarios the car park and associated road have also been modelled, assuming a worst-case scenario of 29 cars entering or exiting the facility within a 1-hour period.

The BS4142 assessment shows that no adverse impact is predicted at the nearest NSRs considering both scenario 1 and scenario 2. This equates to 'No Observed Effect Level' when assessed in conjunction with the NPPF. An IEMA 'Increase in Ambient Noise Level' assessment shows a 'None/Not Significant' level of impact, which adds further context to the BS4142 assessment.

A brief overview of the recommendations and mitigation measures provided can be seen below.

Recommendations and Mitigation
- The construction should have no holes or gaps and should be fully sealed. - The construction should use composite panels that can provide 24 dB Rw or better of sound reduction. - The location of the open roller shutter and car park should be as shown on the plans. If any of the site is to be reoriented, it may have to be reassessed. - The car park Speed limit should not exceed 10mph. - The car park surfaces should be constructed of a low noise bituminous surface. - No further external plant has been specified. However, if this changes and new external mechanical plant is required, said plant should not exceed a Cumulative Plant Noise Limit Level of 38.0 dBA at the closest 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 extension to existing workshop and creation of parking area ('the Proposed Development') at James Alpe Accident Repair Centre, Lincoln Way, Clitheroe, BB7 1QD ('the Site').

The Applicant has submitted a full planning application reference number 3/2019/0007 ('the Application') to Ribble Valley Borough Council, however, conversations with the client have shown that it is likely that a new planning application will be submitted.

Accordingly, the following technical noise assessment has been produced to accompany the Application, or resubmission of the application, to the Ribble Valley Borough Council.

This report details the existing background sound climate at the nearest receptors, as well as the sound emissions associated with the Proposed Development.

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 sound levels at the nearest sensitive receptor ('NSR') to Site;
- Detailed sound modelling, acoustic calculation and analysis in accordance with ISO9613 – 1 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 Practice Guidance in England and Wales, BS4142:2014 and other relevant Standards.

1.3 Legislation, Policy and Guidance

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

- National Planning Policy Framework (2018)
- Noise Policy Statement for England
- IEMA Guidelines on Noise Impact Assessments
- BS4142:2014
- ISO 9613-2 Attenuation of sound during propagation outdoors
- BS EN 12354-4 Building Acoustics

2. Site Description & Background Information

2.1 Site & Surroundings

The Proposed Development is located on Salthill Industrial Estate in Eastern Clitheroe. The immediate area is predominantly industrial in nature, there are however some residential dwellings Approximately 10m from the eastern perimeter of the existing structure on Lincoln Way. Lincoln Way facilities a moderate amount of traffic flow during the day time period. Directly to the south of the site is Up-Brooks Road, and residences located on this road are the closest Noise Sensitive Receptors (NSRs) to the site. The acoustic environment of the area could be described as moderate in level, which is typical of an industrial/suburban location. Whilst on site it was found that the dominant source of noise in the area was traffic noise from vehicles travelling along Lincoln Way. Plant equipment could frequently be heard at the NSR, and intermittently noise from inside the industrial units was audible.

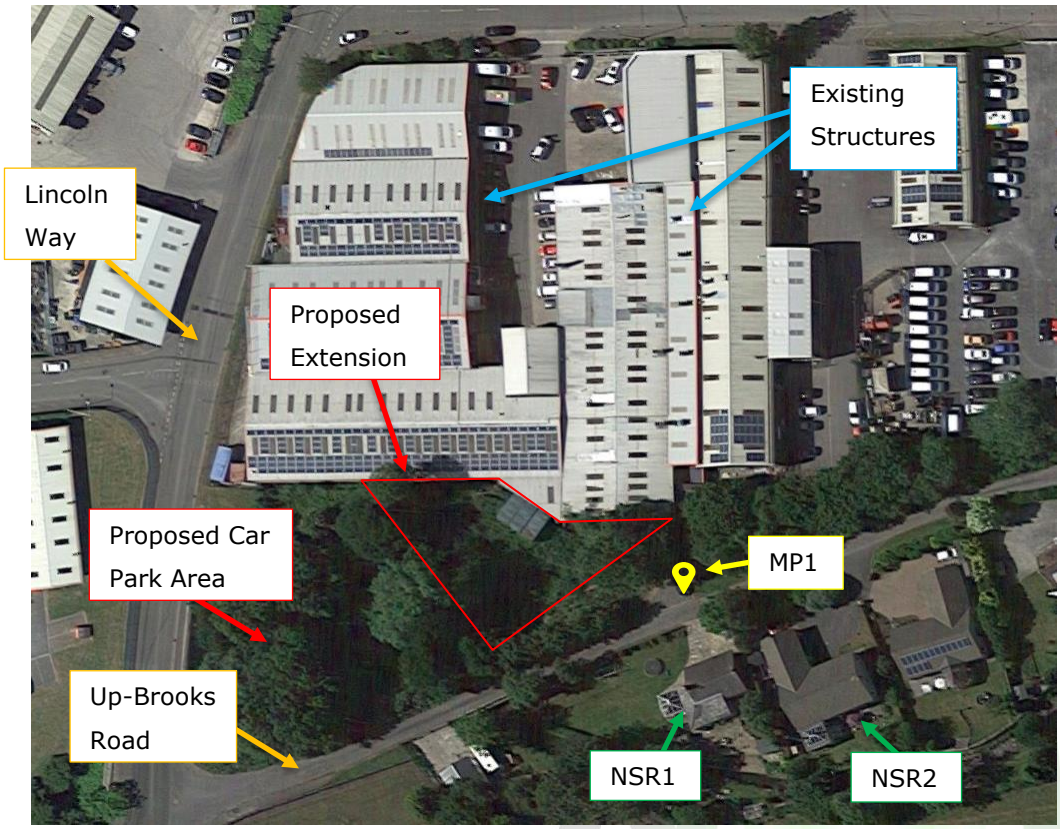


Figure 1.0 – Site and Surroundings

2.2 Background

It is proposed that the current body shop workshop in the southern section of the existing building be extended. The client has stated that if necessary, operations with a lower noise level could take place in the extension, and the extra body shop work could occur in another section of the site. For this reason, the report details two scenarios; one in which the proposed extension is used for body shop operations, and one where the extension houses the valeting operations. The current status of the application is 'Refused' and as such, the client is looking for resubmission in the immediate future. A review of the decision notice, notes reason number 1 for the refusal is:

"*The applicant has failed to provide an assessment to determine the noise impact(s) of the proposed development on the residential amenity of the occupants of nearby dwellings.*"

For this reason, a noise impact assessment has been requested to ensure the amenity of local noise sensitive receptors is protected.

The opening times stated on the application are 07:00 to 18:00 and location and site plans are included in Appendices C and D respectively.

3. Environmental Noise Survey

In order to characterise the sound profile of the area of the proposed development, a short-term 4-hour environmental sound survey was carried out on the 14th March 2019. Short-term noise measurements were also undertaken of the existing operations.

3.1 Measurement Methodology

For the short-term sound monitoring, the sound level meter was placed at ground floor level, approximately 1.7m from the floor and over 3m away from any other reflective surface. The monitoring position was chosen in order to collect representative sound levels of the area during the week day time operational hours. This position was also representative of the sound levels at the NSR. The measurement position can be found in figure 1.0.

3.2 Measurement Equipment

Piece of Equipment	Serial No	Calibration Deviation
CESVA SC420 Class 1 Sound level meter	T246458	≤0.5
CESVA CB006 Class 1 Calibrator	901927	

Table 1.0 – 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.

3.3 Weather Summary

During the sound monitoring the wind speed measured at over 5m/s until 12:00, and for this reason, measurements before this time will not be used in the subsequent calculations. During the measurement period, there was no precipitation and the weather conditions after 12:00 were suitable for the measurement of environmental noise in accordance with BS7445 Description and Measurement of Environmental Noise.

3.4 Results

3.4.1 Summary Results

The following table shows a summary of the sound survey results; L_{Aeq}, L_{Amax}, L_{A90} and the L_{A10} for the measurement period.

Measurement Position MP1				
Measurement Time Period ('t')	**$L_{Aeq,t}$**	**$L_{Amax,t}$**	**$L_{A90,t}$**	**$L_{A10,t}$**
Hour 1 – 14/03/19 – 11:10 – 12:00	60.0	82.0	52.0	64.0
Hour 2 – 14/03/19 – 12:00 – 13:00	59.0	78.0	51.0	62.0
Hour 3 – 14/03/19 – 13:00 – 14:00	55.0	78.0	49.0	60.0
Hour 4 – 14/03/19 – 14:00 – 15:00	57.0	78.0	55.0	59.0

Table 2.0 – Sound Survey Summary Results

The following table shows a summary of the sound survey results; L_{Aeq}, L_{Amax}, L_{A90} and the L_{A10} for internal noise measurements. The measurements were taken inside the current body shop and valeting areas.

Internal Measurement Positions				
Description	**$L_{Aeq,t}$**	**$L_{Amax,t}$**	**$L_{A90,t}$**	**$L_{A10,t}$**
Valeting Area – 10:25 – 10:35	72.0	86.0	70.0	73.0
Body Shop Area – 10:40 – 10:55	80.0	90.0	66.0	83.0

Table 3.0 – Internal Noise Measurements

3.4.2 Background Sound Level Summary Results

The following table shows a summary of the background sound level. The background sound level has been taken from the quietest hour during the measurement period.

Measurement Position MP1				
Measurement Period ('t')	**$L_{A90,t}$**	**Statistically most Repeated $L_{A90,t}$**	**Min. $L_{A90,t}$**	**Max. $L_{A90,t}$**
Hour 3 – 14/03/19 – 13:00 – 14:00	49.0	50.0	47.0	61.0

Table 4.0 – Background Sound Level Summary Results

3.5 Subjective impression & Context

Whilst on site it was found that the breakout noise from the current operations was intermittently audible at a low level at the NSRs. At approximately 14:00 plant equipment from the industrial estate could be heard. This continued until the end of the measurement period, and as such, it is thought it would be more robust to use a background noise level from earlier in the measurement period. This is thought to be a worst-case scenario as the noise emissions from the Proposed Development will be most noticeable during periods of lower background noise. However, Given the above, it should also be noted that the current noise emissions from the site are legitimately considered part of the background sound level in the area and the subsequent analysis is solely for the proposed extension.

3.6 Assumptions

It is assumed that the noise level generated inside the new extension will be of the same level as the current operations.

3.7 Uncertainty

BS4142:2014 section 10.0 states that uncertainty in the calculation of sound levels during the assessment process can arise from both the measured values and calculation methods.

To ensure the accuracy of the assessment consideration has been taken for the level of uncertainty in the measured data and associated calculations in the proposed methodology used to undertake the assessment. Where the level of uncertainty could affect the conclusion, reasonably practicable steps have been taken to minimise the level of uncertainty. Where the level of uncertainty is excessive, additional measurements and site visits have been conducted to increase the confidence in the results. In all instances the following steps have been taken to address the uncertainty;

1) Measured Values; A detailed understanding of the source of noise under investigation has been conducted including consideration for the complexity, variability over time and location, the character and effect of the residual sound level in comparison with the source, the measurement location, quantity of measurements and distance/intervening ground conditions, measurement time interval and the range of times measurement were taken, the suitability of weather conditions, the level of rounding and the classification of the instrumentation used to conduct the assessment.
2) Calculation Methods; Consideration has been taken for the accuracy of the measured sound levels, the character of the sound emissions in question, the calculation method and the simplification of the real situation to "fit" the modelled situation. Recognised standards and validated methods and processes have been used to establish accurate values during the calculation process.

For the avoidance of doubt, the level of uncertainty will not be quantified. If appropriate consideration is taken for points 1 and 2 during the collection of data and analysis thereof, then the influence of uncertainty in the final result is at its lowest practical value.

4. Noise Assessment

4.1 BS4142:2014 Noise Assessment

In the following section, the breakout noise from the new extension and the predicted noise level generated within the car park will be assessed. The assessment considers the two scenarios shown below:

- Scenario 1 - The breakout noise for an extension to the current body shop section.
- Scenario 2 - The breakout noise if the new extension is used for the relocation of the vehicle valeting section.

4.1.1 Specific Sound Level

The A-weighted sound pressure levels, measured within the current development, can be seen in the following table.

Internal Measurement Positions				
Operational Hours ('t')	**$L_{Aeq,t}$**	**$L_{Amax,t}$**	**$L_{A90,t}$**	**$L_{A10,t}$**
Body Shop Area – 10:40 – 10:55	80.0	90.0	66.0	83.0
Valeting Area – 10:25 – 10:35	72.0	86.0	70.0	73.0

Table 5.0 – Internal Noise Measurements

The noise breakout from the new extension has been calculated using the following criteria:

- The walls of the extension facing the NSRs and Lincoln Way are constructed of 200mm concrete block on the lower half and composite steel panelling on the upper half. the composite panelling has been modelled assuming it is providing a sound reduction of 24 dB R_w.
- The roof is constructed of the same composite panelling as the walls, again providing a sound reduction of 24 dB R_w.
- There is a roller shutter door on the south-western section of the wall. To present a worst-case scenario, this has been modelled as completely open, providing no acoustic reduction other than 6 dB of internal to external attenuation (reverberant space to none reverberant space).

The calculations for the breakout from the new structure can be seen below. The surfaces are all treated as area noise sources within the sound model, and this calculated in the SoundPlan software. The calculation for the composite noise reduction provided by the façades can be seen in Appendix F.

Description	Scenario 1 (dBA)	Scenario 2 (dBA)
Internal Noise Measurement	80.0	72.0
R_w of Walls	27.0	27.0
R_w of Roof	24.0	24.0
L_{Aeq} of Walls $_{(L1 - Rw - 6)}$	47.0	39.0
L_{Aeq} of Roof $_{(L1 - Rw - 6)}$	50.0	42.0
L_{Aeq} of Roller Shutter $_{(L1 - 6)}$	74.0	66.0

Table 6.0 – R_w Calculations

The noise level for the car park and associated road to the new extension has been calculated using formulas within the CRTN guidance document. To present a worst-case scenario, it is assumed that 29 cars will either enter or exit the car park within a 1-hour period. The surface is assumed to be low noise Bitumen, and the speed limit is assumed to be 10 mph (approximately 16 kph). A

summarized calculation can be seen in the table below, and the full calculations can be seen in Appendix F.

Description	Lp (dBA)
$L_{10,1hour}$	57.0
Traffic Speed and Type Correction	-5.0
Road Surface Correction	-1.0
Corrected $L_{10,1hour}$	51.0
$L_{Aeq,1hour}$	50.0

Table 7.0 – CRTN Calculation

The specific sound level at the NSRs has been calculated using SoundPlan Essential 8.0, which undertakes its calculation in accordance with the guidance given in IS09613 – 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 model has been calibrated using the predicted noise levels stated above.

The sound maps showing the specific sound level emissions from the Proposed Development considering scenario 1 and scenario 2 can be seen below in Figure 2.0 and Figure 3.0.

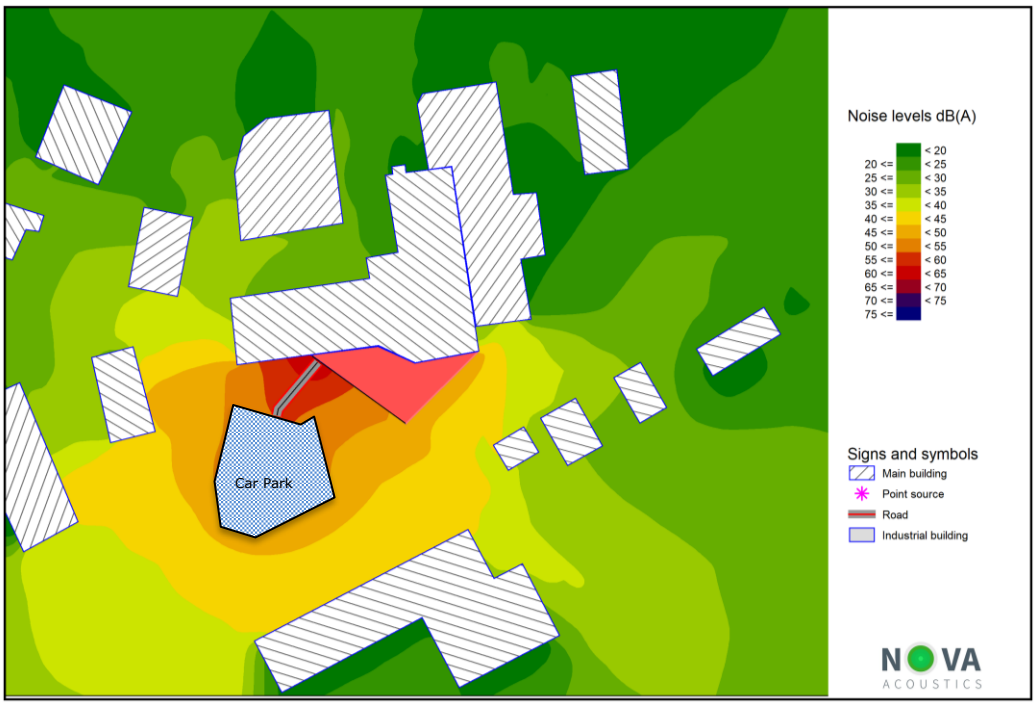


Figure 2.0 – Specific Sound Level Map – Scenario 1

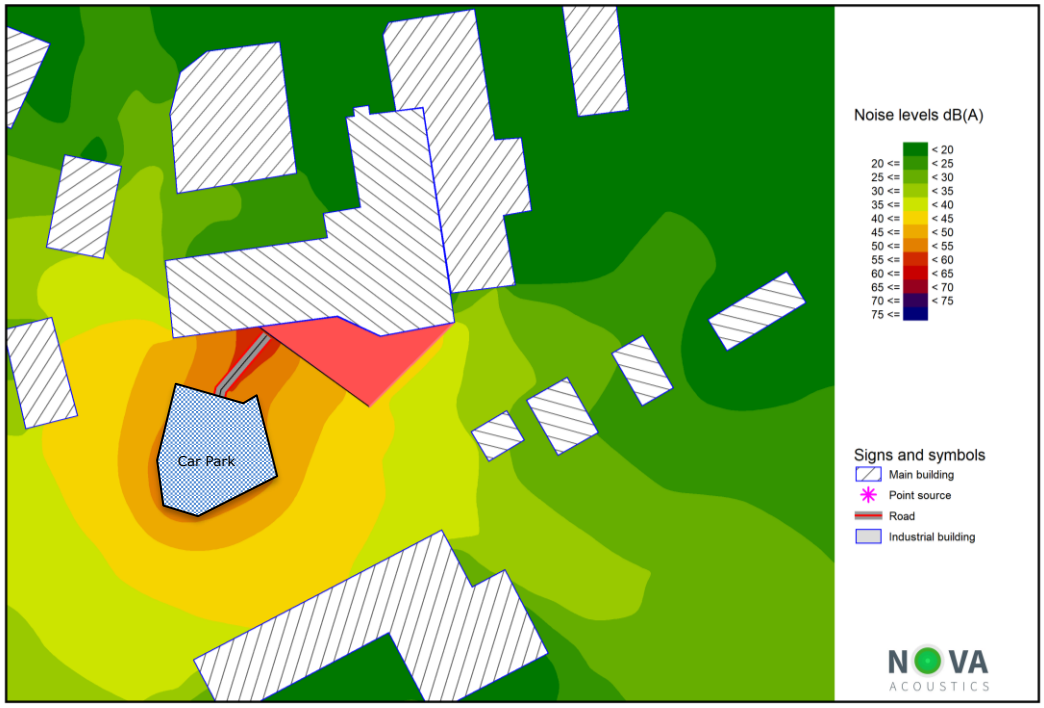


Figure 3.0 – Specific Sound Level Map – Scenario 2

A summary of the specific sound levels at the NSRs, based on the sound maps shown in Figure 2.0 and Figure 3.0, can be seen in the following table.

NSR	Scenario 1 - Specific Sound Level (dBA)	Scenario 2 - Specific Sound Level (dBA)
1	39.0	33.0
2	36.0	30.0

Table 8.0 - Specific Sound Level at NSR Summary

4.1.2 Rating Level

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 distance 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."

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.

Source	Tonality	Impulsivity	Intermittency	Other Sound Characteristics	Discussion
Scenario 1 - Breakout Noise Level and Car Park	+2	+3	+3	--	Tonality of vehicle engines, impulsivity of hammering, intermittent nature of work

Scenario 2 - Breakout Noise Level and Car Park	+4	--	+3	--	Tonal nature of vehicle engines and vacuums, intermittent nature of work

Table 9.0 – 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	Scenario 1 - Rating Sound Level (dBA)	Scenario 2 - Rating Sound Level (dBA)
1	47.0	40.0
2	44.0	37.0

Table 10.0 – Summary of Rating Sound Levels

4.1.3 Background Sound Level

The background sound level is the underlying level of sound over a period, T, and is indicative of the relative quietness at a given location. It does not reflect the occurrence of transient and/or higher sound level events and is generally governed by continuous or semi-continuous sounds.

To ensure the background sound level values used within the assessment are reliable and suitably represent both the particular circumstance and periods of interest, efforts have been made to quantify a 'typical' background sound level for a given period. The purpose has not been to simply select the lowest measured value. Diurnal patterns have also been considered as they can have a major influence on background sound levels, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night time period for sleep purposes.

Since the intention is to determine a background sound level in the absence of the specific sound that is under consideration, it is necessary to understand that the background sound level can in some circumstances legitimately include industrial and/or commercial sounds that are present as separate to the specific sound.

The table below outlines a summary of the background sound level for the operational period, as well as the statistically most repeated values for this period.

Operational Hours ('t')	$L_{A90,t}$	Statistical $L_{A90,t}$	Min. $L_{A90,t}$	Max. $L_{A90,t}$
Hour 3 – 14/03/19 – 13:00 – 14:00	49.0	50.0	47.0	61.0

Table 11.0 – Summary of Background Sound Levels

Discussion:

According to the statistical analysis the most repeated $L_{A90,t}$ value during the operational period is 50.0 dBA. The range of $L_{A90,t}$ during this period is relatively high, however, as the statistically most repeated value sits at the lower end of this range it is viewed as 'conservative' and 'robust'. It is also important to note that this value has been taken from the quietest hour during the measurement period when other plant in the area was at a minimal level. For these reasons, this value will be used in the following assessment.

4.1.4 BS4142 Assessment

The rating sound level has been assessed in accordance with BS4142:2014 at all NSRs. The BS4142:2014 assessment at the most affected NSR (NSR1), during the operational period, can be seen below.

Results	Scenario 1 - Sound Level (dBA)	Scenario 2 - Sound Level (dBA)	Notes
Rating Sound Level	47.0	40.0	As shown in Table 10.0.
Operational Period Background Sound Level	50.0	50.0	As shown in Table 11.0.
Excess of Rating over Background Sound Level	-3.0	-10.0	Assessment Indicates 'Negligible Impact'.

Table 12.0 – BS4142:2014 Assessment

Discussion

As can be seen in the assessment above, the Proposed Development is predicted to cause 'Negligible Impact' on the amenity of the surrounding NSRs considering Scenario 1 and 2. This equates to 'No Observed Effect level' when viewed in conjunction with NPPF.

4.2 Increase in Ambient Noise Level Assessment

The following section analyses the expected increase in ambient noise levels in the surrounding area due to the Proposed Development. The specific sound levels associated with the Proposed Development are logarithmically added to the lowest measured residual sound level. The higher the increase in noise levels the higher the impact.

Increase in Ambient Noise Level Assessment		
Description	**Scenario 1 - Value (dBA)**	**Scenario 1 - Value (dBA)**
Lowest Measured Ambient Noise Level	55.0	55.0
Specific Noise Level	47.0	40.0
Resulting Noise Level	55.6	55.1

Increase in Noise Level	+0.6	+0.1
Expected impact	None/Not Significant	None/Not Significant

Table 13.0 –Increase in Ambient Noise Level Assessment

Discussion

As can be seen in the assessment above, considering both scenarios, the unrated sound level emissions are not expected to significantly increase in the ambient noise level of the area. This is viewed to have a 'None/Not Significant' impact on the surrounding NSRs when assessed with IEMA guidelines.

4.3 Recommendations and Mitigation

The following section outlines the mitigation measures that are necessary to reduce the impact of Proposed Development.

- The construction should have no holes or gaps and should be fully sealed.
- The construction should use composite panels that can provide 24 dB Rw or better of sound reduction.
- The location of the open roller shutter and car park should be as shown on the plans. If any of the site is to be reoriented, it may have to be reassessed.
- The car park Speed limit should not exceed 10mph.
- The car park surfaces should be constructed of a low noise bituminous surface.
- No further external plant has been specified. However, if this changes and new external mechanical plant is required, said plant should not exceed a Cumulative Plant Noise Limit Level of 38.0 dBA at the closest 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. Lmax is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq 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. L90 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. L10 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.

National Planning Policy Framework (2018)

Government policy on noise is set out in the National Planning Policy Framework (NPPF), published in 2018. 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 170e, 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 180 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 impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
b) *Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
c) *Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.*

Noise Policy Statement for England

Paragraph 123 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.

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, LAmax 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 LAeq 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 LAeq 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 14.0 – IEMA Guidelines Effect Descriptors

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

Table 15.0 – 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.

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 $L_{Ar,Tr}$ 'rating sound level'. A correction to include the consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

BS4142:2014 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 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.

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.

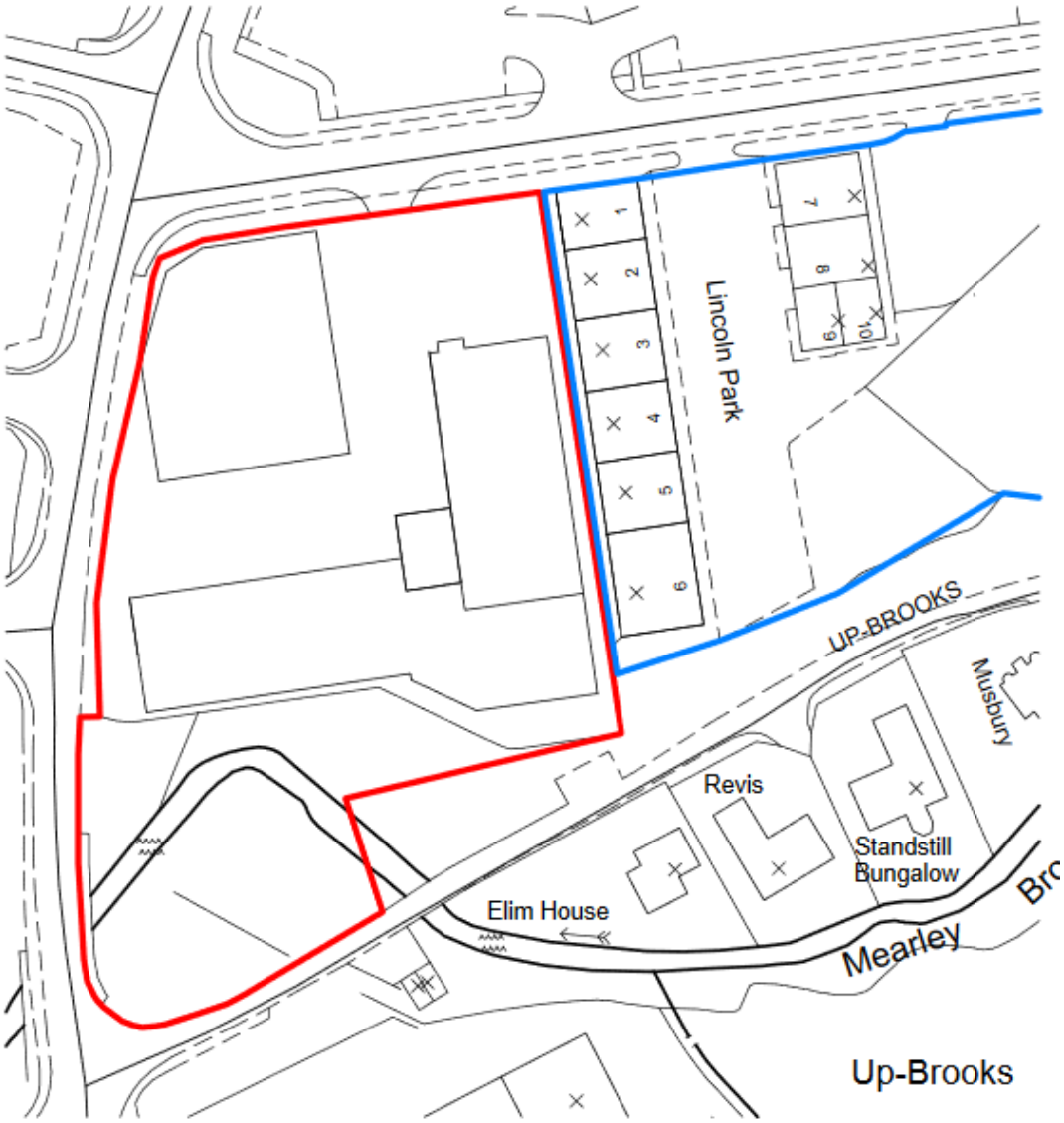
This standard provides guidance on the outdoor propagation of sound. It is widely used to establish the different attenuations that occur during the transmission of the sound from the sources to the receivers. The total attenuation is the sum of the following: geometrical divergence, atmospheric absorption,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

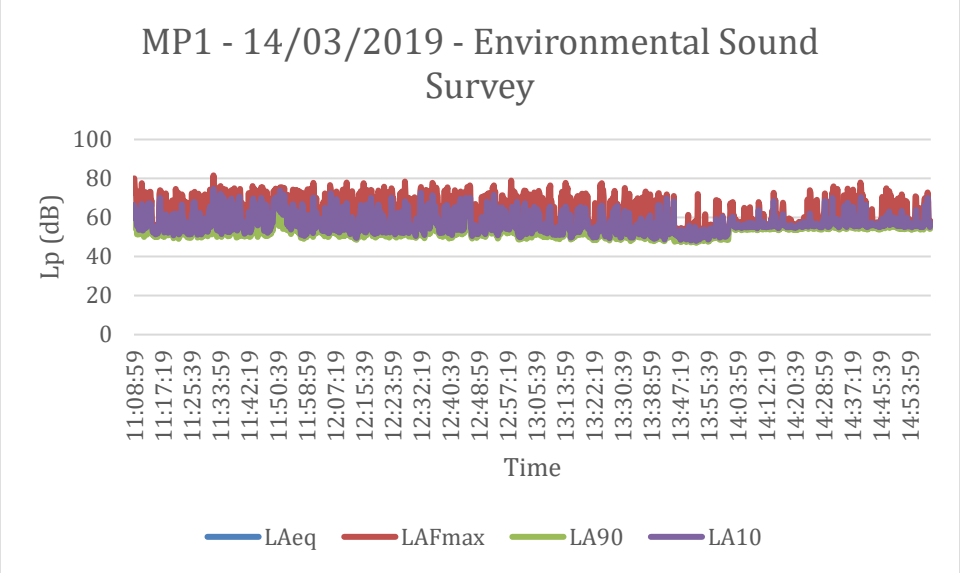
This European Standard describes a calculation model for the sound power level radiated by the envelope of a building due to airborne sound inside that building, primarily by means of measured sound pressure levels inside the building and measured data which characterize the sound transmission by the 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.

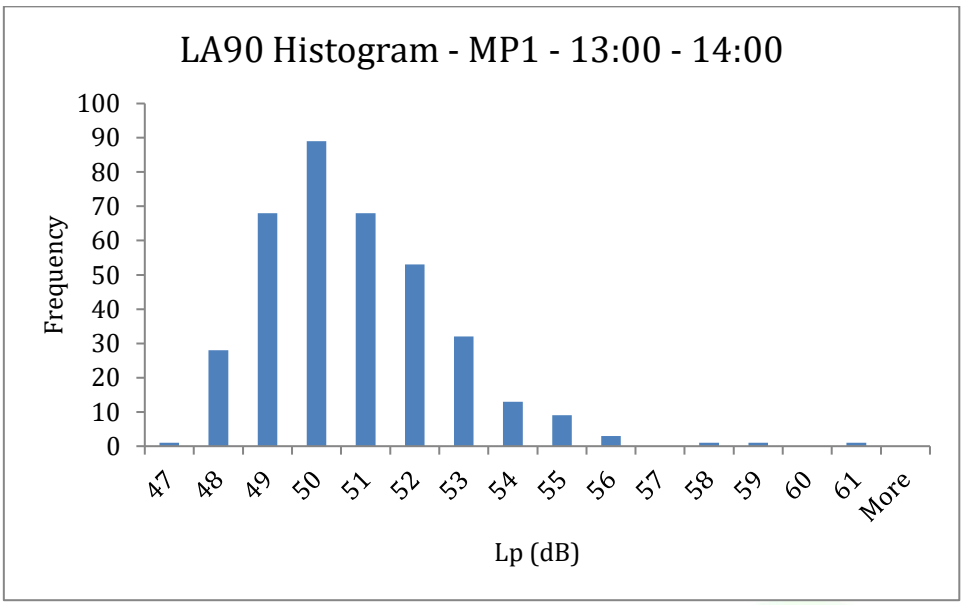
Appendix C - Location Plan

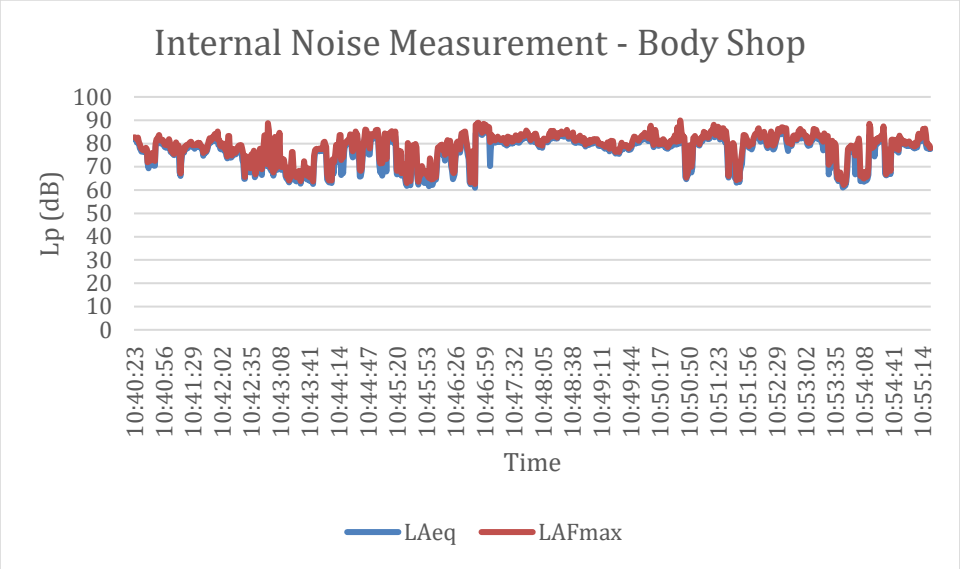


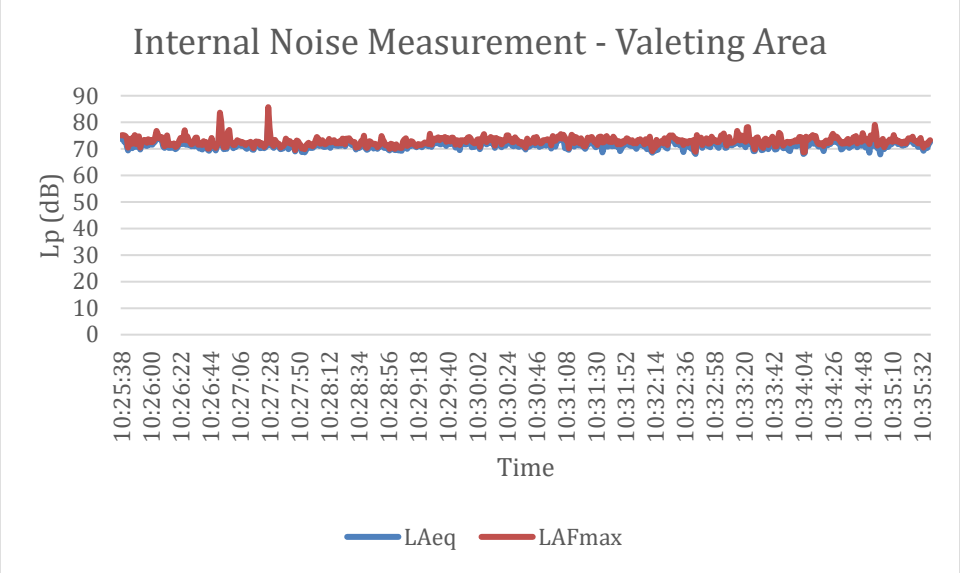
Appendix D – Site Plans

Appendix E – Environmental Sound Survey






Internal Noise Measurement - Body Shop
Lp (dB)
100
90
80
70
60
50
40
30
20
10
0
10:40:23
10:40:56
10:41:29
10:42:02
10:42:35
10:43:08
10:43:41
10:44:14
10:44:47
10:45:20
10:45:53
10:46:26
10:46:59
10:47:32
10:48:05
10:48:38
10:49:11
10:49:44
10:50:17
10:50:50
10:51:23
10:51:56
10:52:29
10:53:02
10:53:35
10:54:08
10:54:41
10:55:14
Time
LAeq
LAFmax


Internal Noise Measurement - Valeting Area
Lp (dB)
90
80
70
60
50
40
30
20
10
0
10:25:38
10:26:00
10:26:22
10:26:44
10:27:06
10:27:28
10:27:50
10:28:12
10:28:34
10:28:56
10:29:18
10:29:40
10:30:02
10:30:24
10:30:46
10:31:08
10:31:30
10:31:52
10:32:14
10:32:36
10:32:58
10:33:20
10:33:42
10:34:04
10:34:26
10:34:48
10:35:10
10:35:32
Time
LAeq
LAFmax

Appendix F – Calculations

Description	Value (dB)
Rw of Aerated Concrete Block	42.0
Rw of Composite Metal Panel	24.0
t of Aerated Concrete Block	6.3×10^{-5}
t of Composite Metal Panel	4.0×10^{-3}
t_{av}	2.0×10^{-3}
R_{av}	27.0

Table 16.0 – Composite R_w Calculation

CRTN Calculation

- $L_{10,1hour}$ = 42.2 + 10 x log (q), where q = vehicles per hour.

So, for 29 vehicle movements per hour, either entering or exiting the Proposed Development, the calculation would be:

- $L_{10,1hour}$ = 42.2 + 10 x log (29) = 56.8

Then a correction is applied to account for traffic speed and vehicle type (assuming no heavy vehicles):

With a speed limit of 16 km/h (10 mph)

- 33 * log (16 + 40 + 500/16) + 10 * log (1) – 68.8 = -4.8 dB

Then a correction is applied for the type of road surface. If the vehicles are expected to be travelling at less than 75 kph, a -1 dB correction is applied.

So, the overall traffic noise level for the access road would be:

- 57 – 6 for the $L_{A10,1hr}$ and 51 - 1 for the $L_{Aeq,1hr}$

Therefore, the $L_{Aeq,1hr}$ is predicted to be: **50 dB**