



Noise Impact Assessment of a Proposed Drive-Thru Coffee Facility

Client Name: Rochemont Ltd.

Client Address: 75/77 Drake Street, Rochdale, OL16 1SB

Site Address: Land at the Corner of Mellor Street & College Street, Rochdale, OL12

Date: 23/05/2022



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Executive Summary

An environmental noise survey and noise impact assessment have been undertaken for land at the corner of Mellor Street & College Street, Rochdale, OL12 to assess the potential increase in noise levels from a proposed Coffee Drive-Thru facility on the surrounding Noise Sensitive Receptors (NSRs). The measured background and ambient sound levels have allowed for BS4142:2014 and IEMA noise assessments to be carried out.

Provided the recommendations in the report are implemented, the BS4142:2014 assessments indicate that the rating sound level should not exceed the background sound level during the day time or night time operational hours. This indicates 'Low Impact' in accordance with BS4142:2014 and 'No Observed Effect Level' (NOEL) when assessed in accordance with the NPSE and NPPF.

An IEMA 'Increase in Ambient Noise Level' assessment has shown that the ambient noise level at the most affected NSR is predicted to rise by less than 0.6 dB during both the day time and night time operational hours. This is classed as a 'Not Significant' increase in accordance with the IEMA 'Guidance on Noise Impact Assessments' and 'No Observed Effect Level' (NOEL) when assessed in accordance with the NSPE and NPPF.

Recommendations and Mitigation Overview

- Install 1 No. AcousticA 'CP03 – C – 0560 – 1D' silencer (or alternative silencer with the minimum octave frequency band Insertion Loss (IL) values as seen in the Table 12.0) between the extraction fan and the flue terminus.
- HGV deliveries should not occur outside the hours of 07:00 to 23:00.

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

1. Introduction

Overview

NOVA Acoustics Ltd has been commissioned to prepare a noise assessment of a Proposed Drive-Thru Coffee Drive-Thru facility (the Proposed Development') on land at the Corner of Mellor Street & College Street, Rochdale, OL12 ('the Site').

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

The following technical noise assessment has been prepared to support the planning application to Rochdale 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.

Scope & Objectives

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

- Baseline sound monitoring survey to evaluate the prevailing background sound levels at the Closest Noise 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 BS4142:2014+A1:2019 – 'Methods for rating and assessing industrial and commercial sound'. Further information on the legislation can be found in Appendix B.

2. Environmental Noise Survey

Measurement Methodology

In order to characterise the sound profile of the area at the closest Noise Sensitive Receptor (NSR), an environmental sound survey was carried out from 04/05/22 to 06/05/22. For the long-term sound monitoring, a sound level meter was attached to a lamppost approximately 3.5m above the ground. The monitoring position was chosen in order to collect representative sound levels at the NSR during the typical operational periods of the proposed development. The monitoring location is shown in Figure 1.0 below.

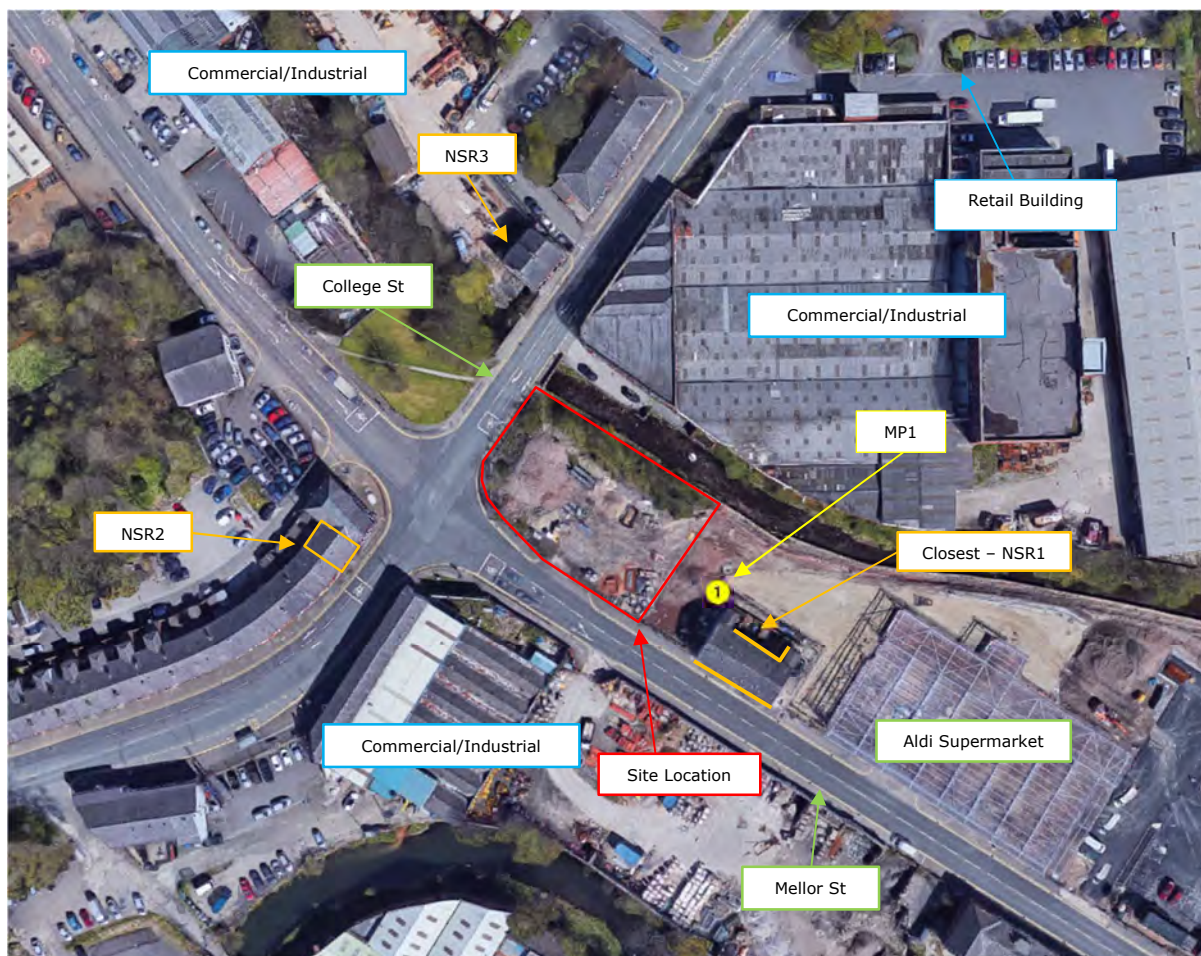


Figure 1.0 – Indicative Site Layout

Context & Subjective Impression

The site is located on vacant land at the corner of Mellor Street and College Street. The area surrounding the site consists primarily of commercial properties with residential dwellings located to the south-west and to the immediate south-east of the site.

The acoustic environment of the area is of a moderate to high level and is dominated by road traffic noise emissions from the surrounding road networks. During site visits HGV deliveries to the nearby Aldi supermarket were audible at MP1, however, no other commercial activity was audible above the road traffic noise emissions.

Background

The site plan illustrates the proposed development on a 0.34-acre (0.13HA) site. The main building footprint is 170sqm. Key features include:

- External Fixed Plant:** Located at the top left of the building footprint.
- Order Speaker:** Located on the left side of the building footprint.
- Extraction Flue Terminus:** Located at the bottom left of the building footprint.
- Development Site Area:** The entire 0.34-acre site is circled in red.
- HGV Delivery Area:** Located at the bottom right of the site, adjacent to the main building.
- NSR1 Windows:** Located on the right side of the building footprint, adjacent to the existing residential area.
- Retaining wall:** Located on the right side of the site, separating the development from the existing residential area.
- Existing Residential:** Located to the right of the development site.
- Boundary treatment to:** Located to the right of the development site, adjacent to the existing residential area.
- Min 1m level transition strip:** Located at the top of the site, adjacent to the existing residential area.
- 1 in 40 GRADIENT:** Located on the right side of the site, adjacent to the existing residential area.
- Staff Spaces (Unit 1):** Located on the right side of the site, adjacent to the existing residential area.
- Shuffled road (2 lanes):** Located at the bottom left of the site, adjacent to the main building.
- Bin store:** Located at the bottom left of the site, adjacent to the main building.
- Disabled parking:** Located on the left side of the site, adjacent to the main building.
- Other parking:** Located on the right side of the site, adjacent to the main building.

Figure 2.0 – Noise Source Indication

Environmental Noise Survey Results

The tables below outline the ambient and background sound levels measured during the proposed day time and night time operational periods 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} (dB)	L _{Amax,t} (dB)	L _{A90,t} (dB)	L _{A10,t} (dB)
Day 1: 22:00 – 23:00	61.0	85.0	51.0	64.0
Night 2: 06:30 – 07:00	59.0	75.0	58.0	60.0

Table 1.0 – Ambient Sound Level Results

The background noise levels measured during these periods are shown in the table below.

Measurement Position MP1				
Measurement Period ('t')	L _{A90,t} (dB)	*SMR L _{A90,t} (dB)	Min. L _{A90,t} (dB)	Max. L _{A90,t} (dB)
Day 2: 07:00 – 23:00	58.0	58.0	50.0	61.0
Night 2: 06:30 – 07:00	51.0	50.0	50.0	51.0

Table 2.0 – Background Sound Level Results

*Statistically Most Repeated

As can be seen in the table above, the ranges of measured background sound are relatively low during both the day time and night time periods. The statistically most repeated value during the day time is located close to the upper end of the range, therefore, to present a robust analysis, the lowest measured L_{A90,15min} measurement will be used for the assessments.

3. Noise Impact Assessments

BS4142:2014 Noise Impact Assessment

In the following section noise emissions from deliveries, external fixed plant, and the order speaker will be assessed.

Specific Sound Levels

The specific sound levels which will be used in the noise model are defined in the following section.

Order Speaker:

The table below outlines the expected noise levels from orders taken at the drive-thru order bay.

Description	Day/Night Time (dBA)
Normal Voice Noise Level at 1m	60.0
2 No. Voices at 1m	63.0
Calculated Sound Power Level	71.0

Table 3.0 – Order Bay Speaker Noise Emissions

Deliveries:

It is assumed that deliveries to the Proposed Development will **not occur outside the hours of 07:00 to 23:00 daily** in order to reduce the possibility of impact during the night time period (06:30 – 07:00). In order to assess the noise levels from deliveries, data has been taken from a report compiled by 'Noise Solutions Ltd' for a Waitrose Supermarket in London (ref. 86053). In the report, delivery noise levels are predicted using SEL calculations, which take into account each separate process during a delivery period. The table of SEL noise data at 10m is shown below. It is understood that the noise levels used below will represent a worst-case scenario when considering any given delivery at the proposed development.

Noise Source	SEL (dBA)
Lorry Arrival	68.0
Lorry Manoeuvring (No Reversing Alarms)	75.0
Unloading cages onto Lift	71.0
Unloading Pallets onto Lift	75.0
Lorry Lift Up	73.0
Lorry Lift Down	71.0
Unloading Cages/Pallets into BoH	78.0
Lorry Departure	75.0

Table 4.0 – Delivery Noise SEL Data

The information in the table is then used to calculate a single source noise level based on the number of events over the required assessment period using the following equation:

$L_{Aeq,T} = SEL - 10\log(T) + 10\log(N)$; where SEL is the L_{Aeq} over a one second period and represents the noise energy from an event (e.g. pallet loading) compressed into one second; T is the reference time period in seconds; and N is the number of movements in the time period, T .

The predicted cumulative noise level of a single delivery over a 1-hour day time assessment period can be seen in the table below. Given the size of the Proposed Development, it is assumed that 2 large cages and 2 full pallets of produce are loaded into the coffee facility.

Day Time Delivery Noise Level (1-Hour Assessment Period)			
Noise Source	SEL (dBA)	No. of Actions	$L_{Aeq,1hr}$ at 10m (dBA)
Lorry Arrival	68.0	1	32.0
Lorry Manoeuvring	75.0	2	42.0
Unloading cages onto Lift	71.0	2	38.0
Unloading Pallets onto Lift	75.0	2	42.0
Lorry Lift Up	73.0	4	43.0
Lorry Lift Down	71.0	4	41.0
Unloading Cages/Pallets into BoH	78.0	4	48.0
Lorry Departure	75.0	1	39.0
Total $L_{Aeq,1hr}$ at 10m (dBA)	52.0		
Resultant Sound Power Level (dBA)	80.0		

Table 5.0 – Predicted Delivery Noise Levels

External Fixed Plant – Inverter Heat Pumps:

NOVA Acoustics has been informed that 2 No. Mitsubishi PUHZ-RP125YKA inverter heat pumps are to be installed at ground level on the north-east elevation of the Proposed Development.

Description	Value (dBA)
Sound Pressure Level of 1 No. Mitsubishi PUHZ-RP125YKA (L_p)	52.0
Calculated Sound Power Level of 1 No. PUHZ-RP125YKA (L_w)	60.0
Calculated Sound Power Level of 2 No. PUHZ-RP125YKA (L_w)	63.0

Table 6.0 – External Inverter Heat Pump Noise Data

External Fixed Plant – Kitchen Extraction Outlet:

NOVA Acoustics has been informed the following kitchen extraction system will be installed:

- 1 No. JM Aerofoil extraction fan (56JM/16/4/5/32) is to be installed internally. The fabric of the building is assumed to provide sufficient sound reduction to ensure any breakout noise emissions from the fan casing are not a concern, and thus will not be considered in the calculations.
- The ductwork is 560mm in diameter and it is assumed there are no elbows and no ductwork silencers.
- The ductwork penetrates through the roof and is assumed to terminate 1m above.

The following table presents the calculated sound power level of the flue terminus considering the above. Full calculations can be found in Appendix F.

Description	Value (dBA)
Calculated Sound Power Level of Flue Terminus (L_w)	82.0

Table 7.0 – Kitchen Extraction System Noise Data

Noise Modelling

The specific sound level at the NSRs has been calculated using SoundPlan 8.2, which undertakes its calculations 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 sound levels presented in the section above have been inputted into the sound map.
- The noise emissions from the order bay speaker have been modelled as a point source emitter 1.5m above the ground in the location identified in Figure 1.0.
- The noise emissions from the extraction flue terminus have been modelled as a point source emitter 1m above the roof of the Proposed Development in location identified in Figure 1.0.
- The noise emissions from the 2 No. inverter heat pumps have been modelled as a single point source emitter 1m above the ground and 0.5m from the north-east elevation as identified in Figure 1.0.
- The noise emissions from the deliveries have been modelled as a point source emitter 1.5m above the ground.
- It is assumed deliveries will take place at the south-eastern elevation of the building where the main entrance/exit is located. If this is not the case, the assessment will need to be amended.
- All external fixed plant is assumed to operate continuously.
- The grid height of the map is set to 1.5m.

The sound maps showing the specific sound level emissions from the Proposed Development can be seen below in Figures 3.0 and 4.0.

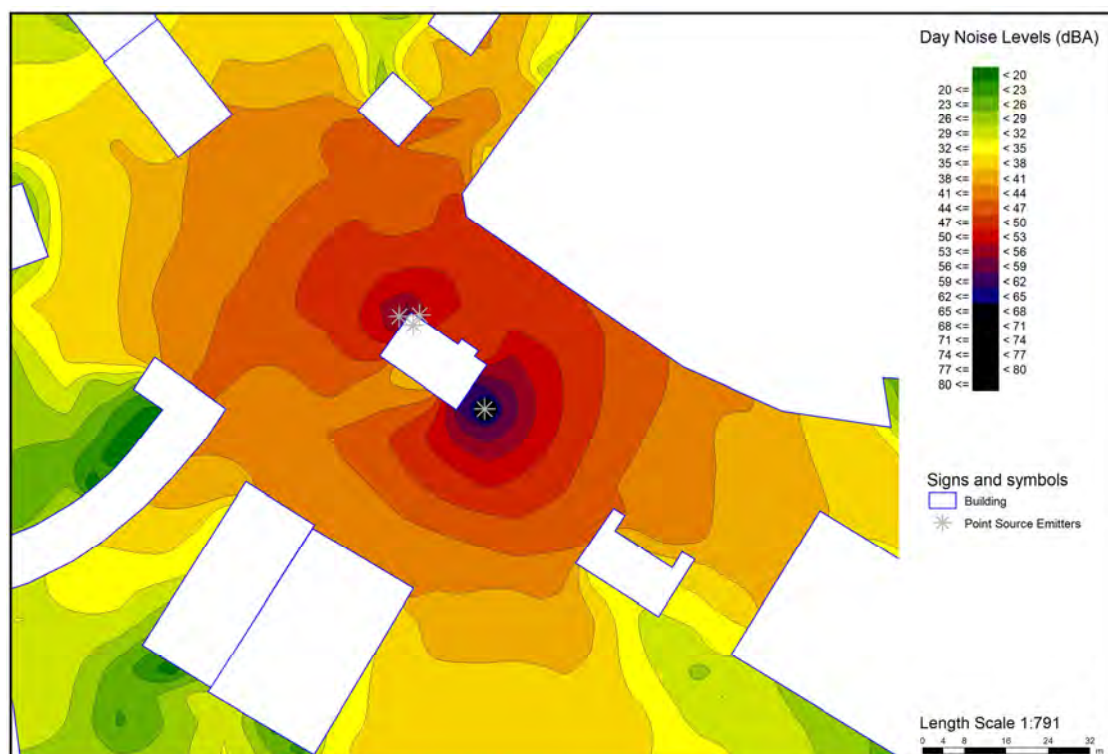


Figure 3.0 – Order Speaker, Fixed Plant and Delivery Sound Map – 1.5m Grid Height (Day)

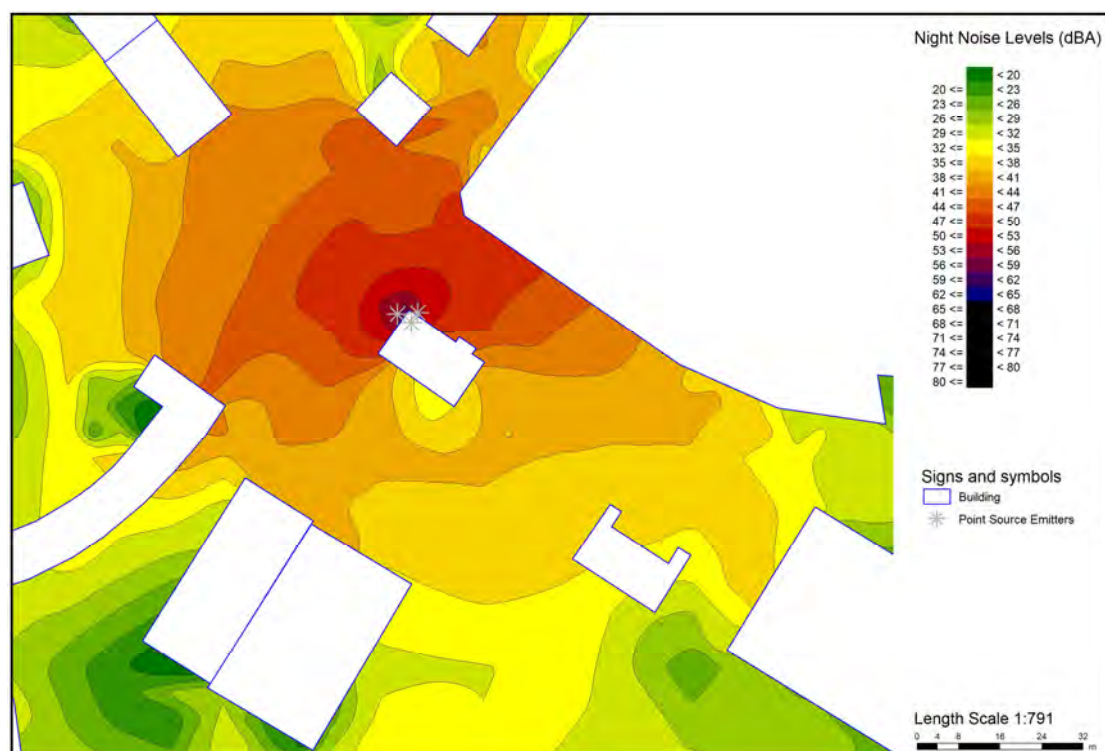


Figure 4.0 – Order Speaker and Fixed Plant Sound Map – 1.5m Grid Height (Night)

A summary of the Specific Sound Levels at the NSRs based on the sound maps shown above can be seen in the following table.

NSR	Day Time (dBA)	Night Time (dBA)
1	40.0	37.0
2	41.0	40.0
3	44.0	44.0

Table 8.0 – Specific Sound Level at NSR Summary

Rating LevelRating Penalty Assessment:

Considering the requirements of the rating penalty, an assessment of the various sound sources associated with the Proposed Development has been undertaken and has been detailed in the following table.

Time Period	Source	Tonality	Impulsivity	Intermittency	Other Sound Characteristics
Day	Deliveries, Fixed Plant & Order Speaker	+2.0	+3.0	+3.0	--
Night	Fixed Plant & Order Speaker	+2.0	--	+3.0	--

Discussion

During the day, the cumulative delivery and fixed plant noise will contain tonal aspects (engine and fixed plant units), impulsive components (unloading pallets and cages), and will be intermittent in nature. In total, a +8.0 dB penalty will be applied to the specific sound levels at the NSRs during the day time assessment period.

However, during the night no deliveries are expected, thus no penalty for impulsivity is applied. In total a +5.0 dB penalty will be applied to the specific sound levels at the NSRs during the night time assessment period.

Table 9.0 – Rating Penalty Assessment

Incorporating the rating penalties with the Specific Sound Levels, the rating sound levels have been derived and are detailed in the following table.

NSR	Day Time (dBA)	Night Time (dBA)
1	48.0	42.0
2	49.0	45.0
3	52.0	49.0

Table 10.0 – Rating Sound Level at NSRs

BS4142:2014 Noise Impact Assessment

The rating sound level has been assessed in accordance with BS4142:2014 at the most affected NSRs. The BS4142:2014 assessments at the NSRs during the day and night periods can be seen in the following table.

Day Time Assessment			
NSR	Results	Sound Level (dB)	Notes
1	Rating Sound Level	48.0	As shown in Table 10.0.
	Operational Period Background Sound Level	50.0	As shown in Table 2.0.
	Excess of Rating over Background Sound Level	-2.0	Assessment Indicates 'Low Impact'.
2	Rating Sound Level	49.0	As shown in Table 10.0.
	Operational Period Background Sound Level	50.0	As shown in Table 2.0.
	Excess of Rating over Background Sound Level	-1.0	Assessment Indicates 'Low Impact'.
3	Rating Sound Level	52.0	As shown in Table 10.0.
	Operational Period Background Sound Level	50.0	As shown in Table 2.0.
	Excess of Rating over Background Sound Level	+2.0	Assessment Indicates Low Level of 'Adverse Impact'.
Night Time Assessment			
NSR	Results	Sound Level (dB)	Notes
1	Rating Sound Level	42.0	As shown in Table 10.0.
	Operational Period Background Sound Level	50.0	As shown in Table 2.0.
	Excess of Rating over Background Sound Level	-8.0	Assessment Indicates 'Low Impact'.
2	Rating Sound Level	45.0	As shown in Table 10.0.
	Operational Period Background Sound Level	50.0	As shown in Table 2.0.
	Excess of Rating over Background Sound Level	-5.0	Assessment Indicates 'Low Impact'.
3	Rating Sound Level	49.0	As shown in Table 10.0.

Operational Period Background Sound Level	50.0	As shown in Table 2.0.
Excess of Rating over Background Sound Level	-1.0	Assessment Indicates 'Low Impact'.

Table 11.0 – BS4142:2014 Assessment

Discussion

The table above shows that during the day time operational period, the rating sound levels at NSR1 and NSR2 are not predicted to exceed the prevailing background sound level. This indicates 'Low Impact' in accordance with BS4142:2014 and 'No Observed Effect Level' (NOEL) when assessed in accordance with the NPSE and NPPF. However, the day time rating sound level at NSR3 is predicted to exceed the prevailing background sound level by 2.0 dB, which indicates a low level of 'Adverse Impact' in accordance with BS4142:2014 and 'Lowest Observed Adverse Effect Level' (LOAEL) when assessed in accordance with the NPSE and NPPF.

The table above also shows that during the night time operational period, the rating sound levels at all NSRs are not predicted to exceed the prevailing background sound level. This again indicates 'Low Impact' in accordance with BS4142:2014 and 'No Observed Effect Level' (NOEL) when assessed in accordance with the NPSE and NPPF.

Recommendations and Mitigation Measures

The following section provides recommended mitigation measures to reduce the noise impact of the Proposed Development.

According to the SoundPlan noise modelling software, the primary noise emissions affecting NSR3 are produced by the extraction flue terminus. Give this analysis, the following mitigation measures should be recommended:

- Install 1 No. AcousticA 'CP03 – C – 0560 – 1D' silencer between the extraction fan and the flue terminus.

It should be noted that any extraction ductwork silencer may be installed so long as it achieves the minimum octave frequency band Insertion Loss (IL) values as seen in the table below.

Minimum IL of Extraction Ductwork Silencer (IL, Hz, dB)								
Description	63	125	250	500	1k	2k	4k	8k
Min. IL	2.0	4.0	7.0	14.0	14.0	9.0	9.0	7.0

Table 12.0 – Minimum Insertion Loss Values for Extraction Ductwork Silencer

The following figures show the sound maps of the specific sound level emissions from the Proposed Development considering the proposed mitigation measures.

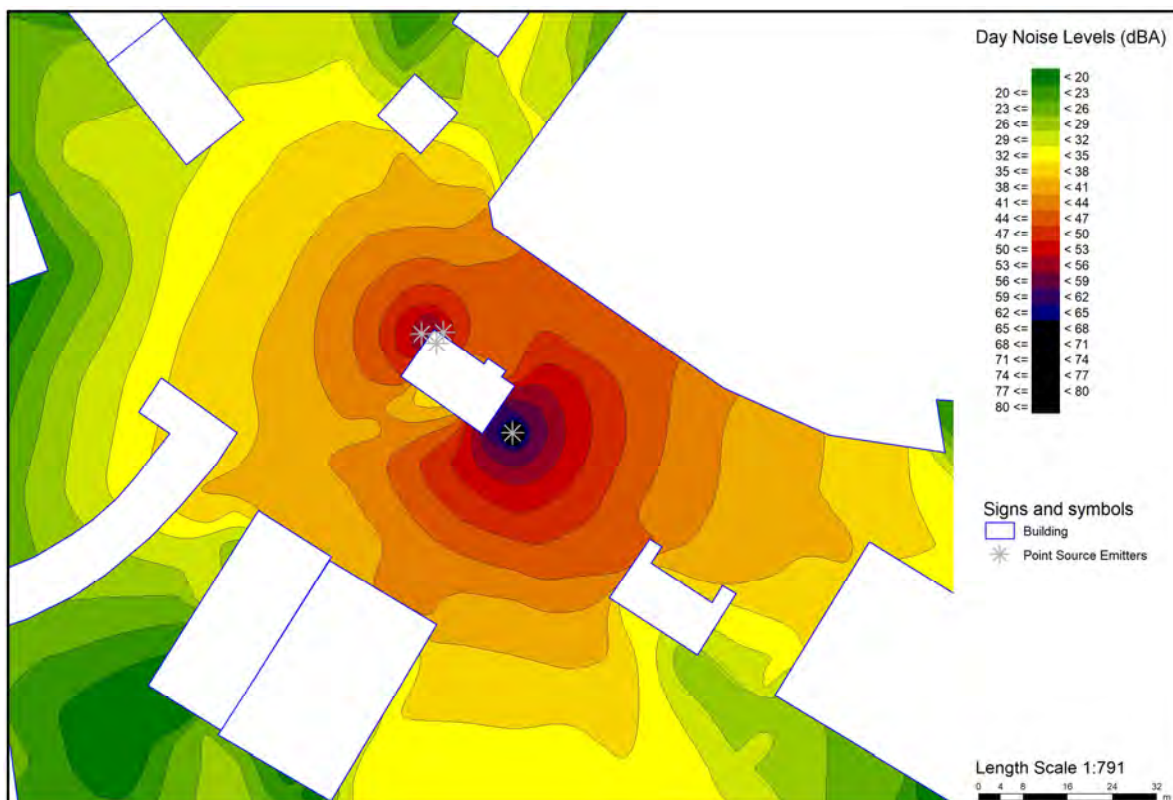


Figure 5.0 – Sound Map Mitigated – 1.5m Grid Height (Day)

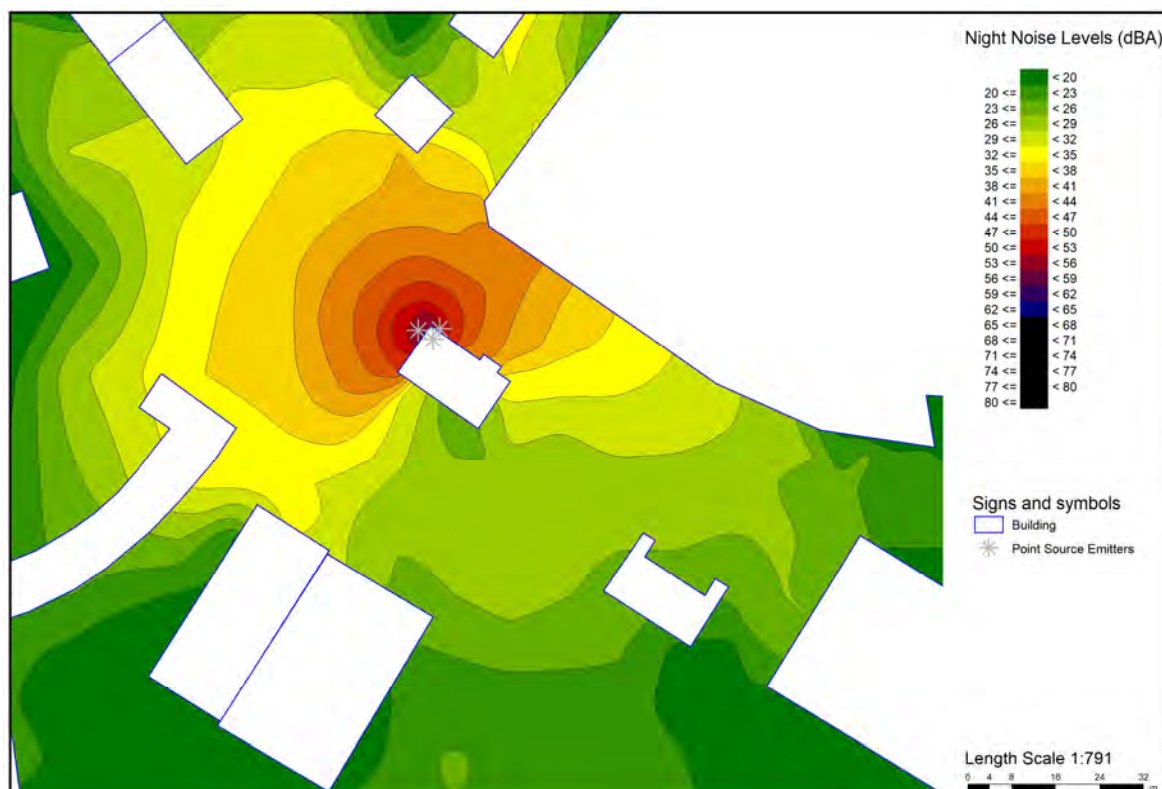


Figure 6.0 – Sound Map Mitigated – 1.5m Grid Height (Night)

The following table presents the specific sound levels at each NSR and the resultant rating sound level considering the rating penalty assessment shown in Table 9.0.

Description	Day Time (dBA)	Night Time (dBA)
NSR1 – Specific Sound Level	38.0	27.0
NSR1 – Rating Sound Level	46.0	32.0
NSR2 – Specific Sound Level	37.0	32.0
NSR2 – Rating Sound Level	45.0	37.0
NSR3 – Specific Sound Level	38.0	37.0
NSR3 – Rating Sound Level	46.0	42.0

Table 13.0 – Rating Sound Level at NSRs Considering Mitigation Measures

The rating sound levels have been assessed in accordance with BS4142:2014 at the most affected NSRs. The BS4142:2014 assessments at the NSRs during the day and night periods considering the proposed mitigation measures can be seen in the following table.

Day Time Assessment			
NSR	Results	Sound Level (dB)	Notes
1	Rating Sound Level	46.0	As shown in Table 13.0.
	Operational Period Background Sound Level	50.0	As shown in Table 2.0.
	Excess of Rating over Background Sound Level	-4.0	Assessment Indicates 'Low Impact'.
2	Rating Sound Level	45.0	As shown in Table 13.0.
	Operational Period Background Sound Level	50.0	As shown in Table 2.0.
	Excess of Rating over Background Sound Level	-5.0	Assessment Indicates 'Low Impact'.
3	Rating Sound Level	46.0	As shown in Table 13.0.
	Operational Period Background Sound Level	50.0	As shown in Table 2.0.
	Excess of Rating over Background Sound Level	-4.0	Assessment Indicates 'Low Impact'.
Night Time Assessment			
NSR	Results	Sound Level (dB)	Notes
1	Rating Sound Level	32.0	As shown in Table 13.0.
	Operational Period Background Sound Level	50.0	As shown in Table 2.0.
	Excess of Rating over Background Sound Level	-18.0	Assessment Indicates 'Low Impact'.
2	Rating Sound Level	37.0	As shown in Table 13.0.
	Operational Period Background Sound Level	50.0	As shown in Table 2.0.
	Excess of Rating over Background Sound Level	-13.0	Assessment Indicates 'Low Impact'.
3	Rating Sound Level	42.0	As shown in Table 13.0.
	Operational Period Background Sound Level	50.0	As shown in Table 2.0.
	Excess of Rating over Background Sound Level	-8.0	Assessment Indicates 'Low Impact'.

Table 14.0 – BS4142:2014 Assessment – Mitigated

Discussion

The table above shows that should the proposed mitigation measures be adhere to, the rating sound level during both the day time and night time operational periods is predicted to be at least 4.0 dB below prevailing background sound level at all NSRs. This indicates 'Low Impact' in accordance with BS4142:2014 and 'No Observed Effect Level' (NOEL) when assessed in accordance with the NPSE and NPPF.

Drive-Thru Traffic Noise Assessment

In the following section, the noise level considering the increase in traffic from the car park due to the Proposed Development is assessed.

CRTN Calculations of Drive-Thru Traffic:

The noise levels have been predicted using the 'Calculation of Road Traffic Noise' (CRTN) document compiled by the Welsh Transport Authority. The calculation considered the following factors:

- Predicted traffic flow,
- Type of road surface,
- Vehicle speed,
- Vehicle type,
- Road gradient.

A transport statement has been prepared by SCP (doc ref: LB/210733/TS/0) which presents expected drive thru traffic during peak hours. The document states a peak flow of 47 vehicles between 12:00 to 13:00. However, there are no predictions for operational period between 06:30 to 07:00 hours, therefore, to provide a robust assessment, a peak flow of 24 vehicles has been assumed. The table below shows the full CRTN calculation and the calculated $L_{Aeq,1hr}$ noise emissions from the drive-thru vehicles. The night time value is time corrected to show traffic movements for 30 minutes per hour.

Description	Day Time 1-hour (dBA)	Night Time 30-min (dBA)	Notes
Traffic Flow (No. of Vehicles)	47	24	
Uncorrected $L_{A10,1hr}$	58.9	56.0	
Speed and Vehicle Type Correction	-1.4	-1.4	Assumed 5 mph speed limit and 0% heavy vehicles.
Road Surface Correction	-1.0	-1.0	Assumed impervious bitumen surface.
Corrected $L_{A10,1hr}$	56.6	53.6	
Calculated L_{Aeq}	55.6	52.6	Corrected $L_{A10,1hr}$ – 1.0 dB
Time Corrected L_{Aeq}	--	49.6	$L_{Aeq} - 10 \cdot \log(60/30)$

Table 15.0 – Drive-Thru CRTN Calculations

Specific Sound Levels

The calculated drive thru $L_{Aeq,1hr}$ (day time) and $L_{Aeq,30min}$ (night time) have been inputted to the SoundPlan 8.2 noise model and modelled as a road.

The sound map showing the specific sound level emissions from the drive-thru vehicle noise can be seen below in Figures 7.0 and 8.0. Again, a map height of 1.5m has been selected.

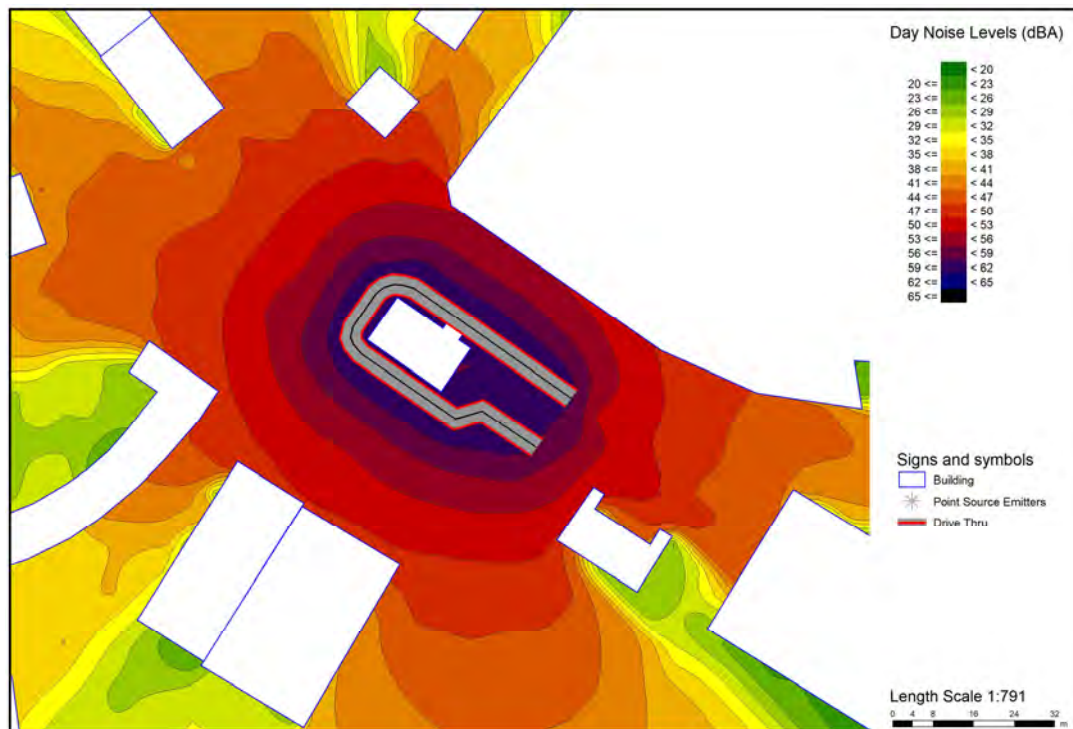


Figure 7.0 – Drive-Thru Traffic Sound Map – 1.5m Grid Height (Day Time)

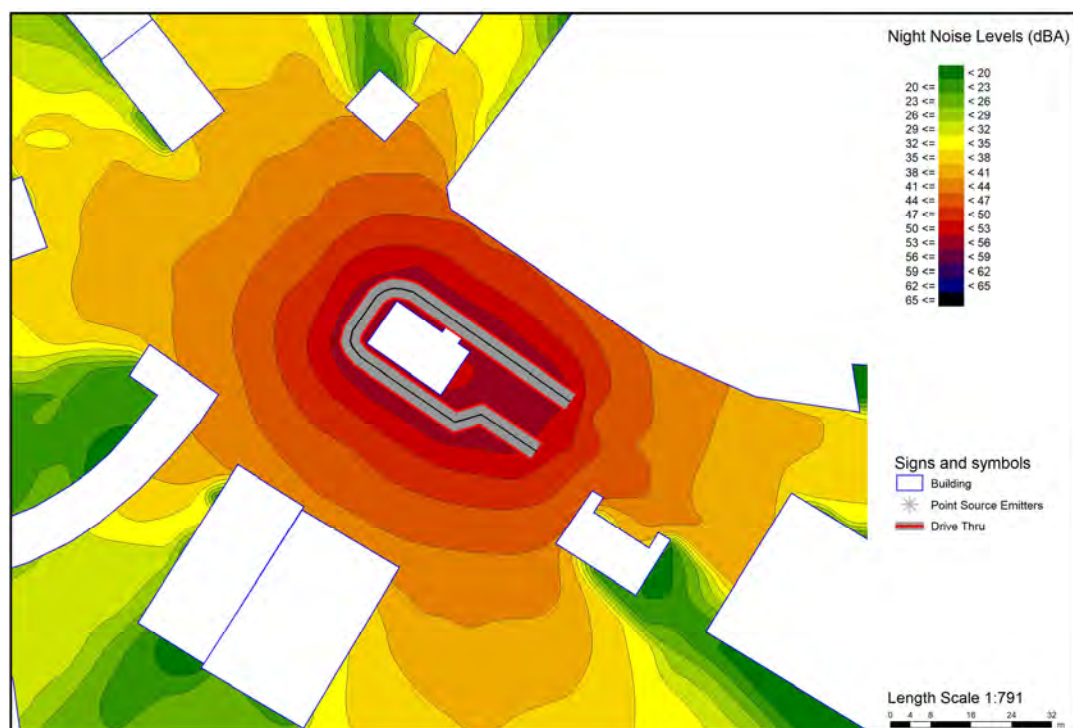


Figure 8.0 – Drive-Thru Traffic Sound Map – 1.5m Grid Height (Night Time)

The specific sound levels at the NSR based on the sound maps shown in the figures above, can be seen in the following table.

NSR	Day Time (dBA)	Night Time (dBA)
1	52.0	46.0
2	50.0	43.0
3	52.0	45.0

Table 16.0 – Specific Sound Level at NSR Summary

Increase in Ambient Noise Assessment of Drive-Thru Traffic

In the following section the expected increase in noise levels due to the vehicle movements in the drive-thru is assessed. The specific sound levels at the worst affected NSR are logarithmically added to the measured ambient noise levels presented in Table 1.0. The higher the increase in noise levels the higher the expected impact.

Description	Day Time (dBA)	Night Time (dBA)
Specific Sound Level at NSR1	52.0	46.0
Lowest Measured Ambient Noise Level	61.0	59.0
Resultant Noise Level	61.5	59.2
Increase in Noise Levels	+0.5	+0.2
IEMA Impact Rating	'Not Significant'	'Not Significant'

Table 17.0 – Increase in Ambient Noise Level Assessment of Drive-Thru Traffic

Discussion

The assessment above indicates that the expected increase in noise levels due to patron vehicle movements during both the day and night time operational periods is to be 'Not Significant' when assessed in accordance with the IEMA Guidelines on Noise Impact. This equates to 'No Observed Effect Level' (NOEL) when assessed in accordance with the NPSE and NPPF.

Cumulative Increase in Ambient Noise Assessment

The following section assesses the predicted cumulative impact at the NSRs. The sources to be assessed are:

- Order bay speaker.
- Predicted delivery noise during the day time operational hours only.
- External fixed plant considering the proposed extraction system silencer.
- Drive-thru vehicle noise.

The sound maps showing the cumulative specific sound level emissions from the Proposed Development can be seen below in Figures 9.0 and 10.0. Again, a map height of 1.5m has been selected.

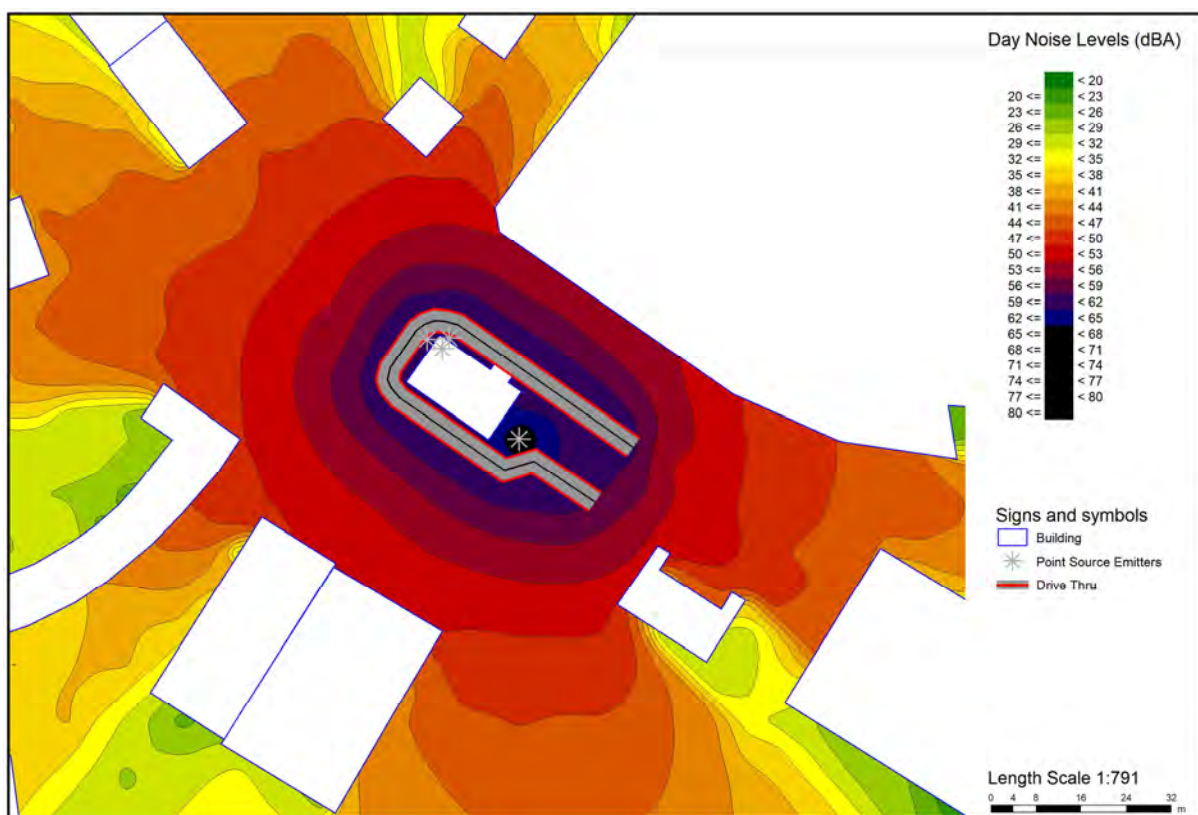


Figure 9.0 – Cumulative Sound Map – 1.5m Grid Height (Day Time)

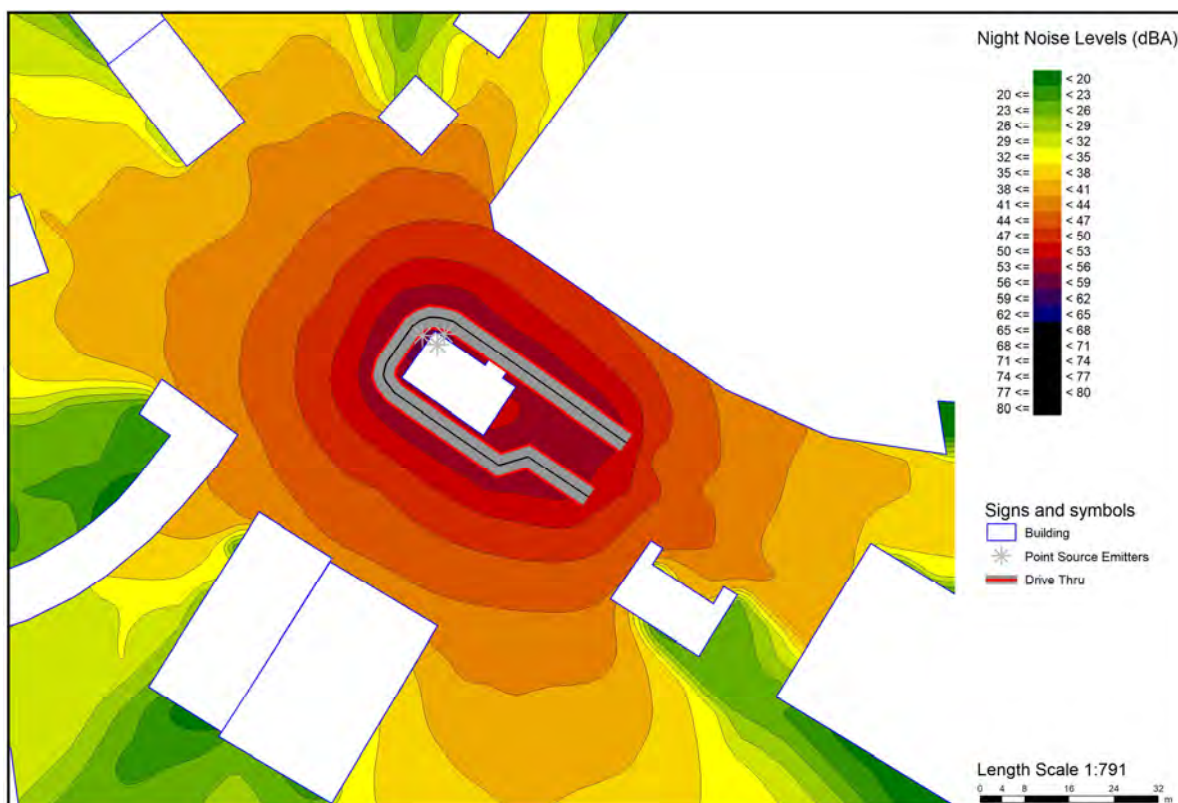


Figure 10.0 – Cumulative Sound Map – 1.5m Grid Height (Night Time)

The specific sound levels at the NSR based on the noise maps shown in the figures above can be seen in the following table.

NSR	Day Time (dBA)	Night Time (dBA)
1	53.0	46.0
2	50.0	44.0
3	52.0	46.0

Table 18.0 – Specific Sound Level at NSR Summary

Increase in Ambient Noise Level Assessment		
Description	Day Time (dBA)	Night Time (dBA)
Specific Sound Level at NSR1	53.0	46.0
Lowest Measured Ambient Noise Level	61.0	59.0
Resulting Noise Level	61.6	59.2
Increase in Ambient Noise Level	+0.6	+0.2
Expected Impact	'Not Significant'	'Not Significant'

Table 19.0 – Cumulative Noise Level Assessment

Discussion

The assessment above indicates that provided the mitigation measures as specified within this report are adhered to, the expected increase in noise levels from the Proposed Development during the day time and night time operational periods is to be 'Not Significant' when assessed in accordance with the IEMA Guidelines on Noise Impact. This equates to 'No Observed Effect Level' (NOEL) when assessed in accordance with the NPSE and NPPF.

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 log ₁₀ (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 normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

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

For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10} , the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the

time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq} .

This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound. To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

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

Appendix B – Legislation, Policy and Guidance

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

B.1 – National Planning Policy Framework (2021)

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

Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;

Paragraph 185 states:

Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

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

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

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

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

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

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

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

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

SOAEL – Significant Observed Adverse Effect Level

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

LOAEL – Lowest Observed Adverse Effect Level

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

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise. This can be related to the third aim above, which seeks: “where possible, positively to improve health and quality of life through the pro-active management of noise while also considering the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.”

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

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

B.3 – British Standard BS4142:2014+A1:2019 – ‘Methods for rating and assessing industrial and commercial sound’

Overview

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.

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.”

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.

Assessment of Impact

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.”

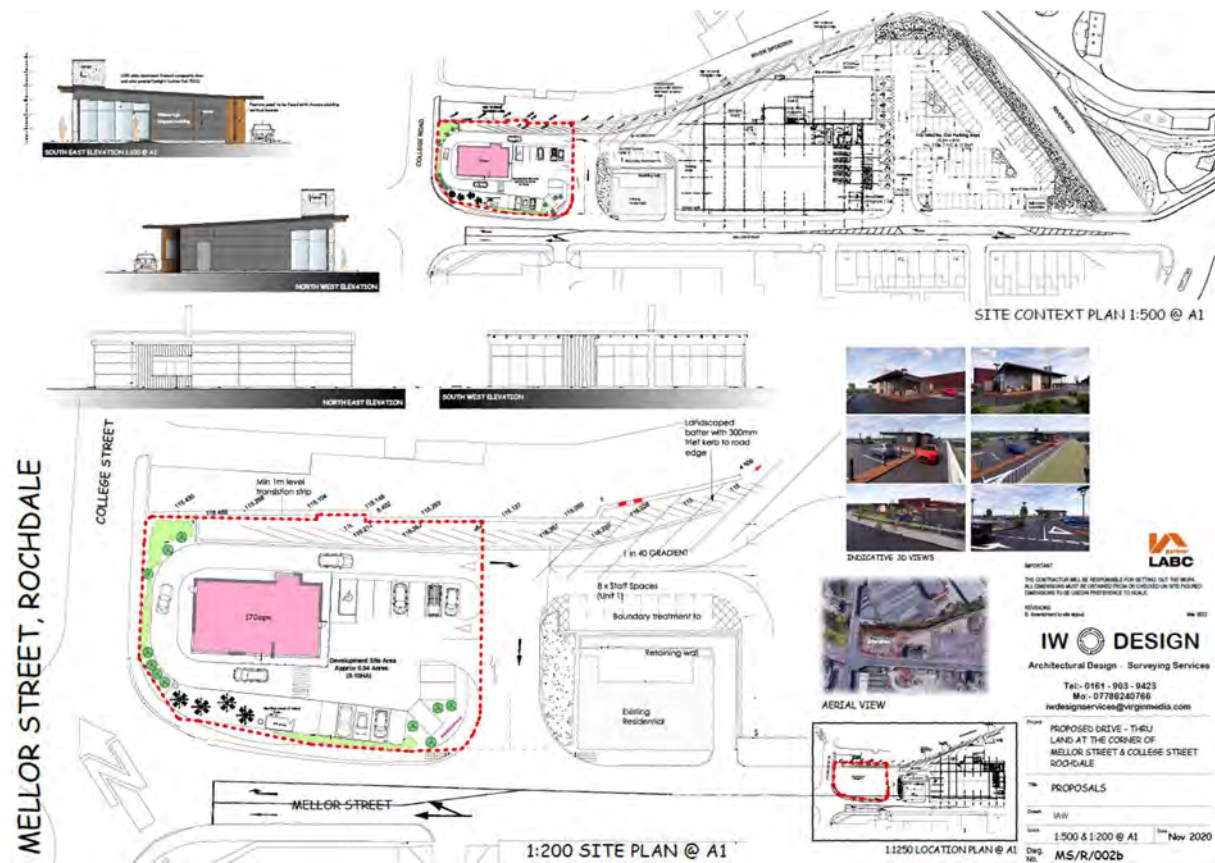
Interpreting the guidance given in BS4142:2014, with consideration of the guidance given in the NPSE and NPPG Noise, an estimation of the impact of the rating sound is summarised in the following text:

- 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.

Appendix C – Site Plans



Appendix D – Environmental Survey

D.1 – Tabulated Summary Noise Data

Measurement Position MP1				
Measurement Time Period ('t')	L _{Aeq,t} (dB)	L _{Amax,t} (dB)	L _{A90,t} (dB)	L _{A10,t} (dB)
Day 1 - 04/05/22: 13:00 – 23:00	63.0	87.0	61.0	64.0
Night 1 – 04/05/22: 23:00 – 07:00	56.0	84.0	49.0	59.0
Day 2 - 05/05/22: 07:00 – 23:00	63.0	95.0	62.0	65.0
Night 2 – 05/05/22: 23:00 – 07:00	58.0	93.0	48.0	61.0
Day 3 - 06/05/22: 07:00 – 11:45	64.0	82.0	63.0	65.0

L _{A90} Analysis				
Measurement Period ('t')	L _{A90,t} (dB)	*SMR L _{A90,t} (dB)	Min. L _{A90,t} (dB)	Max. L _{A90,t} (dB)
Day 1 - 04/05/22: 13:00 – 23:00	61.0	59.0	50.0	61.0
Night 1 – 04/05/22: 23:00 – 07:00	49.0	42.0	41.0	53.0
Day 2 - 05/05/22: 07:00 – 23:00	58.0	58.0	50.0	61.0
Night 2 – 05/05/22: 23:00 – 07:00	48.0	41.0	40.0	51.0
Day 3 - 06/05/22: 07:00 – 11:45	58.0	57.0	54.0	61.0

Table 20.0 – Sound Survey Summary Results

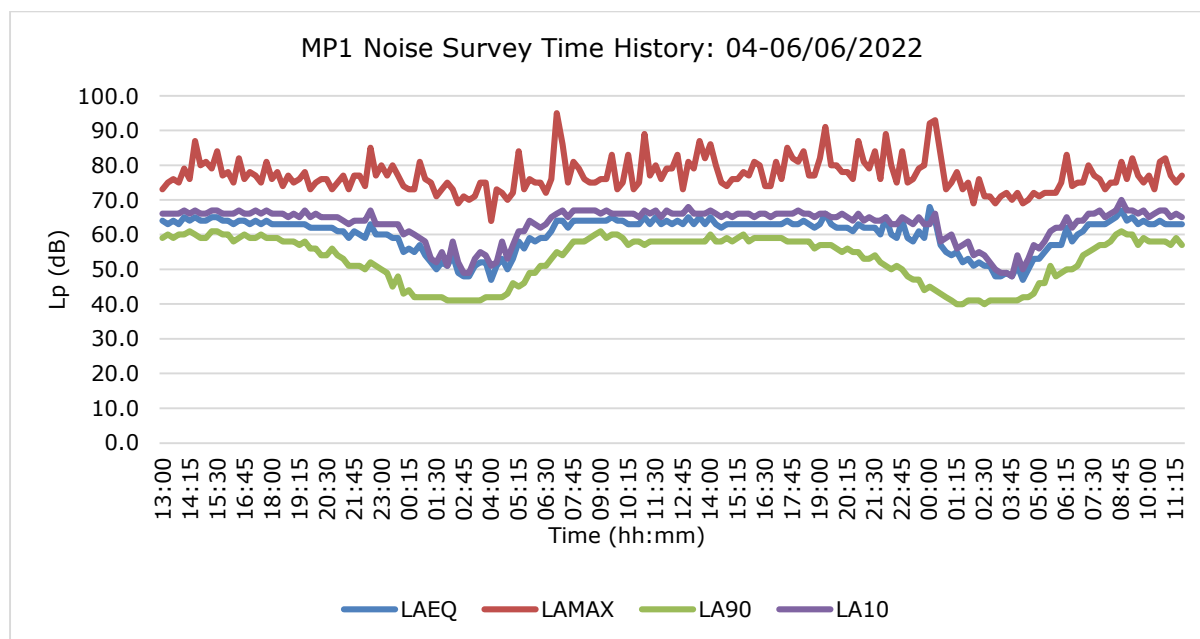


Figure 11.0 – MP1 Noise Survey Time History

D.2 – Surveying Equipment

Piece of Equipment	Serial No.	Calibration Deviation
Svante 971 Class 1 Sound Level Meter	77796	≤0.5
Svante SV33B Class 1 Calibrator	116639	

Table 21.0 – Measurement Equipment

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

D.3 – Meteorological Conditions

As the environmental noise survey was carried out over a long un-manned period no localised records of weather conditions were taken. However, all measurements have been compared with met office weather data of the area, specifically the closest weather station, and 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 – Chadderton (Approx. 8km South of Site)				
Time Period	Air Temp (°C)	Rainfall (mm/h)	Prevailing Wind Direction	Wind Speed (m/s)
04/05/2022: 00:00 – 23:59	8.1 – 12.1	0.0 – 2.0	WSW	0.0 – 4.4
05/05/2022: 00:00 – 23:59	6.7 – 16.7	0.0	W	0.0 – 3.1
06/05/2022: 00:00 – 23:59	10.4 – 15.1	0.0 – 1.2	SW	0.0 – 4.4

Table 22.0 – Weather Summary

The table above shows the weather data recorded at the second closest weather station as the closest weather station in Rochdale did not record the relevant weather data.

Appendix E – Manufacturer's Datasheets

Technical Details



Technical Data Sheet

JM Aerofoil

Project Name	: jm single phase pdf
Quotation Number	:
Customer	: nfs
FanCode	56JM/16/4/5/32
FanDiameter /Size	560mm
Blades	5
FanSpeed	1420 rpm
Velocity	10.0 m/s
BladeAngle	32°
Form of Running	B
FanCasing	Long
RequestedDuty	2.45m³/s @ 192 Pa (static)
OutletDynamic Pressure	60 Pa
DutyShaft Power	0.955kW
MaxShaft Power	0.974kW
Total Efficiency	65 %
MotorFrame	CT9
MotorRating	0.970kW
Full LoadCurrent	6.7A
StartingCurrent	13.5A
MotorMounting	Pad
ElectricalSupply	220-240 Volts 50 Hz 1 Phase
StartType	DOL
MotorWinding	Standard
Enclosure	StandardAll
AirDensity	1.2 kg/m³ / 20 °C / 0 m / 50% RH
Smoke Venting	Non Smoke Venting
ProductNumber	DX571456

	Sound Spectrum (Hz)								Overall	
	63	125	250	500	1k	2k	4k	8k	Lw*	LpA@ 3m**
Inlet*	78	81	76	77	74	71	67	63	85	59
Outlet*	79	81	76	77	74	71	68	64	85	59
Breakout*	69	60	50	52	49	44	49	40	70	35

* Lw dB re 10⁻¹² W** dBA re 2x10⁻⁵ Pa

Performance data has been derived from tests carried out in a Flakt Woods laboratory, in accordance with ISO 5801 and is specifically applicable for Ducted installations. When an electronic controller is incorporated, enhanced motor noise can occur - particularly when the operating speed is well below maximum. FWL therefore recommend using a auto transformer speed controller for noise sensitive applications.

Acoustic data has been derived from tests carried out in a Flakt Woods laboratory, in accordance with BS 848 Pt2, 1985 under Ducted conditions. The single figure provided is the overall Inlet sound pressure level at the specified distance, under spherical, free field conditions. Breakout levels stated are estimated from induct sound power levels and are provided for guidance.

Terms and Conditions: This offer is made subject to the terms and conditions detailed on the accompanying letter.

CP03 C Series



CP03 - CA - 0560 Silencer

Available in two standard lengths C Series silencers have excellent attenuation properties, achieved with sound absorbing infill retained in the attenuator casing by a perforated liner. The central pod (code P) is an option to increase the insertion loss, however it will add resistance.

- Fits directly onto 560mm diameter fans
- Standard lengths 560mm (1D) & 1120mm (2D)
- Use up to 70°C (standard construction)
- Systems up to 1000 Pascals
- Special lengths on request

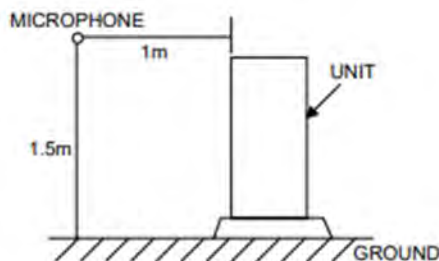


Insertion Loss (dB) - Centre Band Frequency

Product Code	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
CP03 - C* - 0560 - 1D	2	4	7	14	14	9	9	7
CP03 - C* - 0560 - 2D	3	6	10	19	20	14	12	10
CP03 - C*P - 0560 - 1D	3	7	9	18	24	24	20	15
CP03 - C*P - 0560 - 2D	4	9	17	27	29	28	23	23

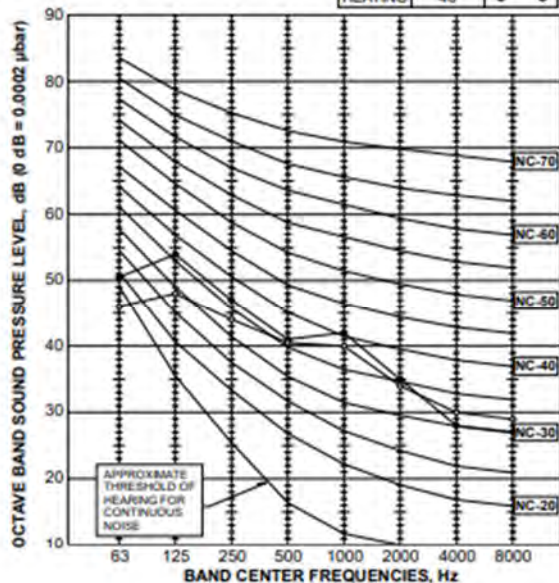
Replace * in code with A or B for connection pattern. Insertion loss data is derived from continual testing to BS4718 and other standards in independent UKAS certified laboratories, which includes where appropriate, re-generated or self noise testing in both forward and reverse flow conditions. If you request system analysis from our technicians all predictions will be assessed using the relevant certified insertion loss data together with relevant dynamic corrections.

5-4. NOISE CRITERION CURVES



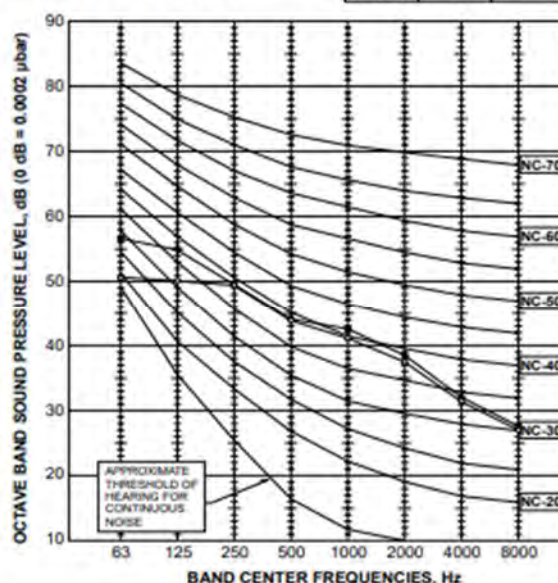
PUHZ-RP35/50VHA4

MODE	SPL(dB)	LINE
COOLING	44	○—○
HEATING	46	●—●



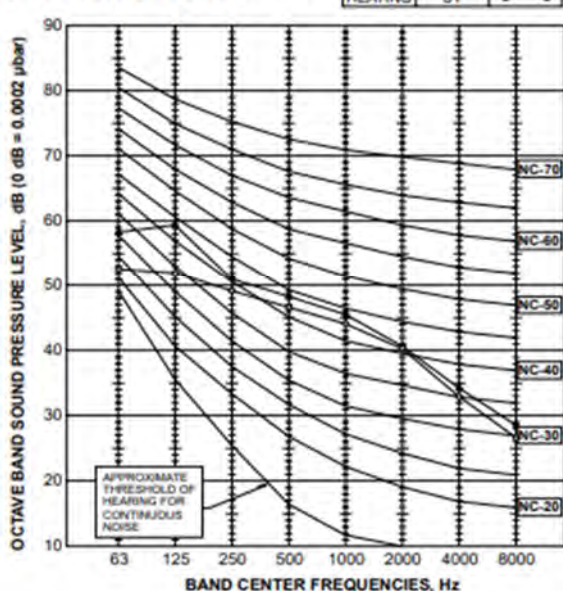
**PUHZ-RP60VHA4
PUHZ-RP71VHA4**

MODE	SPL(dB)	LINE
COOLING	47	○—○
HEATING	48	●—●



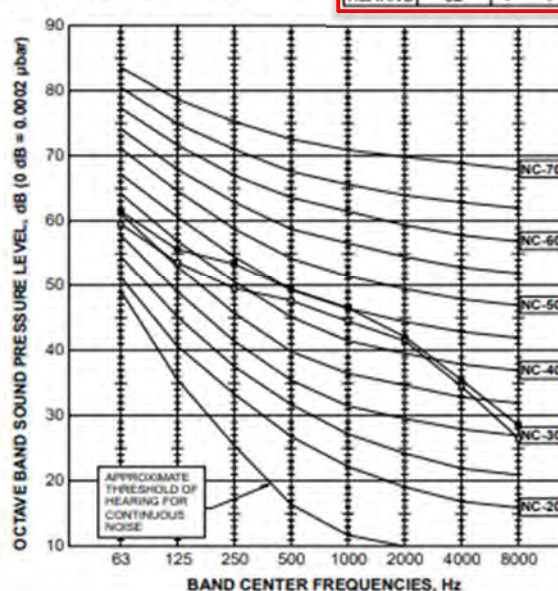
**PUHZ-RP100VKA
PUHZ-RP100YKA**

MODE	SPL(dB)	LINE
COOLING	49	○—○
HEATING	51	●—●



**PUHZ-RP125VKA
PUHZ-RP125YKA**

MODE	SPL(dB)	LINE
COOLING	50	○—○
HEATING	52	●—●



Appendix F – Kitchen Extraction Flue Calculations

Extraction Flue – As Proposed

Fan: Extract			Octave Centre Frequency (Hz)								Overall (Lw)
			63	125	250	500	1k	2k	4k	8k	
56JM/16/4/5/32 - Outlet Lw			79	81	76	77	74	71	68	64	85.3
Uncertainty			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Ductwork Attenuation	No.	Model									
Ductwork sheet	1	Round >500	0	0	0	0	0	0	0	0	
	2										
	3										
Elbow Attenuation	No.	Model									
Elbow sheet	1										
	2										
	3										
Silencer Attenuation	No.	Model									
Insertion Losses (IL)	1										
	2										
	3										
Outlet Reflection (End Reflection Sheet)			-8	-4	-1	0	0	0	0	0	
A-Weighting			-26	-16	-9	-3	0	1	1	-1	
Resulting Lw at Outlet			48.0	64.0	69.0	77.0	77.0	75.0	72.0	66.0	Overall (dBA)
Specific Sound Level at 1m (Lp - free field)											71.1
Sound Power Level (Lw)											82.1

Extraction Flue – Proposed Mitigation Measures

Fan: Extract			Octave Centre Frequency (Hz)								Overall (Lw)
			63	125	250	500	1k	2k	4k	8k	
56JM/16/4/5/32 - Outlet Lw			79	81	76	77	74	71	68	64	85.3
Uncertainty			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Ductwork Attenuation	No.	Model									
Ductwork sheet	1	Round >500	0	0	0	0	0	0	0	0	
	2										
	3										
Elbow Attenuation	No.	Model									
Elbow sheet	1										
	2										
	3										
Silencer Attenuation	No.	Model									
Insertion Losses (IL)	1	CP03 - C - 560 1D	-2	-4	-7	-14	-14	-9	-9	-7	
	2										
	3										
Outlet Reflection (End Reflection Sheet)			-8	-4	-1	0	0	0	0	0	
A-Weighting			-26	-16	-9	-3	0	1	1	-1	
Resulting Lw at Outlet			46.0	60.0	62.0	63.0	63.0	66.0	63.0	59.0	Overall (dBA)
Specific Sound Level at 1m (Lp - free field)											60.3
Sound Power Level (Lw)											71.3