

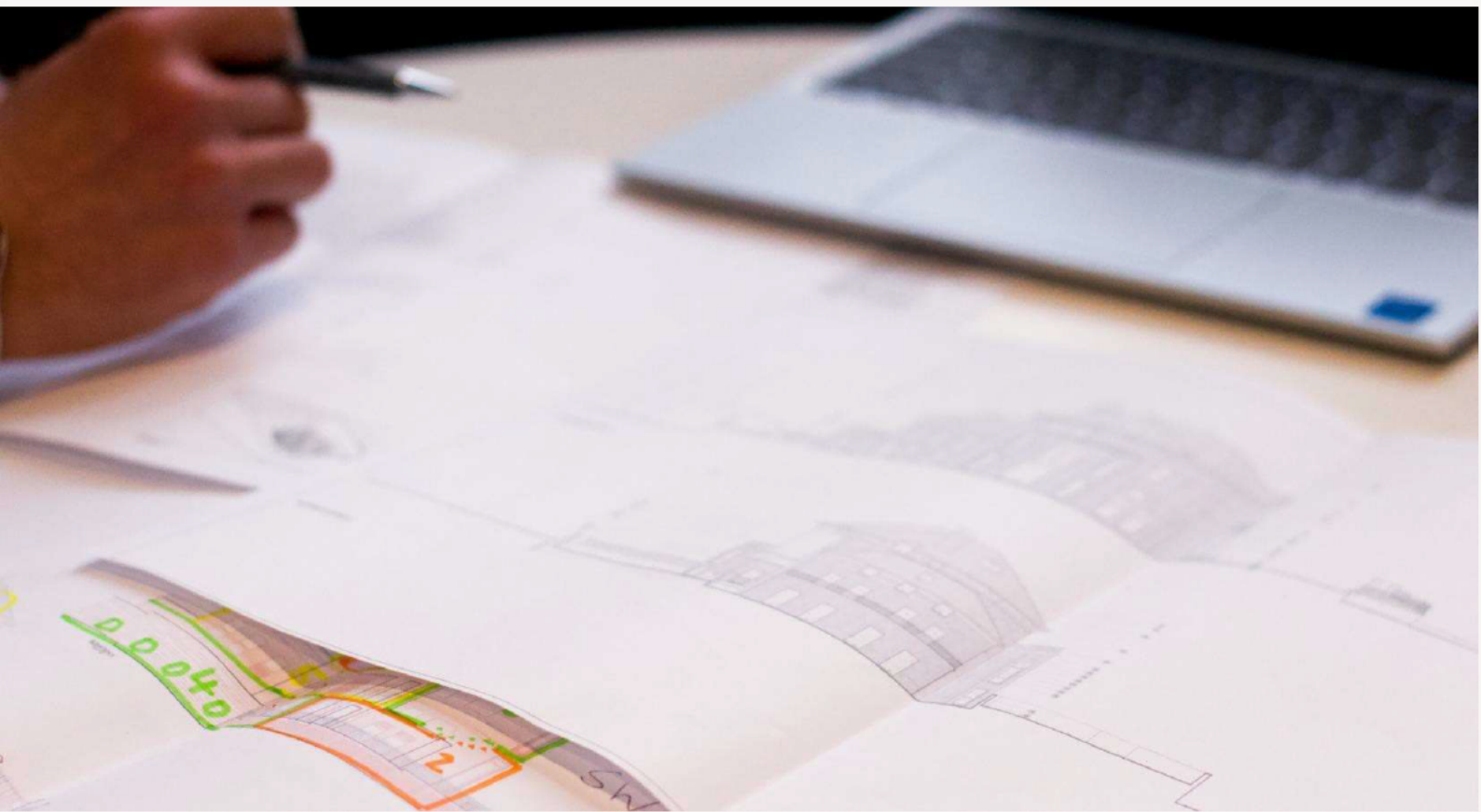


PENINSULAR
ACOUSTICS

Clwyd Transport Services Ltd

Proposed Transport Yard, Llay

Acoustics Assessment



Clwyd Transport Services Ltd

Proposed Transport Yard, Llay

Acoustics Assessment

Type of Document (Version) Public

Project No. PA0157

Date: December 2023

Peninsular Acoustics

Liverpool: Office 14 Clock Tower Building, Clock Tower Park, Liverpool, England, L10 1LD

Birmingham: Studio 222, Custard Factory 2, Gibb Street, Birmingham, B9 4AA

Website: www.peninsularacoustics.co.uk

Quality Control

Issue/revision	P01	P02	P03	P04
Remarks	Issue for planning			
Date	December 2023			
Prepared by	Joel Phillips			
Signature				
Checked by	Adam Walker			
Signature				
Authorised by	James Healey			
Signature				
Project number	PA0157			
Report number	R01			
File reference	PA0157-R01-P01			

Contents

1.	INTRODUCTION	1
1.1.	INTRODUCTION	1
1.2.	SITE DESCRIPTION	1
1.3.	SCOPE OF WORKS	2
2.	STANDARDS AND GUIDANCE	3
2.1.	BS 4142	3
3.	ENVIRONMENTAL SOUND SURVEY	4
3.1.	METHODOLOGY	4
3.2.	EQUIPMENT	4
3.3.	SURVEY CONDITIONS AND OBSERVATIONS	5
3.4.	RESULTS	5
4.	ACOUSTIC MODELLING	9
4.1.	INPUT PARAMETERS	9
4.2.	MODELLED SCENARIOS	9
5.	BS 4142 ASSESSMENT	11
5.1.	EMBEDDED SCHEME MITIGATION	11
5.2.	INITIAL NUMERICAL IMPACT ASSESSMENT	11
5.3.	CONTEXT	12
5.4.	ADDITIONAL RECEPTORS	12
5.5.	UNCERTAINTY	13
6.	ADDITIONAL CONSIDERATIONS	14
6.1.	COMMERCIAL UNITS	14
6.2.	L _{AFMAX} CONSIDERATIONS	14
7.	CONCLUSIONS	15

Appendices

APPENDIX A

TECHNICAL TERMINOLOGY

APPENDIX B

SITE PLAN

APPENDIX C

TIME-HISTORY

APPENDIX D

SOUND LEVEL CONTOUR DRAWINGS

APPENDIX E

REPORT LIMITATIONS

1. Introduction

1.1. Introduction

Peninsular Acoustics have been commissioned by Clwyd Transport Services Ltd (hereafter referred to as 'the Client') to undertake an Acoustics Assessment to demonstrate that the change of use from an existing garden centre to a transportation yard located at Pinfold Lane, Llay, Wrexham LL12 0PX (hereafter referred to as 'the Site') does not adversely impact on nearby commercial operations and residential amenity.

The Client submitted a pre-application enquiry to Wrexham County Borough Council (hereafter referred to as 'the Local Authority') which indicated that the development would be acceptable in principle but that an acoustics assessment should be submitted to support any subsequent formal application.

An acoustic glossary is provided in Appendix A to assist the reader.

1.2. Site Description

1.2.1. Existing Site

The Site lies within the town of Llay, Wrexham; to the north-west is Commercial Resprays, an automotive body shop; to the north-east is Magellan Aerospace Ltd- Structures; to the south is Llay Road with residential dwellings on the opposing side; and to the west is Pinfold Lane with a variety of further commercial units beyond.

The Site currently comprises Carlton Garden Centre, which will be retained but on a smaller site directly adjacent to the west.

1.2.2. Development Proposals

Development proposals comprise the redevelopment of the existing garden centre premises into a transportation yard, designed to accommodate up to 25 trailers. The existing vehicular access of Pinfold Lane would be retained as part of the proposals.

An indicative site layout in appendix B.

1.2.3. Noise Sensitive Receptors

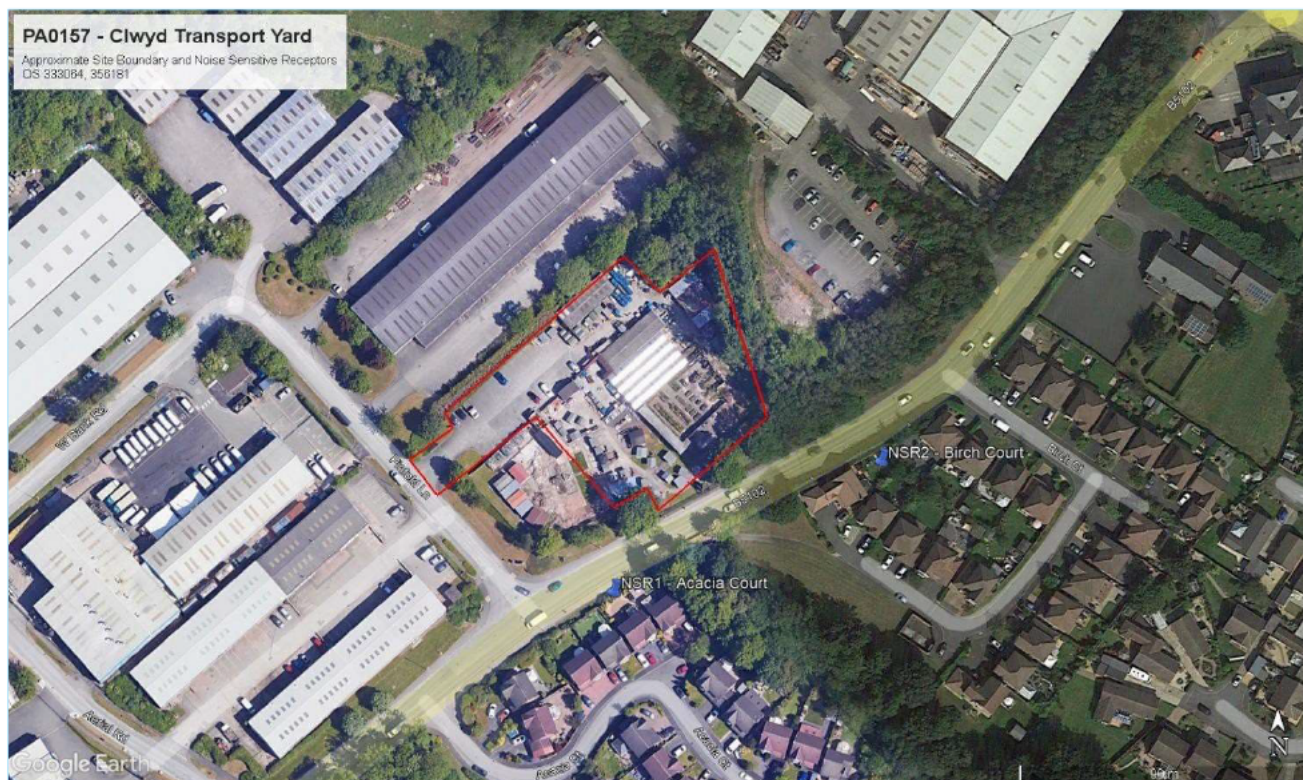
The nearest Noise Sensitive Receptors (NSRs) adjacent to the Site are:

- Dwellings on Acacia Court (NSR1); and
- Dwellings on Birch Court (NSR2).

Additionally, during the pre-application consultation it is understood that the Environmental Health Officer (EHO) at the Local Authority has requested consideration against the potential impact on existing commercial receptors to the north.

An approximate redline boundary along with the identified NSRs is presented in Figure 1-1.

Figure 1-1: Approximate Redline Boundary



1.3. Scope of Works

The following scope of works has been undertaken:

- An Environmental Sound Survey has been undertaken to determine prevailing acoustic conditions at the Site in summary as follows;
 - Continuous measurements were undertaken in accordance with BS 7445-2¹ to determine typical levels at a position equidistant to the amenity areas of residential dwellings on the opposing side of Llay Road.
- Using detailed Client notes that outline the intended operations at the Site and following analysis of the survey data, a 3D acoustic model has been created. Sound levels generated by the proposed Site pertaining to Heavy Goods Vehicle (HGV) movements have been predicted at the nearest residential amenity space;
- A BS 4142² assessment has been undertaken to determine the potential noise impact from the proposed Site on nearby residential amenity; and

Where necessary suitable mitigation measures have been recommended to limit the acoustic impact from the Site on nearby residential amenity.

¹ BS 7445-2: 1991 Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use

² BS 4142:2014 +A1:2019 'Methods for rating and assessing industrial and commercial sound.'

2. Standards and Guidance

2.1. BS 4142

BS 4142 describes methods for rating and assessing industrial and/or commercial sound and includes, but is not limited to, the assessment of:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical equipment;
- Sound from the (un)loading of goods and materials at industrial/commercial premises; and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes such as that from forklift trucks on or around an industrial and/or commercial site.

The methods described in BS 4142 use outdoor sound levels to assess the likely effects of sound on people who are typically outside residential premises. Although indoor effects can be indicated where the façade composition is known. A summary of the approach set out in BS 4142 is set out below:

Establish or predict the specific sound level of the source(s) by considering both the ambient (includes the source to be assessed) and residual (excludes the source to be assessed but includes all remaining sources) sound level;

- Measure the representative background sound levels, typically by measuring close to the receptor location;
- Rate the specific sound level to account for any distinguishing characteristics (see below);
- Estimate the impact by subtracting the background sound level from the rating level; and
- Consider the initial estimate of impact, as determined above, in the context of the noise and its environment.

The specific sound level is rated to account for distinguishing characteristics by using penalties for tonality, impulsivity, intermittency, and other sound characteristics. The dominant acoustic characteristic should be applied to avoid large penalties which is in accordance with the Institute of Acoustics response to BS 4142.

The character corrections are flexible according to whether the acoustic character is just perceptible at the noise receptor, or is clearly perceptible or highly perceptible, and range from 0 to 6 dB for tonal noise, 3 to 9 dB for impulsive noise, and 3 dB for other non-tonal/impulsive acoustic characteristics.

An initial estimate of impact of the specific sound is obtained by subtracting the background sound level from the rating level. Typically, the greater the difference, the greater the magnitude of impact.

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context;
- At differences lower than +5 dB a low impact is likely, depending on the context. The lower the rating level is to the measured background sound level, the less likely it is that the specific sound source will have an impact.

The results of the initial assessment should then be considered in light of all pertinent contextual factors.

3. Environmental Sound Survey

3.1. Methodology

An unattended Environmental Sound Survey was undertaken between 10:15 on Friday 17th and 09:45 on Tuesday 21st November to establish prevailing acoustic conditions.

A single sound Level Meter (SLM) was setup in free field conditions at 1.2m above ground level as follows:

- Continuous Measurement 1 (CM1): Approximately 15m from the centre of Llay Road which is considered to be equidistant from the central point of the external amenity area of the nearest NSRs to be assessed (south of the Site) on the opposing side of Llay Road: No.11 Acacia Court.

The measurement position is presented in Figure 3-1.

Figure 3-1: Measurement Position



3.2. Equipment

Measurements were taken using a Class 1 integrating/averaging SLM housed, where appropriate, in environmental protection apparatus. The SLM was field calibrated before and after the survey, using a Class 1 calibrator, with no significant drift in calibration noted.

The SLM was setup to record A-weighted ambient, maximum and background sound levels at a minimum along with associated octave band spectra.

Full details of the equipment used to undertake the survey are presented in Table 3-1.

Table 3-1: Equipment and Calibration Details

Measurement Position	Description	Manufacturer & Type	Serial No.	Calibration Due
CM1	Sound Level Meter	NOR118	31512	23/03/2025
	Pre-Amplifier	NOR1201	15457	
	Microphone	GRAS40AF	51464	
	Calibrator	NOR1251	125525651	02/05/2024

3.3. Survey Conditions and Observations

3.3.1. Meteorologic Conditions

Weather conditions during installation and collection of the equipment were dry with wind speeds measuring <1.0 m/s.

Any period where wind speeds exceeded 5 m/s according to the local meteorological data, presented below in Table 3-2, have been reviewed for undue elevation in measured sound levels. Analysis indicates no elevation occurred therefore all measurement data is considered acceptable.

Table 3-2: Weather data taken from local meteorological weather station.

Date	Temperature range °C	Wind Speed m/s	Wind direction	Rainfall	Cloud Cover (octas)
17/11/2023	3 – 10	3 – 4	Northerly	None	0/8
18/11/2023	10 – 15	5 – 6	Northerly	Light Showers	-
19/11/2023	12 – 14	5 – 6	North-east	Light Showers	-
20/11/2023	6 – 10	2 – 4	Easterly	None	-
21/11/2023	6 – 10	3 – 6	Northerly	None	4/8

3.3.2. Site Observations

During the on-site observations, it was noticed that the dominant source of noise affecting the Site is road traffic associated with Llay Road to the south and traffic movements along Pinfold Lane when occurring.

3.4. Results

3.4.1. Ambient Sound Levels

A summary of the results of the environmental sound survey are presented in Table 3-3.

Table 3-3: CM1 Ambient Sound Level Results Summary.

Date	Daytime Ambient Sound Level L _{Aeq,1hr} dB	Night-time Ambient Sound Level L _{Aeq,15mins} dB
Friday 17 th November	60 – 67	54 – 62
Saturday 18 th November	60 – 64	54 – 61

Date	Daytime Ambient Sound Level $L_{Aeq,1hr}$ dB	Night-time Ambient Sound Level $L_{Aeq,15mins}$ dB
Sunday 19 th November	55 – 65	50 – 63
Monday 20 th November	60 – 65	54 – 63
Tuesday 21 st November	64 – 65	-

3.4.2. Background Sound Levels

A statistical analysis of the background sound levels during the survey period are presented in Figure 3-2 and Figure 3-3 for the daytime and night-time respectively.

Additionally, based upon conversations with the Client, due to the fact the Site proposals are predominantly for HGV storage over the weekend period, movements at the Site are only expected to occur between 05:00 – 08:00 on Monday morning and between 13:00 – 18:00 on Friday afternoon.

Therefore, additional statistical analysis of the periods to be assessed for HGV movements in Figure 3-4 and Figure 3-5 for night-time and daytime respectively.

The $L_{A90,15min}$ measurements have been arithmetically averaged to estimate the $L_{A90,1hr}$ reference periods.

A full time-history of sound survey results is presented in Appendix C.

Figure 3-2: Statistical Analysis of Daytime Background Sound Levels $L_{90,1hr}$.

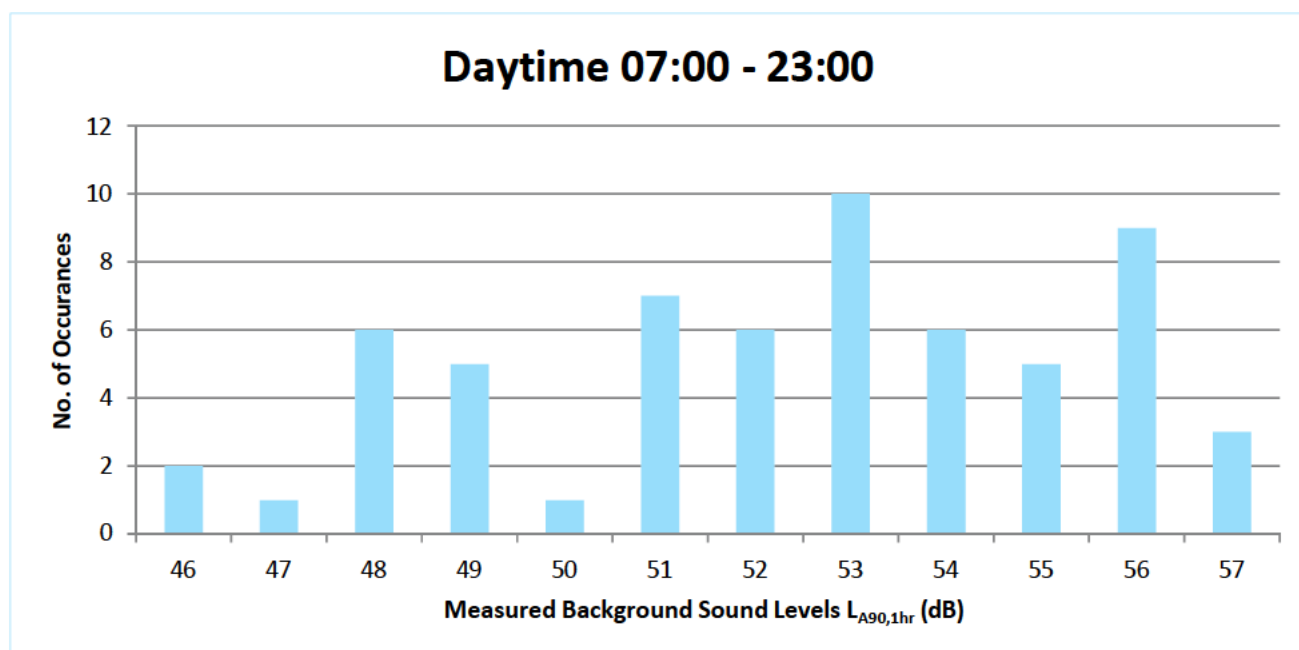


Figure 3-3: Statistical Analysis of Night-time Background Sound Levels $L_{90,15\text{mins}}$.

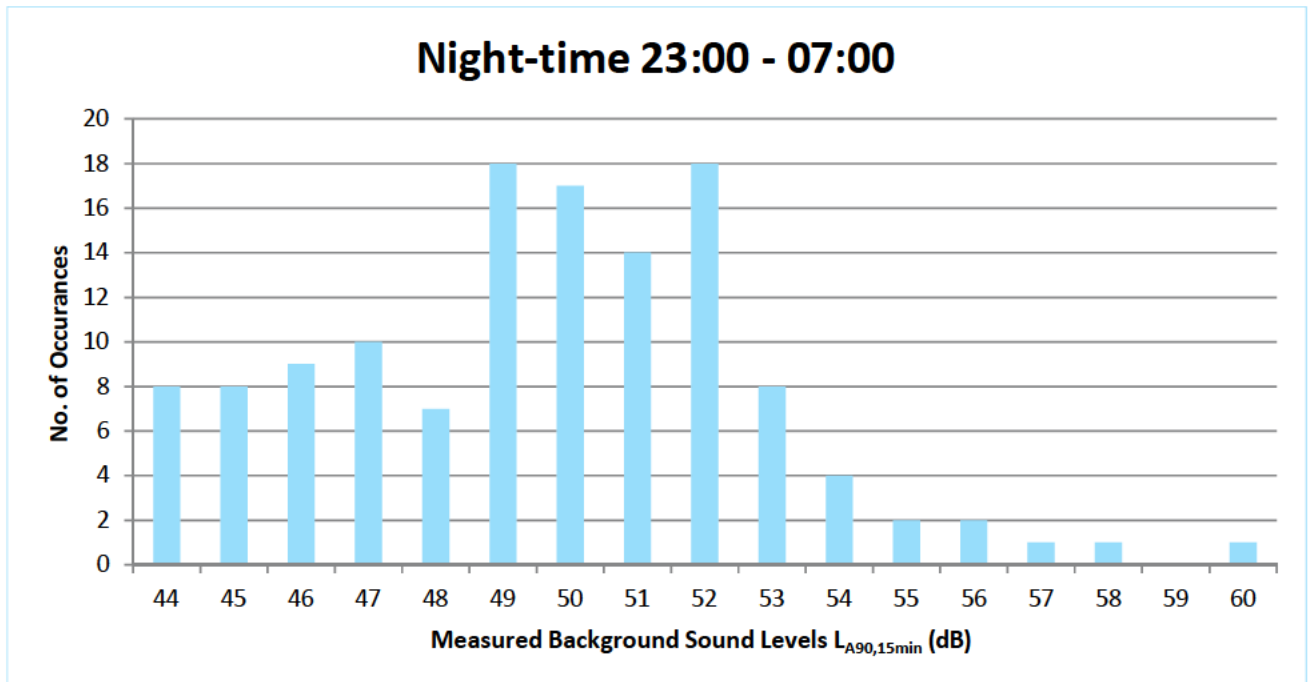


Figure 3-4: Statistical Analysis of Night-time Background Sound Levels during proposed HGV departure hours $L_{90,15\text{mins}}$.

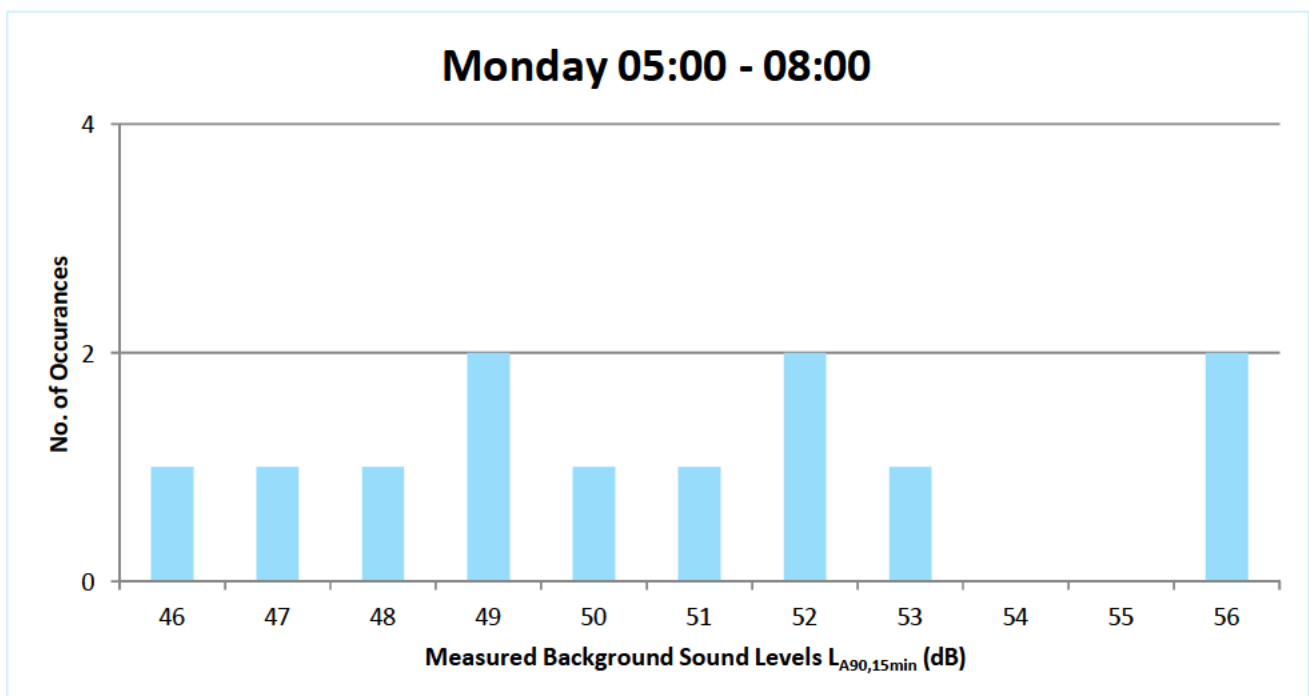
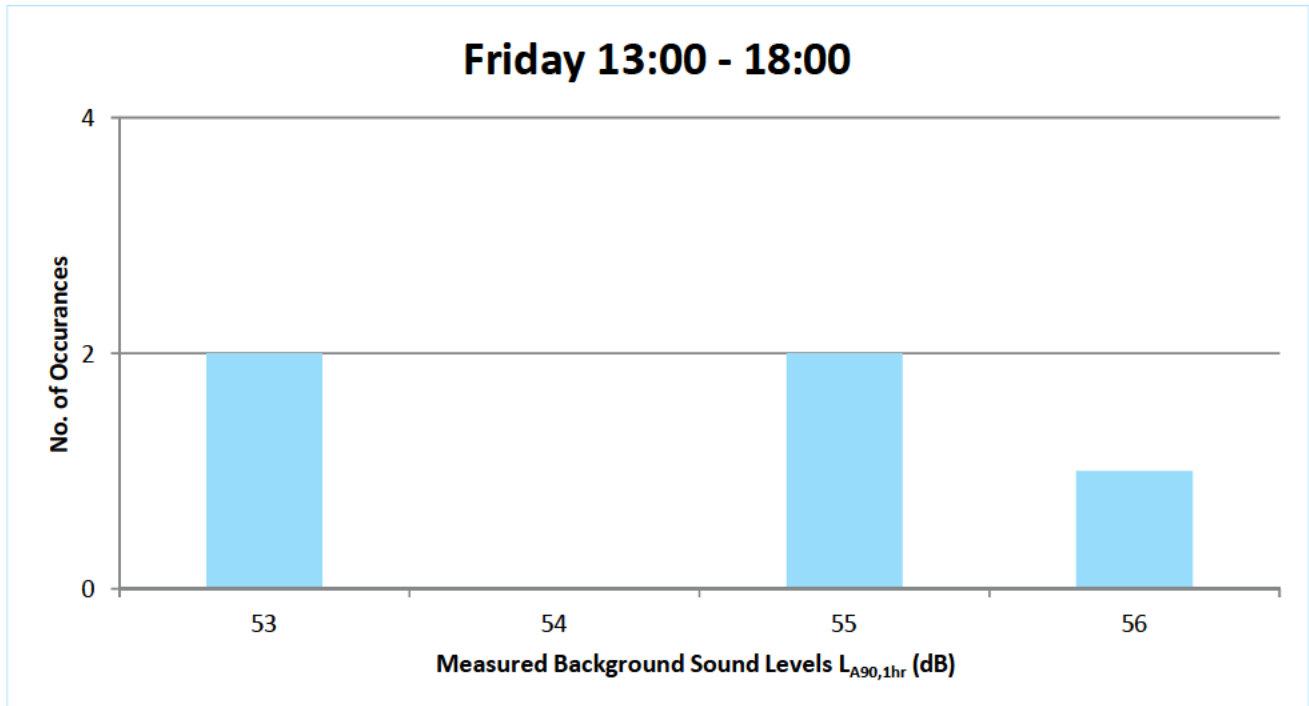


Figure 3-5: Statistical Analysis of Daytime Background Sound Levels during proposed HGV arrival hours $L_{90,1hr}$.



3.4.3. L_{AFmax} Levels

In addition to a BS 4142 assessment, consideration of L_{AFmax} levels will be provided based upon the sleep disturbance criteria outlined in ProPG³.

A summary of the measured L_{AFmax} levels measured at CM1, is presented in Table 3-4.

Table 3-4: Maximum noise levels measured at CM1.

Date	$L_{AFmax,1min}$ Range (dB)	$L_{AFmax,1min}$ 10 th Highest
Friday 17 th November	51 – 81	75
Saturday 18 th November	48 – 80	73
Sunday 19 th November	46 – 81	74
Monday 20 th November	52 – 77	74

³ Professional Practice Guidance on Planning & Noise, May 2017

4. Acoustic Modelling

4.1. Input Parameters

An acoustic model of the Site and environs has been generated in Datakustik CadnaA® modelling software. The model was generated to determine sound levels from the Site and source emissions have been informed by Peninsular Acoustics' in house library data.

CadnaA® considers various inputs, including topography, buildings, and road noise sources, and calculates sound levels in accordance with national and international standards; in this case, the relevant UK standards are the procedures set out in ISO 9613-2⁴.

The modelling assumptions and input information for the acoustic model are as follows:

- Digital Terrain Model – Lidar 1m (Environment Agency, downloaded on 16th November 2023);
- Open Street Map data (publicly available);
- Ground absorption for the Site = 0 (hard ground);
- Buildings set to non-absorptive and purely reflecting objects;
- Building heights estimated following site observations and through a review of the available drawings provided by the Client;
- First order reflections included in the modelling;
- Temperature set to 10°C; and
- Relative humidity set to 70%.

4.2. Modelled Scenarios

It is understood from discussing with the Client that the vehicle fleet is split into a number of different operating centres with the development proposals including up to 15 heavy goods vehicles (HGVs) parked within the Site at any one time. It is important to reiterate that the Site is not intended to be used for the loading and unloading of goods but is to be used as a vehicle parking facility when the HGVs are not in use. Of the vehicles the following scenarios would be classed as typical operations:

- Between 05:00 – 07:00 on Monday, up to 6no. articulated tipper trailers would leave the Site;
- Between 05:00 – 08:00 on Monday, the remaining 9no. rigid tipper vehicles would exit the Site;
- All vehicles would return to the Site, typically on a Friday between 13:00 – 19:00;
- No operations would occur over the weekend on a typical basis.

It is understood that prior to leaving the Site, HGVs would typically idle for approximately 10 minutes during which the drivers undertake regular maintenance checks prior to departing Site.

Based upon this, 2no. scenarios have been acoustically modelled as outlined in Table 4-1.

⁴ ISO 9613-2 'Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation.'

Table 4-1: Modelling Scenarios

Scenario	Time Period	BS 4142 Time Period	Modelling Parameters
1	Monday 05:00 – 07:00	Night-time, 15mins	Assumes up to 2no. HGVs could idle and leave the Site within a 15-minute assessment period.
2	Monday 07:00 – 08:00 Or Friday 13:00 – 19:00	Daytime, 1hr	Assumes 9no. HGVs could idle and leave/arrive at the Site in a single 1-hour assessment period.

The above scenarios are considered to be robust as it is unlikely that 9 out of the 15 HGVs allocated to the Site would leave and depart at the same time on a Monday and a Friday.

Based upon Peninsular Acoustics' experience of working on similar projects, the following sound sources have been included **per HGV** within the acoustic model:

- 1x arrival or departure movement (including where necessary reverse beepers);
- 1x HGV manoeuvre;
- 1x air brakes activating; and
- 1x 10min cab engine idling.

The source data, taken from Peninsular Acoustics' library of previous measurement data, is presented in Table 4-2.

Table 4-2: Source Data

Activity	Sound Pressure Level (dB) in Octave Band Centre Frequency (Hz)								Time (s)	L _{Aeq, T} @ 10m	L _{AFmax} @ 10m
	63	125	250	500	1k	2k	4k	8k			
HGV Arriving & Manoeuvring	71	66	65	66	69	65	58	50	109	72	78
HGV Engine Idling	75	58	66	60	62	59	52	42	37	66	-
Air Brakes	-	-	-	-	-	-	-	-	3	80	81

5. BS 4142 Assessment

5.1. Embedded Scheme Mitigation

The Client will be securing the Site through the inclusion of a fence around the perimeter. Therefore, the acoustic model has assumed a 1.8m high imperforate fence as outlined in Figure 5-1.

The fence does not need to be acoustically absorbent and can comprise a close-boarded timber fence, similar to that installed in a standard residential garden.

Figure 5-1: Location of Acoustic Fence



5.2. Initial Numerical Impact Assessment

Based on the modelling scenarios and embedded scheme mitigation presented above, an Initial Numerical Impact Assessment (INIA) has been undertaken in accordance with BS 4142.

The assessment presented herein is based on the nearest noise sensitive receptor located at No.11 Acacia Court.

The amenity area of No.18 Birch Court, though technically the nearest NSR, benefits from acoustic screening provided by the dwelling itself and is less affected by movements along Pinfold Lane, therefore No.11 Acacia Court amenity area has been assessed as the nearest NSR since it has a direct line of sight to the proposed development area, shown in Figure 1-1.

BS 4142 states that acoustic corrections should be applied for tonality, impulsivity and intermittency, however, based upon the following information corrections for these acoustic features is not considered necessary:

- The Site will only operate as a HGV transport yard whereby HGVs arrive on Friday, depart on Monday and there is no commercial activity in between;
- The Site will not have any loading or unloading activities;
- From discussions with the Client it is understood that all HGVs using the Site are fitted with non-tonal (e.g., 'white noise') reversing beepers instead of tonal reversing sirens; and
- The residential receptors are already exposed to HGV movements using the existing commercial premises.

Notwithstanding the above, a 3 dB correction has been applied for 'other acoustic features' to ensure a robust assessment.

The results of the INIA are presented in Table 5-1 and are taken from modelled receivers positioned at the nearest bedroom window at 4m above ground level for scenario 1; and positioned in the centre of the external amenity area in scenario 2 at 1.5m above ground level.

Table 5-1: BS 4142 INIA Assessment.

Assessment Step	Scenario 1 (Night-time)	Scenario 2 (Daytime)
Modelled Specific Sound Level [A]	40 dB $L_{Aeq,15min}$	39 dB $L_{Aeq,1hr}$
Acoustic Feature Corrections [B]	+3 dB	+3 dB
Rating Level [A + B = C]	43 dB $L_{Ar,15min}$	42 dB $L_{Ar,1hr}$
Background Sound Level [D]	49 dB $L_{A90,15min}$	48 dB $L_{A90,1hr}$
Excess over Background Sound Level [F = C – D]	-6 dB	-6 dB
Initial Estimate of Impact	Low Impact	Low Impact

The results of the assessment show that based upon the chosen background sound levels of 49 dB during the night-time for scenario 1; and 48 dB during the daytime for scenario 2, the predicted impact will be 'Low' in accordance with BS 4142.

5.3. Context

The chosen background sound levels are taken from the full survey data which includes weekend periods whereby sound levels will be typically lower than during the week. When considering the typical background sound levels during the times when the Site is expected to operate, there is a further degree of compliance with rating levels predicted to be up to 11 dB below the background sound level.

Therefore, when considering the location of the Site, the embedded mitigation and the outcome of the assessment, the Site is considered to be suitable for its intended use in accordance with BS 4142.

5.4. Additional Receptors

The INIA focused on dwellings on No.11 Acacia Court, for completeness, the sound levels at the other receptors are presented in Table 5-2 which show similar values to the INIA resulting in a 'Low' impact in accordance with BS 4142 with no exceedances over the background sound level.

Table 5-2: Additional Receptor Results

Receptor	Scenario 1 (Night-time)	Scenario 2 (Daytime)
Acacia Court	39 dB LAeq, 15mins	38 – 39 dB LAeq, 1hr
Birch Court	31 dB LAeq, 15mins	40 dB LAeq, 1hr

5.5. Uncertainty

5.5.1. Measurement Uncertainty

Uncertainty is an unavoidable feature of measurements in the field, which can be subject to many factors; the weather typically being the most significant of which with respect to the measurement of sound.

Crucially, measurements have been undertaken by suitably qualified staff, using state of the art, in calibration equipment, over suitable periods and avoiding adverse weather conditions.

5.5.2. Prediction and Assessment Uncertainty

Uncertainty is also unavoidable in the prediction of sound levels, where naturally, before the scenario being considered becomes a reality, several assumptions need to be relied upon. There is also the uncertainty of people's reactions, which can be influenced by a number of factors, not just the magnitude or character of the sound in question.

The scenarios modelled are based upon information provided by the Client, however, due to the predicted levels being significantly below the background sound level, even if 8 HGVs departed the Site within a 15-minute period the outcome would remain 'Low' impact in accordance with BS 4142.

Therefore, whilst there is natural uncertainty within any assessment it is the professional position of Peninsular Acoustics that uncertainty has been kept to a realistic minimum and that the outcome of this assessment is sufficiently representative and robust.

5.5.3. Summary

In summary the results of the BS 4142 assessment, which consider the installation of a security fence along the west and south perimeter of the Site and is grounded in anticipated scenarios discussed with the Client, indicates that sound levels from the Site are unlikely to exceed background sound levels and thus a 'Low' impact is predicted.

6. Additional Considerations

6.1. Commercial Units

The pre-application advice requested the commercial receptors also be considered. However, BS 4142 is only appropriate for the assessment of commercial sound on NSRs such as residential receptors.

However, the impact from the Site has been predicted at the closest existing commercial premises which indicates that during the daytime, sound levels would range between 44 dB and 53 dB $L_{Aeq, 1hr}$.

These sound levels are based on scenario 2, as it is unlikely that commercial units would be occupied undertaking work requiring concentrating between 05:00 – 08:00 on a Monday morning.

The predicted sound levels are broadly similar to the ambient sound levels measured at CM1 and whilst there will be an anticipated reduction in sound between the carriageway edge and the southern façade of the commercial building to the north of the Site, the character and impact from the Site is highly unlikely to have an adverse impact on existing commercial units given the limited period of operation on a Monday morning and Friday afternoon.

Therefore, even when taking into account a 13 dB reduction provided by a partially open window, the resultant internal levels would be unlikely to cause any disturbances in any potential office area in the existing commercial buildings.

As such, no further considerations are considered warranted.

6.2. L_{AFmax} Considerations

The BS 4142 considers ambient sound levels and whilst feature corrections have been applied for a robust assessment, it is important to consider the L_{AFmax} values potentially caused by HGVs activating airbrakes on departure during the early hours of Monday morning.

Based upon a sound power level of 108 dB (i.e., a delivery vehicle measuring a typical L_{AFmax} of 80 dB at 10m based upon Peninsular Acoustics library data) the predicted sound level at the nearest sensitive receptor, which is to the south of the Site on the opposite side of Llay Road, would be 69 dB L_{AFmax} outside a bedroom window.

Based upon the measured sound levels presented in Table 3-4 this would be broadly in line with existing conditions and as such is not expected to cause an adverse impact on residential amenity.

During the night-time period, the acoustic model predicts a maximum sound level of between 53 and 56 dB at a 4m elevation on the facades of residential dwellings along Acacia Court and Birch Court, based on a sound power level of 108 dB. Since this falls more than 10 dB below the 10th highest measured on-site L_{AFmax} level, there is no expected change in acoustic conditions based upon the introduction of the Site and no adverse impact is anticipated.

Therefore, when considering both BS 4142 and L_{AFmax} assessment parameters, the Site is suitable for development.

7. Conclusions

Peninsular Acoustics has been commissioned by Clwyd Transport Services Ltd to undertake an acoustics assessment to measure the impact from a proposed HGV transport yard to be located at Llay Industrial estate, Pinfold Lane, Llay, Wrexham, on the nearby commercial and residential receptors.

An environmental sound survey has been undertaken which has determined representative background sound levels in the vicinity of the Site.

Using a 3D acoustic model an assessment in accordance with BS 4142 has been conducted on all nearby noise sensitive receptors which has demonstrated that sound levels from the Site will not exceed the existing background sound levels and the overall conclusion is one of a 'Low' impact in accordance with BS 4142.

At the request of the Local Authority, consideration has been given to the impact on existing commercial premises which indicate that sound levels would be broadly in line with existing ambient sound levels and no adverse impact is expected due to brief period in which the Site is operational.

In summary, the results of this assessment show there is unlikely to be any adverse impact on existing residential amenity or existing business operation and therefore, the Site is suitable for its proposed use and planning permission should not be delayed upon grounds of acoustics.

The limitations on how to use this report are presented in Appendix E.

Appendix A

Technical Terminology

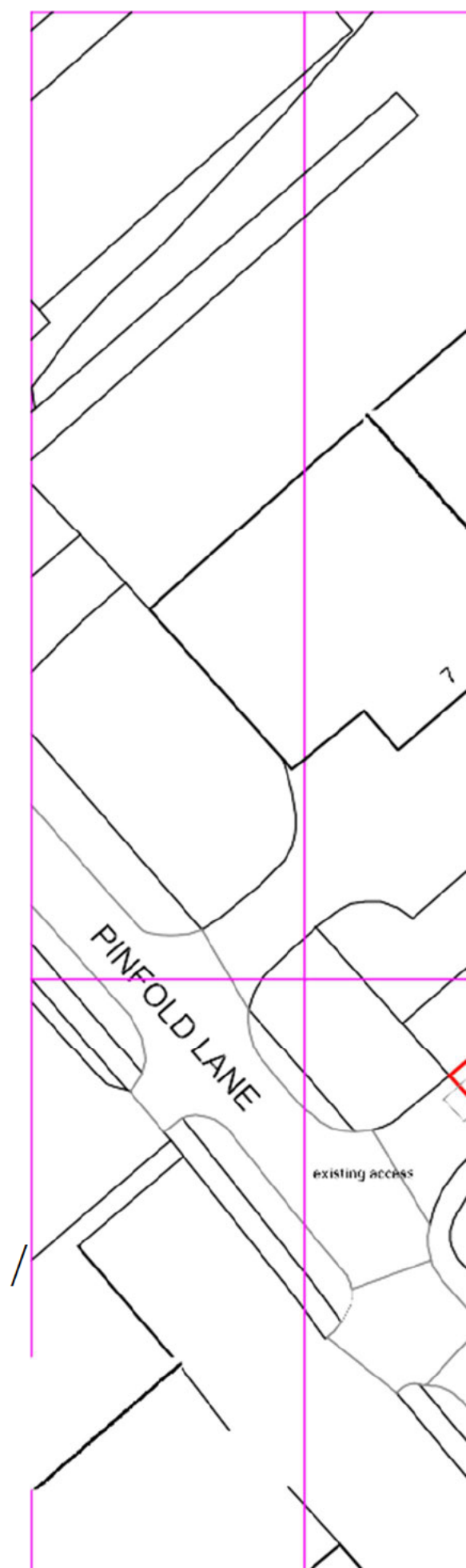
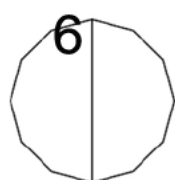
Noise	Typically defined as unwanted, unpleasant or disturbing sound
Frequency (Hz)	The number of oscillations in acoustic pressure per second. It represents the 'tone' of the sound. Often determined in octave bands
Maximum sound pressure level (L_{Fmax})	The maximum or highest sound pressure level measured with a 'fast' time weighting
Equivalent continuous sound pressure level ($L_{eq,T}$)	The average of the total sound energy over a specified time period (T). L_{eq} represents the equivalent sound level that a fluctuating source would have compared to a steady source with the same total sound energy over a specific time period. Commonly used as a descriptor of human perception of sound over time.
'A' weighting	Frequency-dependent weighting based on the response of the human auditory system which has been found to correlate well with the subjective response to sound. Denoted by the use of the letter 'A'. For example, dBA denotes an 'A' weighted sound level in decibels, or L_{Amax} denotes an 'A' weighted maximum sound pressure level.
Internal Ambient Noise Level (IANL)	The noise level within a room or enclosed space. Usually determined as an equivalent continuous sound pressure level over a specific time period ($L_{Aeq,T}$, dB)
Noise Rating (NR) curve	A single figure term used to reflect the spectral frequency content of noise. Although originally proposed to assess environmental noise, NR curves are now typically used to describe noise from mechanical ventilation systems in buildings.
$L_{night,outside}$	The incident external A-weighted long-term average sound level as defined in ISO 1996-2: 1987, determined over all the night periods of a year, in which the night is eight hours between 23:00 and 07:00.
AVO	Acoustics, Ventilation, Overheating (e.g. AVO Guide, AVO Group).
Overheating Strategy Overheating Condition	The situation where measures are in place to mitigate overheating to meet agreed compliance criteria.
Dynamic thermal modelling	A technique that can be used to simulate internal temperatures in dwellings before they are built
Ventilative cooling	Cooling by means of introducing external ambient temperature air at a high ventilation rate. Can be either passive (no fans) or mechanical (with fans).
Purge ventilation	Ventilation to aid removal of high concentrations of pollutants and water vapour released from occasional activities such as painting and decorating or accidental releases such as smoke from burnt food or spillage of water.
Mechanical cooling	Cooling by means of a refrigerant cycle. This would include 'air conditioning' systems and the use of fan coil units (FCUs).

MEV	Mechanical extract ventilation.
“Free area” as used in AD-O	Approved Document O uses the term “Minimum free area” that is required to be achieved by the Equivalent area of the window openings. AD-O provides the accepted definition of Equivalent area for the description of “free area”. The term “free area” is therefore avoided in this document to avoid further confusion.
Acoustic open area	The measurable, cross-sectional, geometric area of an opening. For a partially open window, this is considered to be the lesser of either the size of the hole in the window frame that is left by the opening light, or the combined cross-sectional area around the opening light through which air must pass to move from outside to inside. The area around a hinged opening light includes the triangular areas on the sides adjacent to the hinge, and the rectangular area on the side opposite the hinge. This should not be used for comparing the air-flow performance of elements because this will also be dependent on factors such as depth (length of air-path), surface roughness and tortuosity. Refer to reference 6 for further information.
Effective area, A_{eff}	Defined as the product of the free area and discharge coefficient, this is the preferred parameter for comparing the air-flow performance of elements. Refer to reference 6 for further information.
Equivalent area, A_{eq}	The area of a sharp-edged, circular orifice that gives the same flow rate as the actual opening at a given pressure-difference. In other words, the free-area of a notional circular hole made in an infinitely thin, infinite extent baffle that gives the same air-flow performance as the real opening. Used to describe the area of trickle vents in Approved Document F. Not to be confused with Effective area. Refer to reference 6 for further information.
Coefficient of Discharge, C_d	The ratio of the mass flow rate at the discharge end of the nozzle to that of an ideal nozzle which expands an identical working fluid from the same initial conditions to the same exit pressures.
$D_{n,e}$ / $D_{n,e,w}$	The laboratory tested sound insulation of small building elements, normalised to an equivalent absorption area of 10m ² .
Façade level	The sound pressure level measured close to a building façade that includes contribution from both the incident sound and the sound reflected from the façade. Normally taken to be 3dB higher than the equivalent free-field level, when located at 1 metre from a façade.
Free-field level	A measured sound pressure level that is independent of any contributions due to reflections from nearby surfaces and is therefore representative of the direct path only.
R / R_w	The laboratory tested airborne sound insulation of a building element
Sound insulation	The capacity of a structure to prevent sound from reaching a receiving location. Sound energy is not necessarily absorbed; impedance mismatch, or reflection back toward the source, is often the principal mechanism

Appendix B

Site Plan

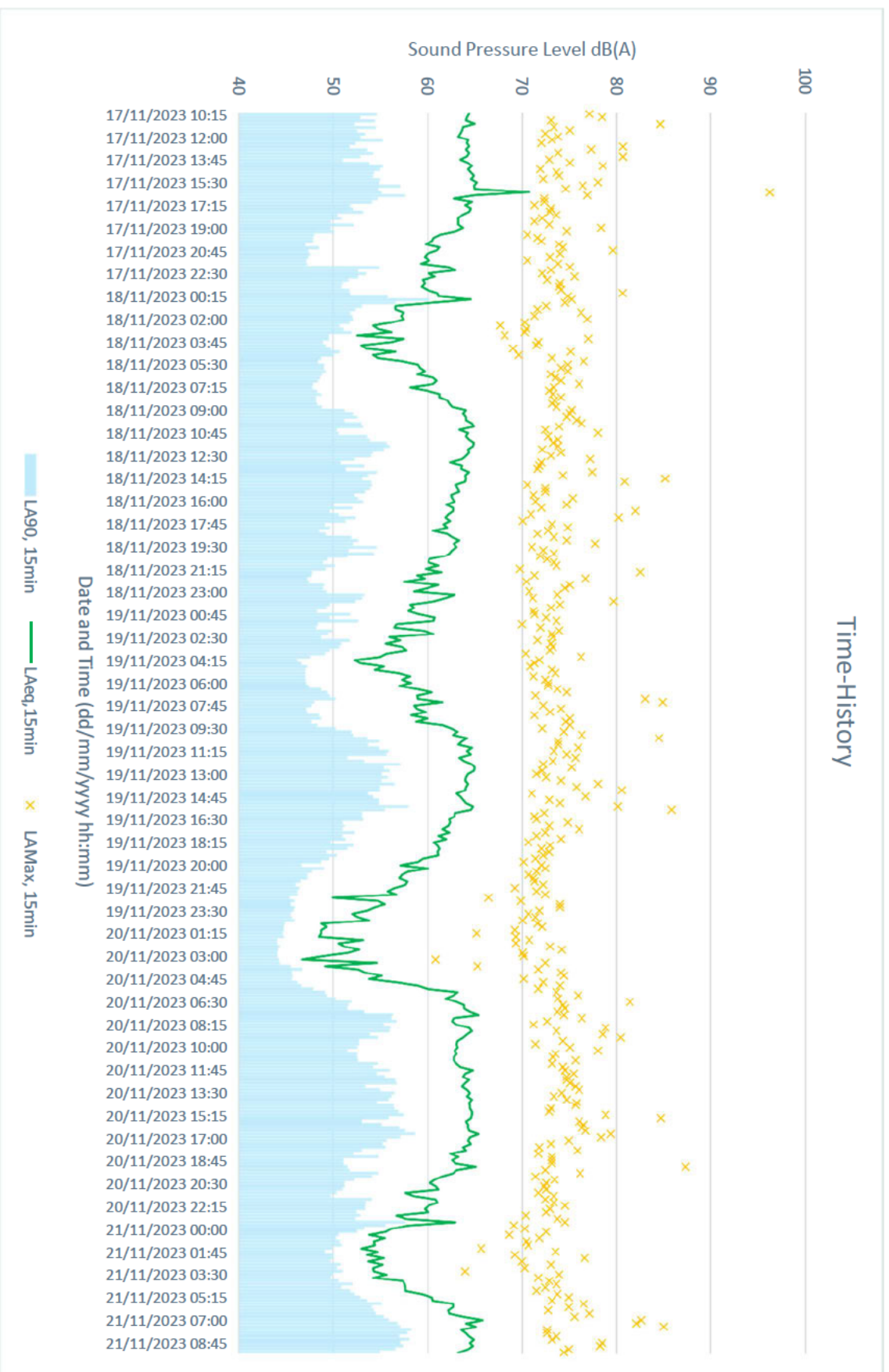
North



Appendix C

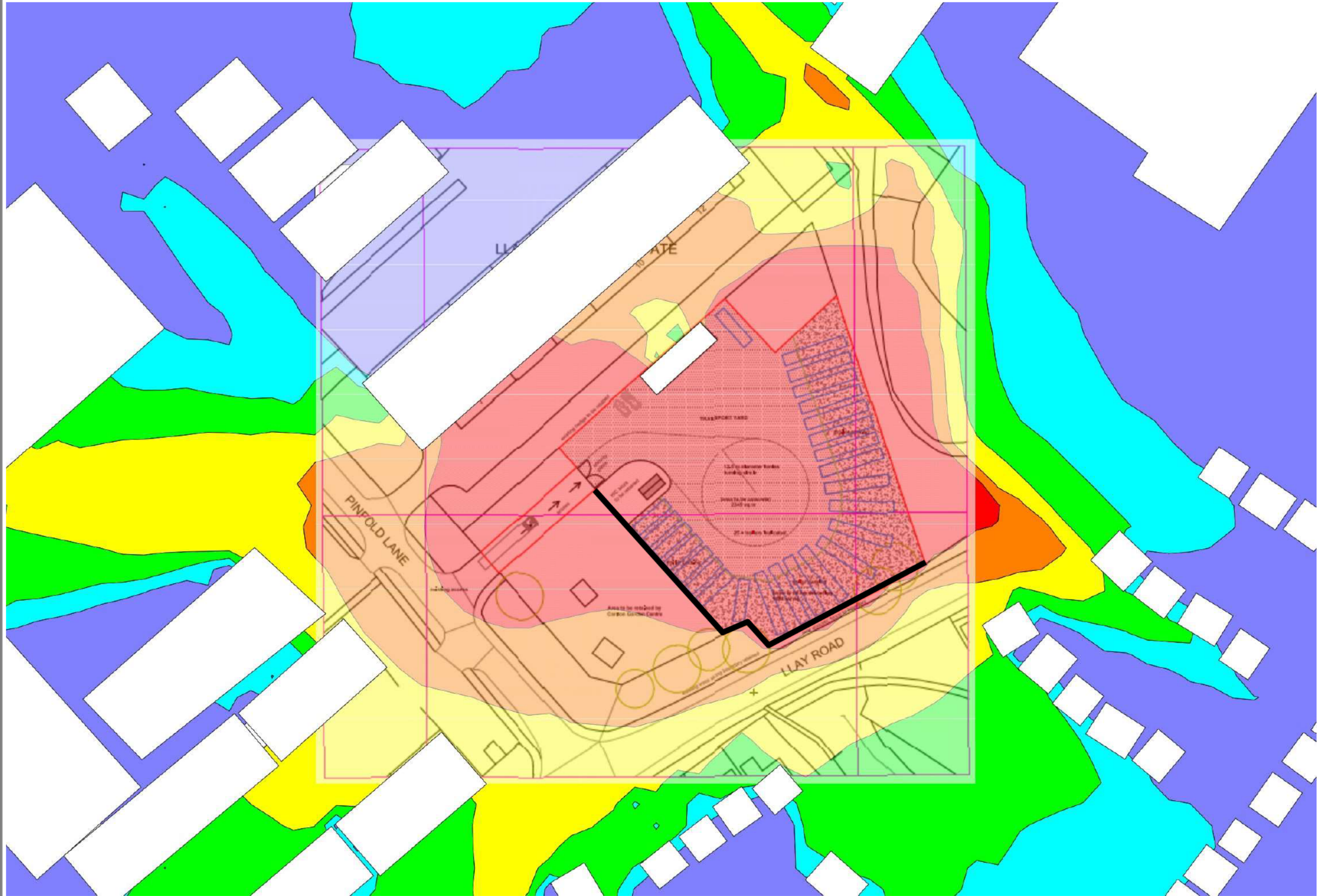
Sound Survey Data

Time-History



Appendix D

Sound Level Contour Drawings



Sound Level Contour Maps

Key

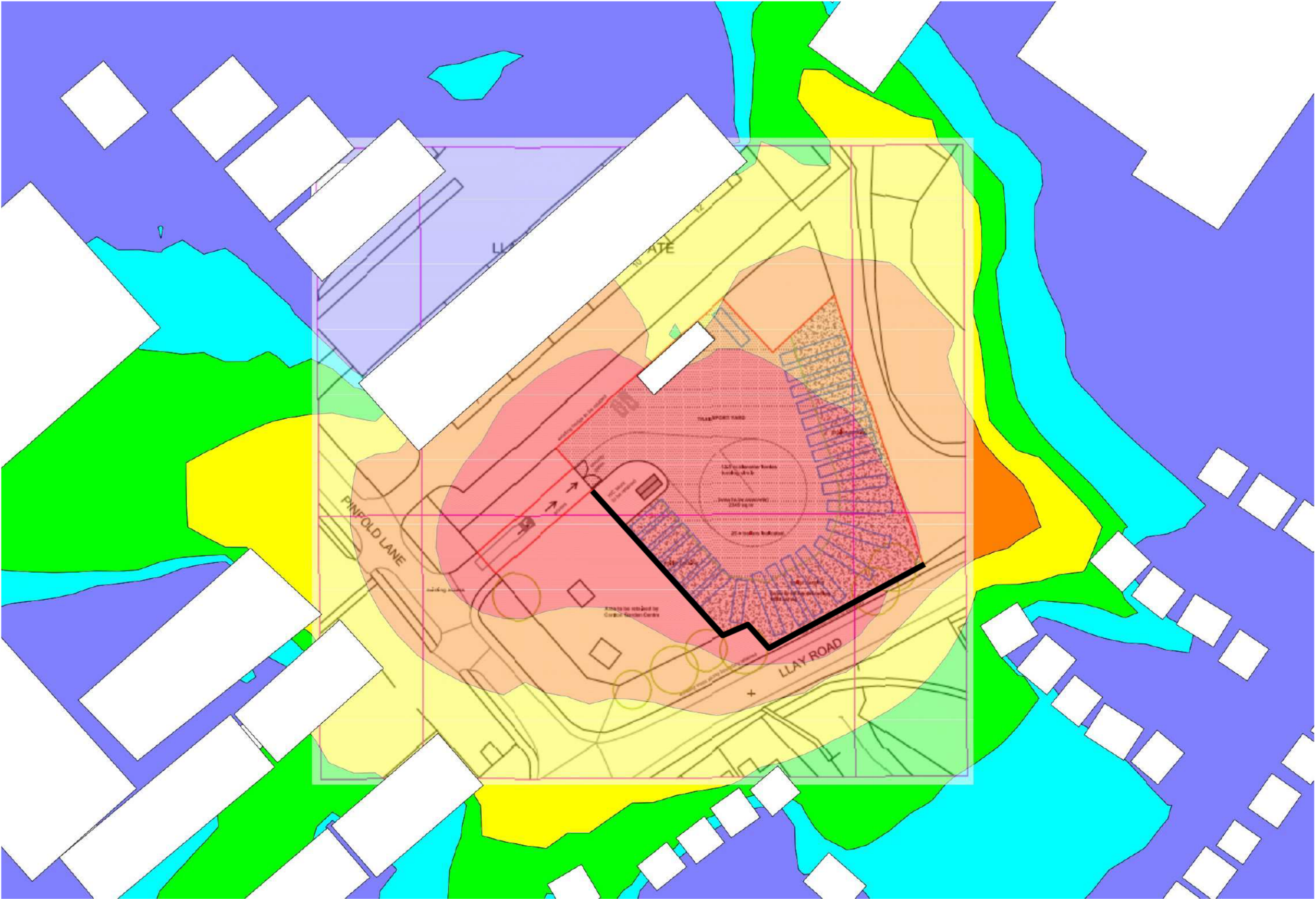
	< 30 dB(A)
	30 - 35 dB(A)
	35 - 40 dB(A)
	40 - 45 dB(A)
	45 - 50 dB(A)
	> 50 dB(A)
	1.8m Fence

05/12/23	P01	PLANNING	AW
DATE	REV	DESCRIPTION	BY

PROJECT:
REF: Daytime Sound Level Contours
DWG: PA0157-ENV-01-P01

Notes

1. Do not scale this drawing.
2. Sound levels presented as $L_{A,r,1hr}$ values.



Sound Level Contour Maps

Key

- < 30 dB(A)
- 30 - 35 dB(A)
- 35 - 40 dB(A)
- 40 - 45 dB(A)
- 45 - 50 dB(A)
- > 50 dB(A)
- 1.8m Fence

05/12/23	P01	PLANNING	AW
DATE	REV	DESCRIPTION	BY

PROJECT:
REF: Night-time Sound Level Contours
DWG: PA0157-ENV-02-P01



Notes
1. Do not scale this drawing.
2. Sound levels presented as $L_{A, 15mins}$ values.

Appendix E

Report Limitations

This report has been prepared for the titled project or named part thereof and should not be used in whole or part and relied upon for any other project without the written authorisation of Peninsular Acoustics Limited. Peninsular Acoustics Limited accept no responsibility or liability for the consequences of this document if it is used for a purpose other than that for which it was commissioned. Persons wishing to use or rely upon this report for other purposes must seek written authority to do so from the owner of this report and/ or Peninsular Acoustics Limited and agree to indemnify Peninsular Acoustics Limited for any and all loss or damage resulting therefrom. Peninsular Acoustics Limited accepts no responsibility or liability for this document to any other party other than the person by whom it was commissioned.

The findings and opinions expressed are relevant to the dates of the site works and design drawings/specifications and should not be relied upon to represent conditions at substantially later dates. Opinions included therein are based on information gathered during the study and from our experience. If additional information becomes available which may affect our comments, conclusions or recommendations Peninsular Acoustics Limited reserve the right to review the information, reassess any new potential concerns and modify our opinions accordingly.



Peninsular Acoustics

Liverpool: Office 14 Clock Tower Building, Clock Tower Park, Liverpool, England, L10 1LD

Birmingham: Studio 222, Custard Factory 2, Gibb Street, Birmingham, B9 4AA

Website: www.peninsularacoustics.co.uk