



ASC REAL ESTATE INVESTMENT LTD

MOLD ROAD, WREXHAM

ENVIRONMENTAL NOISE STUDY

R1375-REP01B-JR

31 OCTOBER 2017

REPORT DETAILS

Project	Mold Road, Wrexham		
Client	ASC Real Estate Investment Ltd Regent House Blackburn BB1 6BH		
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SUMMARY

Red Acoustics Ltd has been commissioned by ASC Real Estate Investments Ltd to provide an assessment of the impact of environmental noise at the proposed development site at Mold Road, Wrexham.

This development is a proposed residential development bordering Mold Road, Wrexham, to the East. Environmental noise surveys have been undertaken to measure the existing noise climate. Surveys indicate the site is affected by road traffic noise from Mold Road as well as noise from the rail line which runs adjacent to the East boundary of the site. Industrial noise from activities to the North and South of the site blend into this noise climate and are not discernible in terms of character over the existing road traffic.

The measured noise levels have been used to build a 3D noise model. The model has been used to predict sound across the site and from these predictions develop the building envelope design as well as measures to protect the amenity of garden spaces.

Typical noise break-in calculations have been undertaken based on the house layouts provided by ASC Real Estate Investments Ltd. The break-in calculations have been used to determine likely glazing, ventilation and facade constructions. The aim of the strategy is to achieve the following internal sound levels:

- Living Rooms, Dining Rooms and Kitchens: $\leq 35\text{-}40\text{dB } L_{Aeq,t}$
- Bedrooms: $\leq 30\text{dB } L_{Aeq,t}$ and $\leq 45\text{dB } L_{Amax}$
- Garden and Patios: $\leq 55\text{dB } L_{Aeq,t}$

Section 6.0 details the recommended glazing and ventilation strategy across the proposed development site as well as locations of close boarded timber fencing. Implementation of the recommended mitigation will ensure the development is adequately protected from environmental noise.

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1.0 INTRODUCTION

Red Acoustics Ltd has been commissioned by ASC Real Estate Investments Ltd to provide an assessment of the impact of environmental noise at the proposed development site at Mold Road, Wrexham.

This development is a proposed residential development bordering Mold Road, Wrexham, to the East. Environmental noise surveys have been undertaken to measure the existing noise climate. Surveys indicate the site is affected by road traffic noise from Mold Road as well as noise from the rail line which runs adjacent to the East boundary of the site. Industrial noise from activities to the North and South of the site blend into this noise climate and are not discernible in terms of character over the existing road traffic.

The predicted noise levels across the site have then been used to determine the likely glazing strategy based on the proposed site layout and typical house construction types as well as boundary treatments to protect the garden noise levels.

2.0 SITE DESCRIPTION & PROPOSED DEVELOPMENT

The proposed residential development site is located on land off Mold Road, with Mold Road bordering the Eastern boundary of the site. The proposal seeks to introduce residential units, which are a mix of assumed detached, semi-detached two storey dwellings and flats with outline planning, and a hospital facility with secure shared living spaces with planning. Figure 2.1 illustrates the site location and proposed general arrangement of the site.

Figure 2.1: Proposed Site Location



Directly to the North of the site is a playing field and to the South a small commercial trading estate with several small businesses that operate on a small scale. A leisure centre borders the Western Border with Mold Road and the Rail line bordering the Eastern Boundary.

3.0 ENVIRONMENTAL NOISE SURVEYS

Attended and automated noise surveys were carried out by Red Acoustics at the application for the Phase 1 development site during the 4th and 8th May 2017 at the following locations:

Position 1 Eastern Boundary - nearest point to Mold Road and Rail Line

Position 2 Western Boundary of site

Position 3 Southern Boundary of Site - Closest to Kent Supplies

The above measurement locations are shown in Figure 3.1. Measurements at Positions 1, 2 & 3 were carried out using unattended noise monitoring stations. Measurements at Positions 1 & 3 were undertaken with the microphones mounted on fencing at a height of approximately 2m above ground level. Measurements at Position 2 were undertaken with the sound level meter mounted on a tripod at a height of 1.3m above ground level. Automated measurements at Positions 1, 2 & 3 were carried out over consecutive 5 minute intervals.

The noise climate of the application site is characterised and dominated by vehicles passing along Mold Road and Railway Pass by events. Table 3.1 summarises the noise levels measured. Full survey details and instrumentation are given in Appendix A.

Table 3.1: Summary of Measured Environmental Noise Levels 4th - 8th May 2017

Location	Measured Noise Levels				
	Daytime		Night-time		
	L _{Aeq} dB	L _{A90} dB	L _{Aeq} dB	L _{Amax} dB	L _{A90} dB
Position 1	46.3 - 69.4	35.1 - 55.7	33.0 - 90.3	36.0 - 103.0	28.7 - 51.1
Position 2	40.0 - 68.2	34.0 - 53.0	32.1 - 64.7	38.5 - 84.7	27.8 - 48.3
Position 3	42.5 - 65.5	36.0 - 56.0	35.6 - 53.4	38.3 - 73.8	35.1 - 49.3

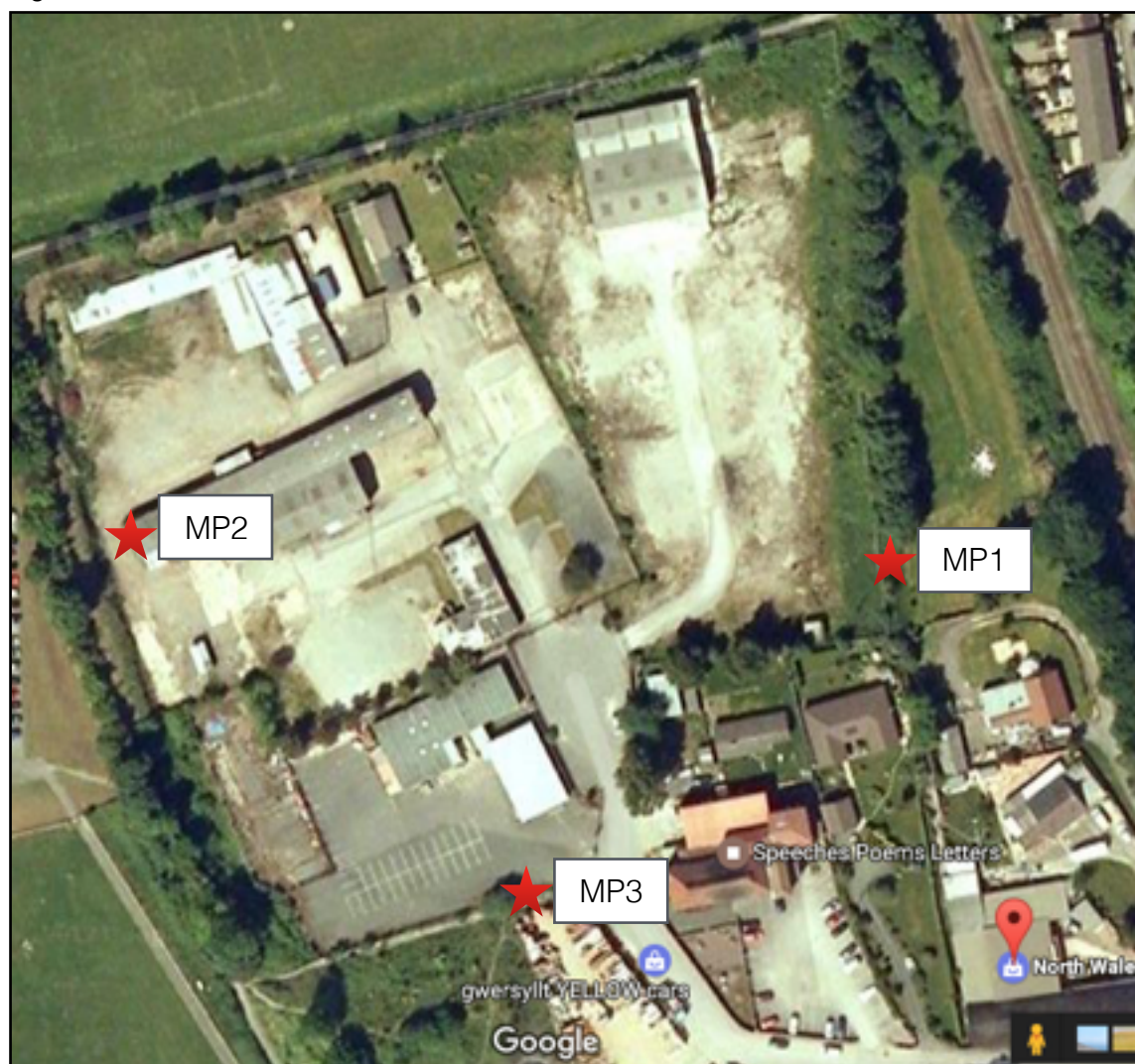
Throughout the period of monitoring (4th - 8th May 2017) L_{AFmax} levels during night time periods on two occasions peak at 103dB. These peak events shared similar high frequency content. Due to the events only happening on a Monday and Friday (The only weekdays monitored) and not during the weekend period it was precautionary to re-survey at position one. This has been carried out to determine whether or not these max events are significant and therefore should be included within the assessment.

Table 3.2 summarises the noise levels measured. Full survey details and instrumentation are given in Appendix A. The results measured during the period 3rd July - 10th July 2017 give the conclusion that previous peak $L_{A\text{Fmax}}$ results are not significant, and can be discounted from the assessment.

Table 3.2: Summary of Measured Environmental Noise Levels 3rd - 10th July 2017

Location	Measured Noise Levels				
	Daytime		Night-time		
	L_{Aeq} dB	L_{A90} dB	L_{Aeq} dB	L_{Amax} dB	L_{A90} dB
Position 1	42.2-70.5	24.9-57.2	30-85	23.9-63.2	22.1-46.8

Figure 3.1: Noise Measurement Locations



The noise levels shown in Table 3.1 have been used to develop and calibrate a noise propagation model for the proposed development as discussed in Section 4.0, thereby allowing noise levels across the entire application site to be predicted. The results of these calculations have then been used to determine appropriate noise mitigation requirements needed to satisfy the design criteria discussed in Section 5.0.

4.0 NOISE PROPAGATION MODELLING & BREAK-IN CALCULATIONS

CadnaA Noise Modelling

To predict noise levels across the facades of the proposed buildings, CadnaA 3D has been used, which implements the calculation procedure specified within ISO 9613-2¹. The model has been calibrated using the measured levels presented in Section 3.0 and using previously measured data as presented in Section 3.0.

The calibration for the road traffic was undertaken by modelling the existing buildings, proposed buildings and the surroundings using Google Earth imagery and drawn details. The monitoring positions were assigned as receiver positions in the model and the sources of interest i.e. road traffic, rail traffic etc... have been adjusted until the receiver position matched the measured data. The calibrated sources are then used to predict noise propagation to and across the proposed development site. Appendix C presents the output from the model.

BS8233:2014 Noise Ingress Calculations

Ingress calculations have been undertaken in accordance with the procedure set out in Appendix G of BS8233:2014. The ingress calculations have been used to select suitable glazing and ventilation combinations that can then be mapped in CadnaA.

Assumptions have been made to assess the impact affecting the section of the development under outline planning. Assumptions have been made regarding the room volume and facade elements and areas. Glazing has been assumed to be no more than 20% of the total facade area, and room volumes of 30m³. It has also been assumed dwellings are no more than two storeys. This information should be updated and checked by Red Acoustics Ltd when details become available.

Appendix C present the results of the BS8233:2014 calculations for the proposed mitigation proposals.

¹ ISO 9613-2:1996 *Acoustics -- Attenuation of sound during propagation outdoors -- Part 2: General method of calculation*

5.0 PLANNING POLICY & DESIGN TARGETS

Planning Policy

National Planning Practice is guided by the National Planning Policy Framework. With regard to Noise the Framework states the following:

Planning policies and decisions should take account of the acoustic environment and consider:

- *whether or not a significant adverse effect is occurring or likely to occur;*
- *whether or not an adverse effect is occurring or likely to occur and;*
- *whether or not a good standard of amenity can be achieved.*

In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.

The terms 'significant adverse impact' and 'other adverse impacts' are defined in the explanatory notes of the 'Noise Policy Statement for England (NPSE)' which states:

There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

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.

Lowest Observed Adverse Effect Level : This is the level above which adverse effects on health and quality of life can be detected.

Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

Significant Observed Adverse Effect Level : This is the level above which significant adverse effects on health and quality of life occur.

These are summarised in Table 5.1 below.

Table 5.1: Explanation of Noise Exposure Hierarchy

Perception	Examples of Outcomes	Increasing Effect Levels	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; closing windows for some of the time because of the noise. Potential for non-awakening sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed Adverse Effect Level	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. having to keep windows closed most of the time, avoiding certain activities during periods of intrusion. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

It should be noted that no specific noise limits for NPPG have been defined in Table 5.1 above, however, guidance from other acoustic standards may be employed to determine suitable levels within the overall principal of the National Planning Policy Framework.

Design Targets

The noise design targets for internal habitable spaces and gardens are detailed in Table 5.2. The targets are based on the advice provided in BS8233:2014. The targets below are design to achieve an effect level of lowest observed or less.

Table 5.2: BS8223:2014 Design Targets

Space	L _{Aeq,16hr} (07:00 - 23:00)	L _{Aeq,8hr} (23:00 - 07:00)	L _{Amax}
Living Room & Kitchen	35dB	-	-
Dining Room & Study	40dB	-	-
Bedroom	35dB	30dB	≤45dB
Garden & Patios	≤55dB	-	-

6.0 RECOMMENDED GLAZING & VENTILATION STRATEGY

Appendix B presents the recommended glazing and ventilation for the development based on the predictions made using the measured survey data. The glazing and ventilation strategy is based on calculation undertaken in accordance with BS8233:2014 in Section 4.0. Table 6.1 presents the minimum octave band Sound Reduction Index (SRI) and Element Normalised Level Difference (D_{ne}) values for the various facade elements. Implementation of the suggested glazing and ventilation strategy in the areas outlined will ensure the levels quoted in BS8233:2014 will be achieved.

Table 6.1: Minimum Facade Element Performance Requirements

Facade Element	Octave Band Performance Data dB				
	125	250	500	1000	2000
4-12-6 Glazing	23	23	30	41	41
Titon Trimvent Vent	28	31	31	29	34
Typical Masonry Facade	48	44	46	54	63

The Site with this arrangement all plots are expected to achieve 55dB $L_{Aeq,T}$ or less in the gardens. Any revisions to the site Red Acoustics Ltd should be consulted as changes may potentially change the impact to habitable areas.

7.0 CONCLUSION

An assessment to determine the glazing and ventilation specification for the proposed residential dwellings has been undertaken as well as an assessment of the impact within garden and patio areas.

Suitable glazing and ventilation options are presented dependent upon the noise level in each mitigation zone. Implementation of the recommended glazing and ventilation strategy will ensure that the internal noise levels are controlled to be less than the recommended limits in BS8233:2014.

Garden noise levels have been predicted across the site and are predicted to achieve $<55\text{dB } L_{Aeq,T}$.

APPENDIX A: NOISE SURVEY DETAILS

Location

Land off Mold Road

Wrexham

North Wales

Survey Dates

4th and 8th May 2017 (Initial)

3rd and 10th July 2017 (Re-Survey)

Weather

Mild, calm, dry

Personnel Present During Equipment Set Up

Johnathon Whittle - Red Acoustics Limited

Jack Rostron - Red Acoustics Limited

Instrumentation

A summary of the instrumentation used to conduct the noise surveys is presented in Table A1.

Table A1: List of Instrumentation Used

Equipment Description	Manufacturer	Manufacturer	Serial Number	Date of Last Calibration Prior to Survey	Certificate Number
Sound Level Meter	CR:171B Type 1	Cirrus	G056973	28-Apr-15	228152
Sound Calibrator	CR:515 Type 1	Cirrus	59150	10-May-16	02691/1
Outdoor Mic Capsule	MK: 224	Cirrus	20044306	28-Apr-15	-
Sound Level Meter	CR:171B Type 1	Cirrus	G056965	28-Apr-15	228143
Sound Calibrator	CR:515 Type 1	Cirrus	59153	10-May-16	02691/2
Outdoor Mic Capsule	MK: 224	Cirrus	20044889	28-Apr-15	-
Sound Level Meter	SVAN 957 Type 1	SVANTEK	28042	17-Feb-15	17595
Preamplifier	SVAN SV12L	SVANTEK	31144	17-Feb-15	17595
Microphone Capsule	SVAN 7052E	SVANTEK	59416	17-Feb-15	18029
Sound Calibrator	Type 1251 IEC 60942-1997 Class 1	Norsonic	32273	05-Apr-16	21209

Methodology

Before and after the measurements the meters were check calibrated to an accuracy of $\pm 0.3\text{dB}$ using their associated calibrators.

Figure A1: Summary of Measured Noise Levels – Position 1 - 4th/8th May 2017

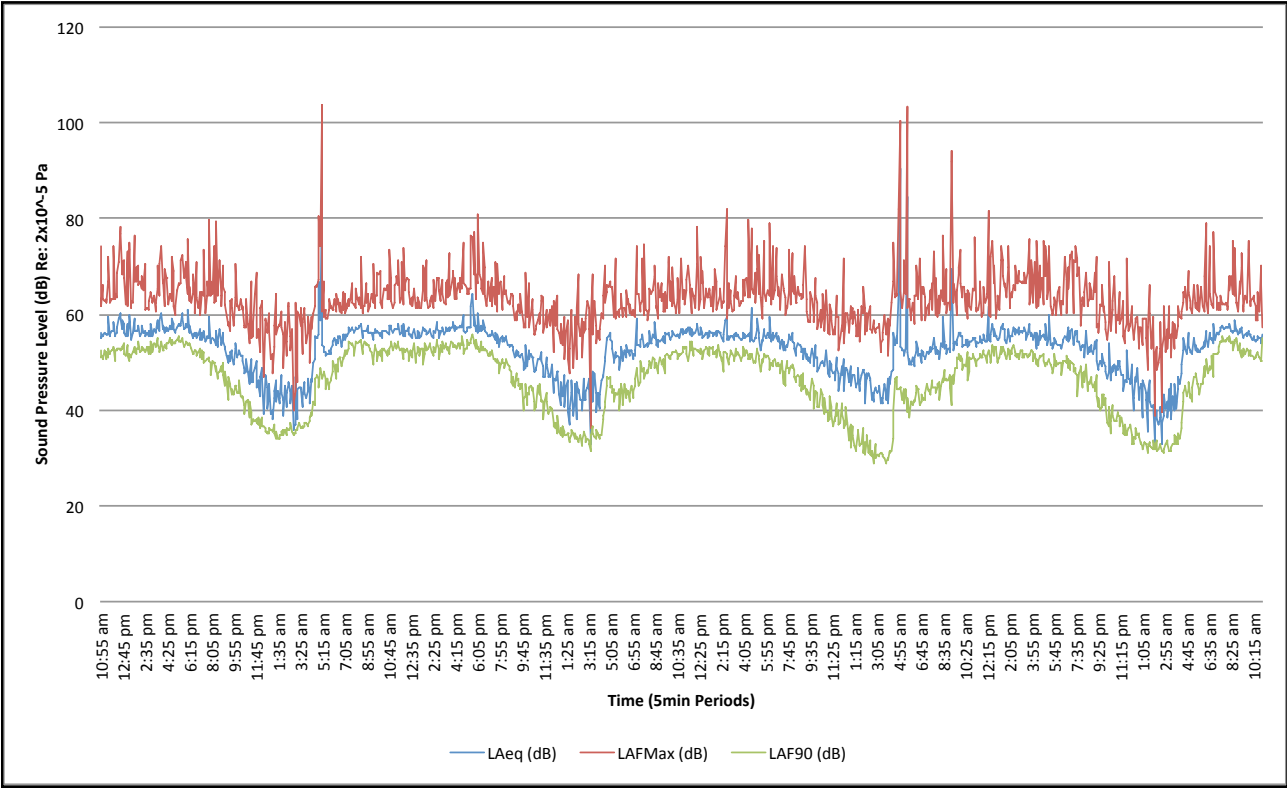


Figure A2: Summary of Measured Noise Levels – Position 2 - 4th/8th May 2017

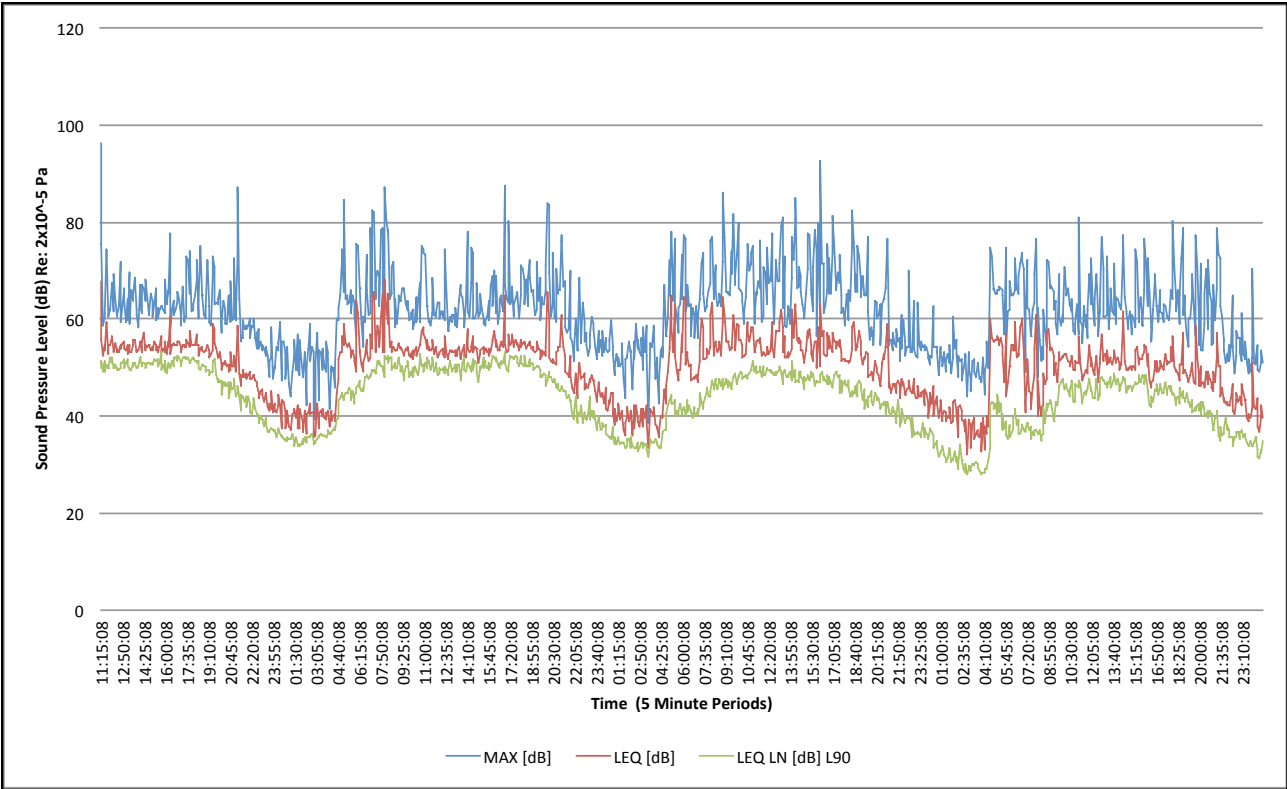


Figure A3: Summary of Measured Noise Levels – Position 3 - 4th/8th May 2017

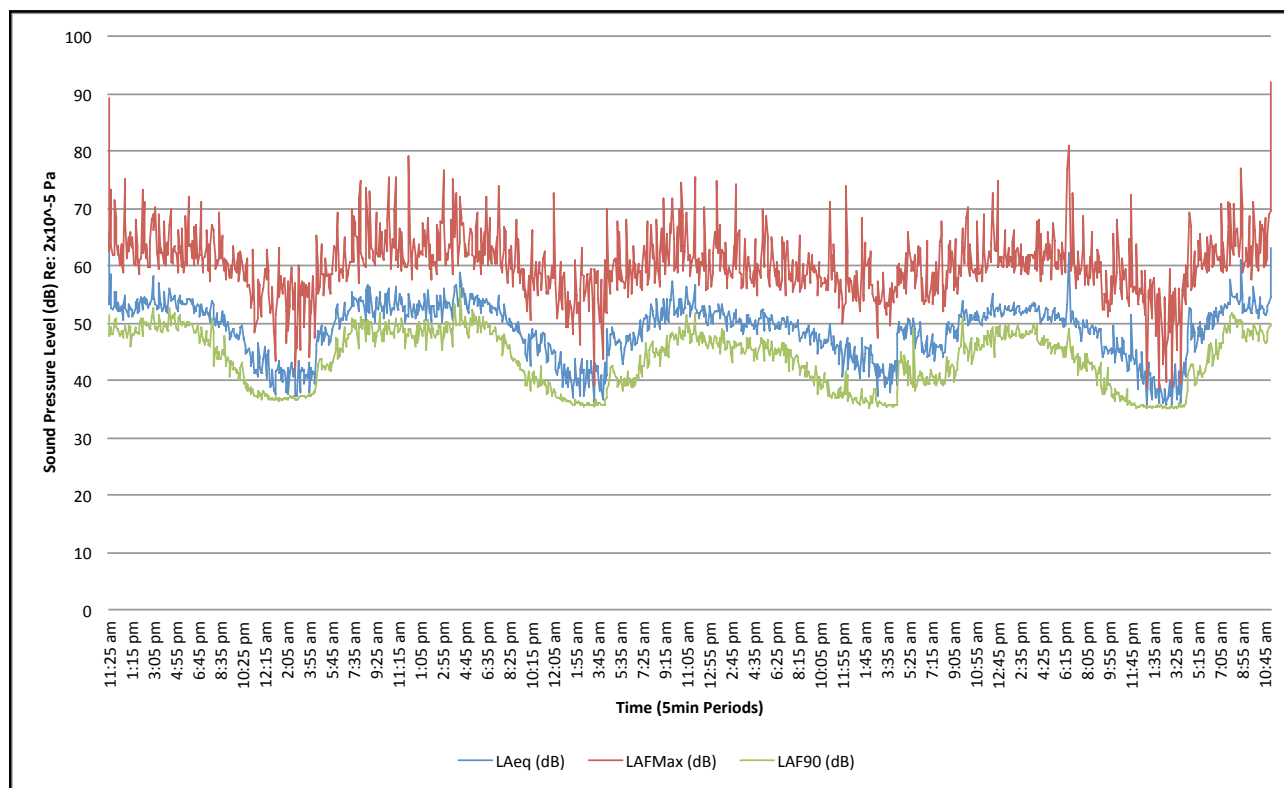
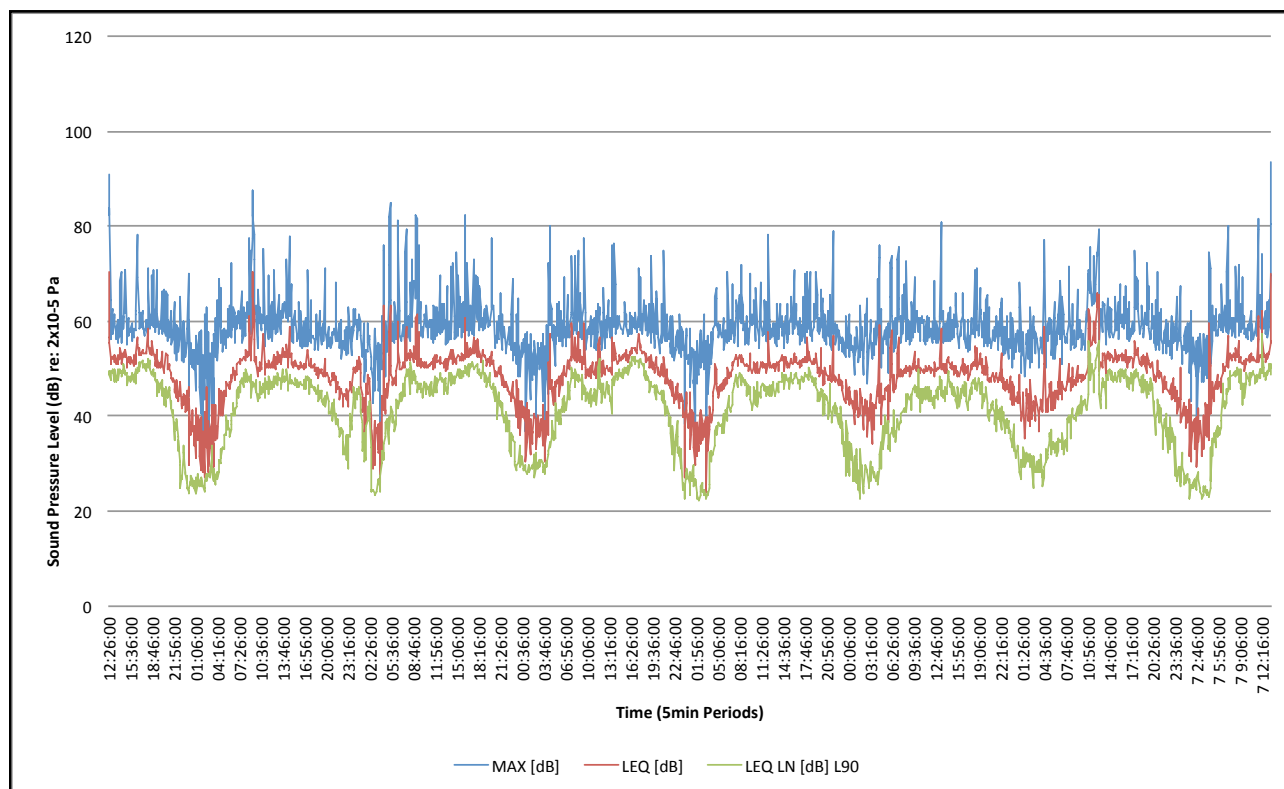


Figure A4: Summary of Measured Noise Levels – Position 1 - 3rd/10th May 2017



APPENDIX B: DRAWING PACKAGE - CADNAA MODEL OUTPUTS

Figure B1: Summary Of Mitigation Measures



Figure B2: Summary Of Garden Noise Levels



PROPOSED RESIDENTIAL DEVELOPMENT - MOLD ROAD, WREXHAM



ASC REAL ESTATE INVESTMENTS LTD

ENVIRONMENTAL NOISE STUDY - R1375-REP01B-JR

APPENDIX C: Break In Calculations

Assessment of Noise Ingress to BS8233 - Mold Road, Wrexham
LSU

		OCTAVE BAND CENTRE FREQUENCY								dBA
		31.5	63	125	250	500	1000	2000	4000	
RT REF	Day L _{eq}	72.1	65.4	56.7	51.2	49.7	48.0	48.3	40.5	54.0
	Night L _{max}	67.7	58.8	54.8	51.8	45.3	52.4	50.4	37.9	55.7
	Night L _{eq}	46.2	52.3	46.5	41.9	35.1	29.8	35.1	24.5	40.3
	Day L _{eq} and Source Correction	72.1	65.4	56.7	51.2	49.7	48.0	48.3	40.5	54.0
	Night L _{max} and Source Correction	67.7	58.8	54.8	51.8	45.3	52.4	50.4	37.9	55.7
	Night L _{eq} and Source Correction	46.2	52.3	46.5	41.9	35.1	29.8	35.1	24.5	40.3
1	Rev Time (27)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
1	Titon Trimvent (non acoustic)	27.0	28.4	27.9	30.8	30.5	29.0	33.7	33.7	
Vent REF	Typical massonry Façade	45	47	48	44	46	54	63	71	
	SRI 2									
	Area of SRI 1	5.00	m2							
	Area of SRI 2	0.00	m2			Day Leq Src Reduction =	0.0			
	Area of Glazing	2.00	m2			Lmax Src Reduction =	0			
	Volume of Room	38.00	m3			Night Leq Src Reduction =	0			
	Target Internal Noise Levels	35				Ext Wall	0			
		45								
		30								
	Target NR	40								
	Include trickle vent?	y								

Suitable?	Glazing Type	Area of Glazing
Yes	6-16-8.8 St Gobain	2.00
Yes	10-16-8.8 St Gobain	2.00
Yes	4-12-6	2.00
Yes	10-12-4	2.00
Yes	10-12-6	2.00
Yes	6-12-6.4 PVB	2.00
Yes	Input	2.00
Yes	6.8-16-6.8 Pilkington Insulight	2.00
Yes	10.8-16-6 Pilkington Insulight	2.00
Yes	8-12-8.8 Stadip Silence	2.00
Yes	10-16-16.8 Stadip Silence	2.00
Yes	16.8-16-16.8 Pilkington Insulight	2.00
Yes	Solaglas 4-20-6	2.00
Yes	Solaglas 4-20(arg)-6	2.00
Yes	Velfac 4-15-4 +6	2.00
Yes	Velfac 8-12-8 + 8	2.00
Yes	6-150-4	2.00
Yes	10-200-6	2.00
Yes	6-100-4	2.00

Day Leq	
Internal Daytime L _{Aeq,16hr}	Exceedence over Target
25.1	0.0
24.8	0.0
25.8	0.0
25.6	0.0
25.3	0.0
26.5	0.0
24.7	0.0
25.2	0.0
25.0	0.0
25.0	0.0
24.7	0.0
24.7	0.0
25.7	0.0
25.6	0.0
24.9	0.0
24.6	0.0
24.9	0.0
24.6	0.0
25.1	0.0

Night Lmax	
Internal Night-time L _{Amax}	Exceedence over Target
26.7	0.0
26.5	0.0
26.9	0.0
26.9	0.0
26.8	0.0
27.4	0.0
26.4	0.0
26.7	0.0
26.6	0.0
26.6	0.0
26.5	0.0
26.4	0.0
27.1	0.0
27.0	0.0
26.5	0.0
26.4	0.0
26.5	0.0
26.4	0.0
26.5	0.0

Night Leq	
Internal Night-time L _{Aeq,8hr}	Exceedence over Target
11.5	0.0
11.0	0.0
12.5	0.0
12.4	0.0
11.6	0.0
13.5	0.0
10.9	0.0
11.9	0.0
11.5	0.0
11.4	0.0
10.9	0.0
10.9	0.0
12.9	0.0
12.8	0.0
11.0	0.0
10.7	0.0
10.9	0.0
10.7	0.0
11.2	0.0

Assessment of Noise Ingress to BS8233 - Mold Road, Wrexham
Housing - Outline Planning

		OCTAVE BAND CENTRE FREQUENCY								dBA
		31.5	63	125	250	500	1000	2000	4000	
RT REF	Day L _{eq}	55.6	55.3	50.3	50.4	50.6	52.5	43.4	34.1	54.5
	Night L _{max}	50.0	53.6	52.4	54.7	55.2	56.9	49.6	31.9	59.1
	Night L _{eq}	50.4	50.2	48.0	45.3	46.2	49.1	41.3	44.6	52.1
	Day L _{eq} and Source Correction	55.6	55.3	50.3	50.4	50.6	52.5	43.4	34.1	54.5
	Night L _{max} and Source Correction	50.0	53.6	52.4	54.7	55.2	56.9	49.6	31.9	59.1
	Night L _{eq} and Source Correction	50.4	50.2	48.0	45.3	46.2	49.1	41.3	44.6	52.1
1	Rev Time (27)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
1	Titon Trimvent (non acoustic)	27.0	28.4	27.9	30.8	30.5	29.0	33.7	33.7	
Vent REF	Typical massonry Façade	45	47	48	44	46	54	63	71	
	SRI 2									
	Area of SRI 1	10.00	m2							
	Area of SRI 2	0.00	m2		Day Leq Src Reduction =	0.0				
	Area of Glazing	2.00	m2		Lmax Src Reduction =	0				
	Volume of Room	30.00	m3		Night Leq Src Reduction =	0				
	Target Internal Noise Levels	35			Ext Wall	0				
		45								
		30								
	Target NR	40								
	Include trickle vent?	y								

Suitable?	Glazing Type	Area of Glazing
Yes	6-16-8.8 St Gobain	2.00
Yes	10-16-8.8 St Gobain	2.00
Yes	4-12-6	2.00
Yes	10-12-4	2.00
Yes	10-12-6	2.00
Yes	6-12-6.4 PVB	2.00
Yes	Input	2.00
Yes	6.8-16-6.8 Pilkington Insulight	2.00
Yes	10.8-16-6 Pilkington Insulight	2.00
Yes	8-12-8.8 Stadip Silence	2.00
Yes	10-16-16.8 Stadip Silence	2.00
Yes	16.8-16-16.8 Pilkington Insulight	2.00
Yes	Solaglas 4-20-6	2.00
Yes	Solaglas 4-20(arg)-6	2.00
Yes	Velfac 4-15-4 +6	2.00
Yes	Velfac 8-12-8 + 8	2.00
Yes	6-150-4	2.00
Yes	10-200-6	2.00
Yes	6-100-4	2.00

Day Leq	
Internal Daytime L _{Aeq,16hr}	Exceedence over Target
27.3	0.0
27.2	0.0
27.5	0.0
27.5	0.0
27.3	0.0
27.8	0.0
27.1	0.0
27.3	0.0
27.2	0.0
27.2	0.0
27.1	0.0
27.1	0.0
27.6	0.0
27.6	0.0
27.2	0.0
27.1	0.0
27.1	0.0
27.1	0.0

Night Lmax	
Internal Night-time L _{Amax}	Exceedence over Target
31.7	0.0
31.6	0.0
31.9	0.0
31.9	0.0
31.8	0.0
32.1	0.0
31.5	0.0
31.7	0.0
31.6	0.0
31.5	0.0
32.0	0.0
32.1	0.0
31.6	0.0
31.6	0.0
31.6	0.0
31.5	0.0
31.6	0.0

Night Leq	
Internal Night-time L _{Aeq,8hr}	Exceedence over Target
24.1	0.0
24.1	0.0
24.3	0.0
24.3	0.0
24.2	0.0
24.5	0.0
24.0	0.0
24.2	0.0
24.1	0.0
24.1	0.0
24.0	0.0
24.0	0.0
24.4	0.0
24.4	0.0
24.1	0.0
24.0	0.0
24.0	0.0
24.0	0.0
24.0	0.0