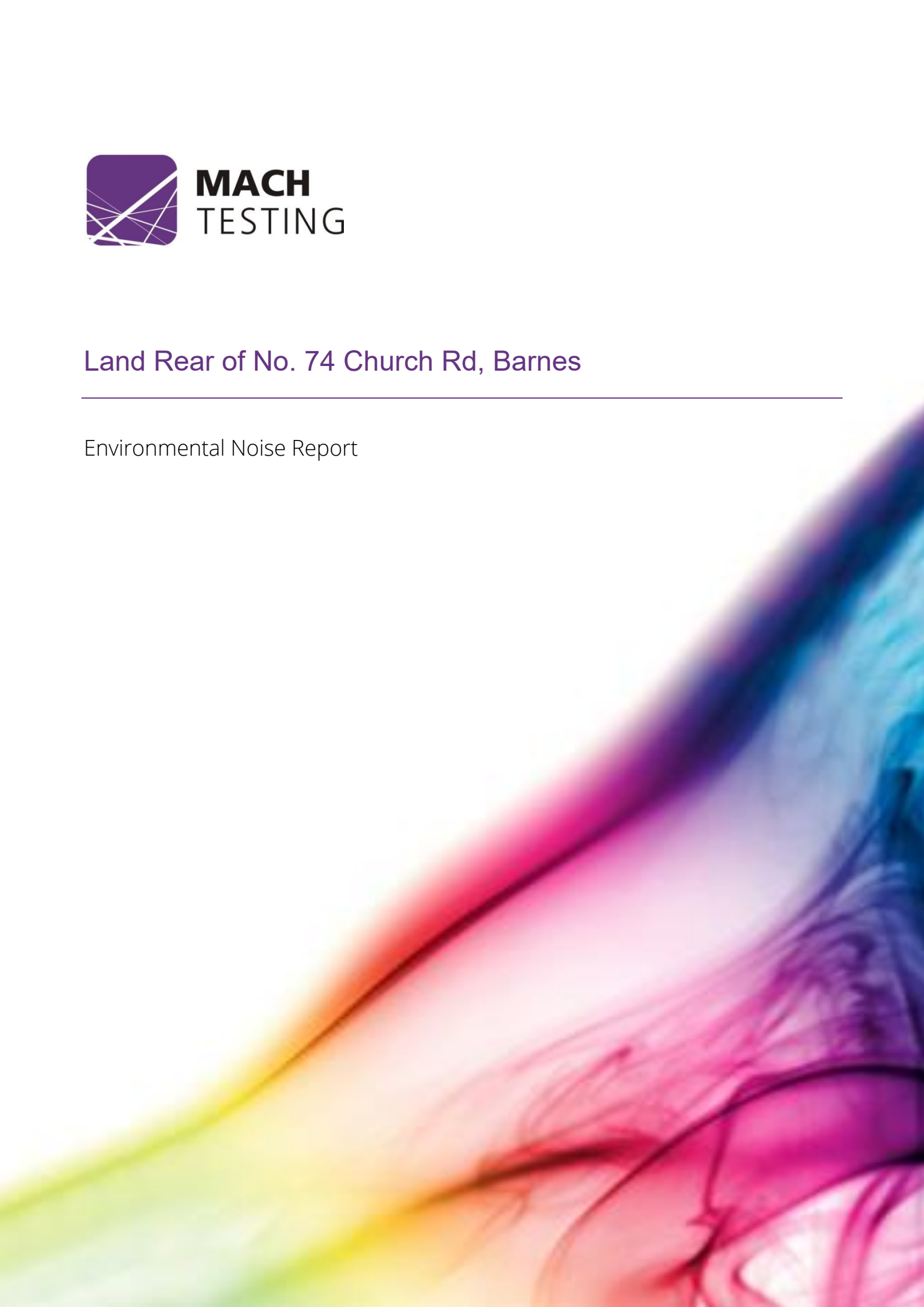
MACH TESTING

Land Rear of No. 74 Church Rd, Barnes

Environmental Noise Report



74 CHURCH ROAD, BARNES

Environmental Noise Report

Anne Machin Architects

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1.0 INTRODUCTION

MACH Testing has been appointed by Basinghall Estate Co Ltd to carry out an environmental noise survey and subsequent assessment for the proposed residential development at 74 Church Road, Barnes. Proposals are for a mixed use development consisting of 5 commercial units and 6 flats.

The purpose of the assessment is to determine any appropriate noise control measures to protect the future occupants against noise ingress from the local environment. To undertake this assessment, an environmental noise survey was carried out on-site between the 27th and 28th of June 2016.

A review of the requirements of the proposed building façades has been provided, in order to enable compliance with guidance given within BS8233: 2014 'Guidance on sound insulation and noise reduction for buildings'.

Additional assessments have been conducted in line with BS4142: 2014. These assessments serve to quantify noise emissions from existing mechanical plant on site, and set maximum noise limits for plant associated with the proposed commercial uses.

2.0 SITE DESCRIPTION

The proposed plans are for a new residential development on the site located at 74 Church Road, Barnes. The proposed development is situated in a courtyard location, through a passage perpendicular to Church Road.

The site is situated in close proximity to sources of road and air traffic noise. As such, appropriate noise control measures will be required in order to protect the future occupants from excessive noise levels. The site in relation to its surroundings is shown in the map and aerial photograph below.

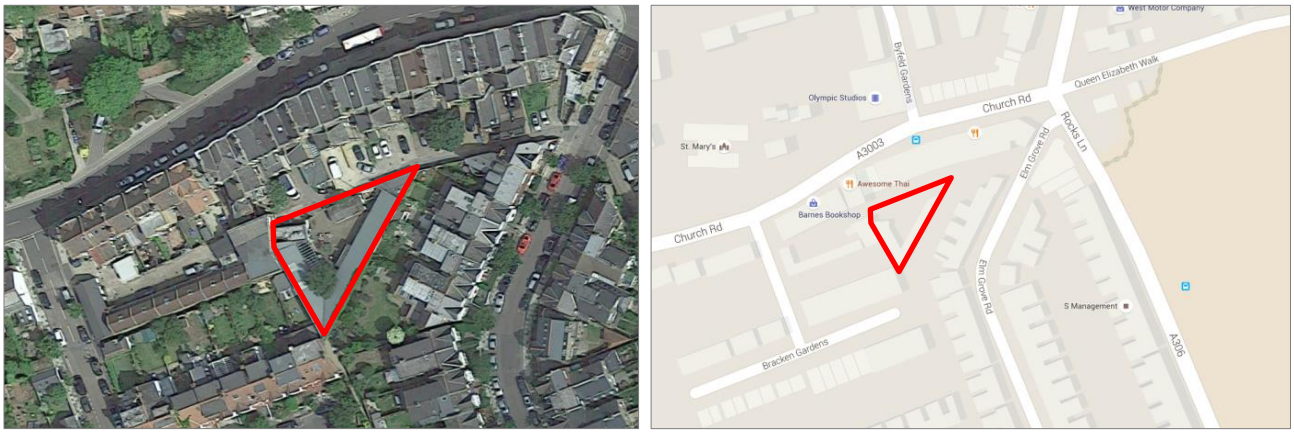

Figure 2.1: Aerial photograph and site map

The primary contributor to noise levels on site is road traffic, with a heavy flow of vehicles on Church Road during the day. Although the site is significantly screened from Church Road, noise from this source is still clearly audible. Noise levels are greatly reduced during the night time period, with a reduced traffic flow.

Air traffic associated with Heathrow Airport is seen to be another significant contributor to ambient noise levels. Air traffic movements are frequent during the day, and reduced during the night. As this noise source is highly intermittent in nature, it is seen that the contribution to average L_{Aeq} levels over day and night is secondary to road traffic.

It is also noted that there are 3 units of mechanical plant located in proximity to the proposed development. These units are associated with a veterinary surgery. Although noise emissions from these units are low, an assessment has been conducted in order to illustrate a negligible noise impact at the proposed dwellings.

3.0 NOISE SURVEY

In order to establish environmental noise levels on site, continuous 5-minute samples of the acoustic parameters $L_{Aeq, T}$, $L_{A90, T}$, and $L_{Amax,T}$ were measured between 12:10 on 27/06/16 and 11:30 on 28/06/16, at a fixed microphone position (designated "F") on site. Data has been gathered over a 24 hour period, in order to provide L_{Aeq} and L_{Amax} levels for both day and night.

As stated in Section 2.0, the noise climate on site consists of road and air traffic noise. MACH Acoustics fixed noise monitoring position has been installed in order to provide a clear picture of noise levels at the location of the proposed development.

Figure 3.1 below provides the location of fixed measurement position 'F'. The microphone was placed approximately 3m above ground level in free field conditions with line of sight to all noise sources, including Church Road, air traffic and the exiting mechanical plant associated with the veterinary centre.

Spot measurements (designated S1 and S2) have also been conducted, in order to establish the noise contribution of passing aircraft, and plant units associated with the veterinary centre. Microphone positions are indicated on the proposed site plan, such that their relation to the proposed dwellings is clear.

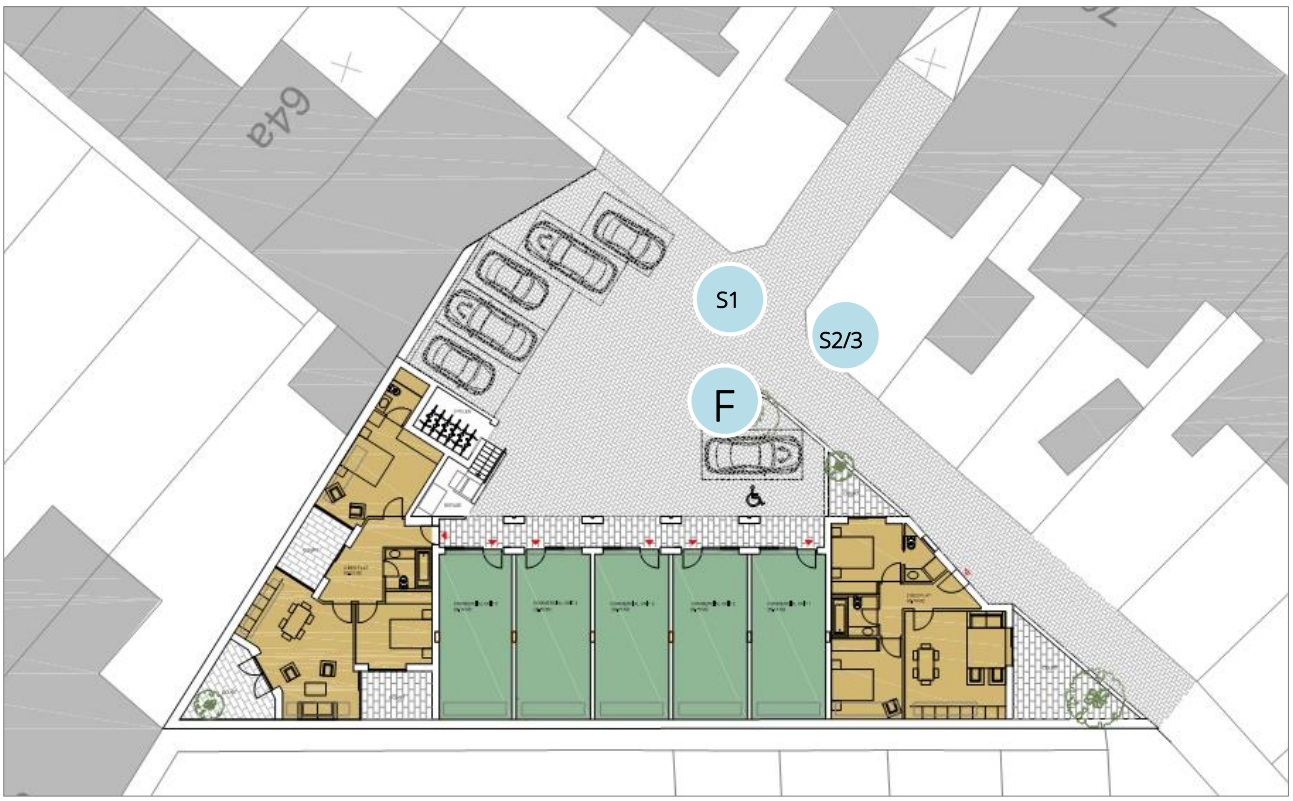

Figure 3.1: Measurement location on the proposed site map

The long term meter was set to measure consecutive 'A' weighted 5 minute time samples. This scenario was implemented so that any inconsistencies in the data could be easily identified and explained. The results of the environmental noise survey are provided within Section 4.0 of this report.

3.1 Measurement Equipment

The measurement equipment illustrated in Table 3 was used during the survey, all equipment complies with BS EN 60942:2003 i.e. a class 1 device.

Name	Serial Number	Last Calibrated	Calibration Due
Norsonic Precision Sound Analyser Type 118	30562	June 2016	June 2018
Norsonic Type 1206 Pre-amplifier	30249	June 2016	June 2018
GRAS 40AF Microphone	114670	June 2016	June 2018
Norsonic Sound Calibrator Type 1251	32090	June 2016	June 2018

Table 3.1: Noise Measurement Equipment

3.2 Weather Conditions

The following climate conditions were recorded for the site:

Wind: Less than 5 m/s.
Humidity: The weather was clear.
Temperature: 14 - 21°C.

The above weather conditions are suitable for the measurement of environmental noise in accordance with BS7445 *Description and Measurement of Environmental Noise.*

4.0 NOISE SURVEY RESULTS

4.1 Fixed Measurement Results

The following graph and table show the measured noise levels at fixed measurement location F on site. All measurements are shown in dB(A). The complete set of measurement data is available on request. The graph in Figure 4.1 below provides the L_{Amax}, L_{Aeq} and L_{A90} levels measured over the length of the noise survey.

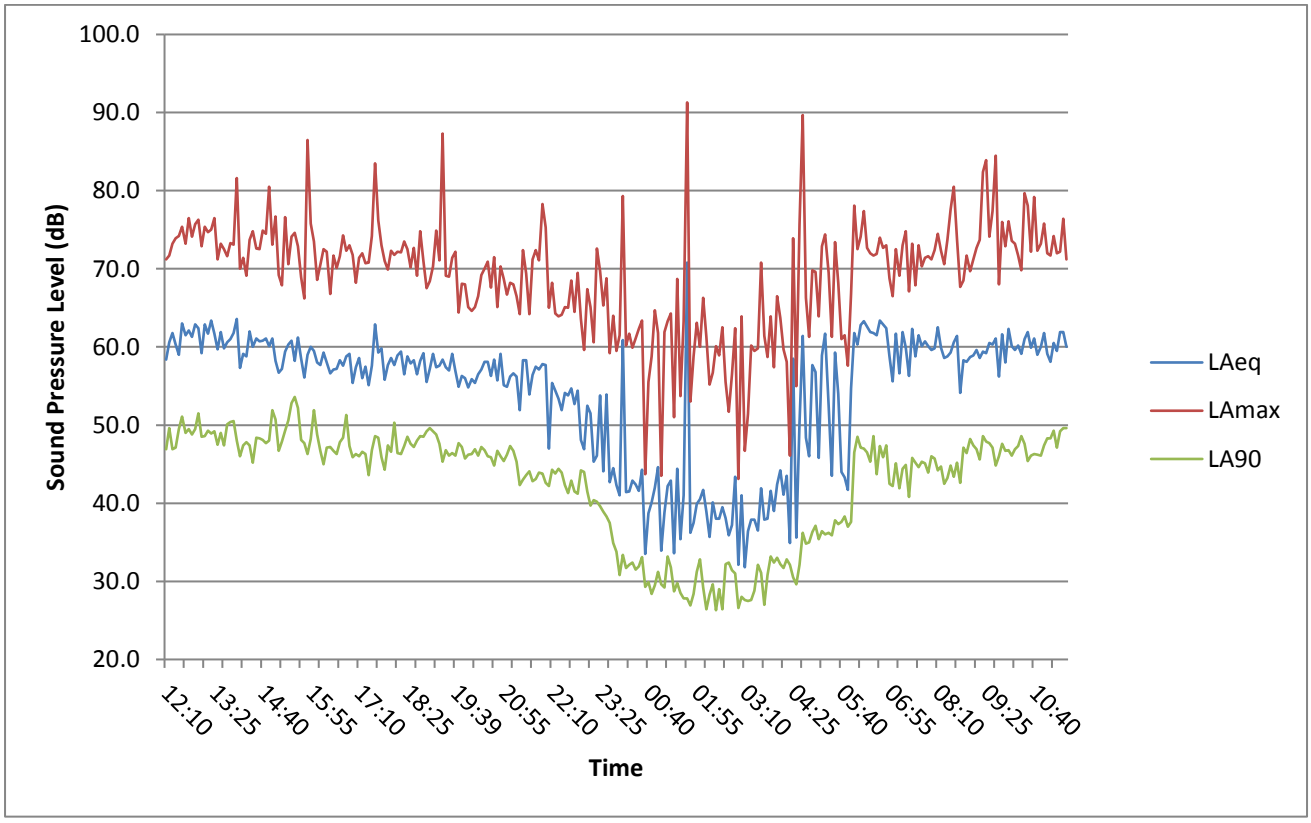

Figure 4.1: Graph of on-site environmental noise measurements

Measurement	Maximum	Minimum	Average
L_{Aeq}	64	47	60
L_{A90}	54	41	-
L_{fmax}	87	64	75

a) DAY (0700 – 2300)

Measurement	Maximum	Minimum	Average
L_{Aeq}	71	32	57
L_{A90}	49	26	-
L_{fmax}	91	43	75

b) NIGHT (0700 – 2300)

Table 4.1: Noise survey results

4.2 Spot Measurement Results

As stated previously, spot measurements were recorded at 2 locations on the site in order to help quantify noise levels from specific noise sources. The L_{Aeq} levels measured from these spot measurements are shown in Table 4.1.

Position	Time	Description	L_{Aeq}, dB
S1	11:50	Aircraft Overhead	66
S2	11:55	Plant Noise – Veterinary Centre, 2 Units	51
S3	11:57	Plant Noise – Veterinary Centre, 1 Unit	49

Table 4.1: Spot Measurements – Positions 1 to 2

4.3 Assessment Background Noise Levels

In order to assess the existing mechanical plant units on site, and provide a benchmark for plant associated with the proposed development, it is necessary to extrapolate a representative background noise level.

BS4142: 2014 states that '*in using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods.*'

BS4142 further states that '*a representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either minimum or modal value*'. Hence BS4142 does not provide a black and white method of obtaining the assessment level for background noise.

For the purposes of assessment, MACH Acoustics have derived the modal LA90 value occurring between 0700-2300 and 2300-0700.

Measurement	Modal Value (dB)
L_{A90} Day (07:00 – 23:00)	47
L_{A90} Night (23:00 – 07:00)	39

Table 4.2: Assessment Noise Levels

4.4 Assessment Façade Noise Levels

Based on the results of fixed microphone F, the following noise levels are representative of the facades of the proposed dwellings. These assessment façade noise levels have been derived in order to enable an assessment in line with BS8233: 2014.

L_{Aeq} 16 Hour	60 dB	(Worst case)
L_{Aeq} 8 Hour	57 dB	(Worst case)
L_{Amax}	84 dB	(Maximum 10 instances exceeding per night)

5.0 BS 4142: 2014 - ASSESSMENT CRITERIA

BS 4142:2014 "Methods for rating and assessing industrial and commercial sound" describes a method of determining the level of noise of an industrial nature, together with the procedures for assessing whether the noise in question is likely to give rise to complaints from persons living in the vicinity. As such, an assessment to BS 4142 is typically called for within planning conditions. The likelihood of complaints in response to a noise depends on various factors. BS 4142 assesses the likelihood of complaints by considering the margin by which the noise in question exceeds the background noise level.

BS 4142 states that one should *'obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level from the rating level and consider the following:*

a) *Typically, the greater this difference, the greater the magnitude of the impact.*
b) *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
c) *A difference of around + 5 dB is likely to be an indication of an adverse impact, depending on the context.*
d) *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 low impact, depending on the context*.

The aforementioned rating level is based upon the specific noise level of the noise source in question. A correction should be applied to the specific noise level to obtain an increased rating level if *'a tone, impulse or other characteristic occurs, or is expected to be present, for new or modified sound sources.* To summarise, BS4142 section 9.2 advises the following in regards to corrections for acoustic characteristics:

- Tonality – *for sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.*
- Impulsivity – *A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level., Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.*
- Other sound characteristics – *Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied*
- Intermittency – *When the specific sound has identifiable on/off conditions, if the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.*

Measurement data indicates that plant associated with the veterinary centre is broadband in nature. As such an acoustic feature correction has not been applied for tonality. It is also warranted that the residual noise climate on site would mask broadband noise with a low specific noise level. As such no correction has been applied.

6.0 GOVERNMENT GUIDANCE DOCUMENTATION – NOISE CONTROL

In March 2012 the Government published the National Planning Policy Framework (NPPF) which sets out the Government's planning policies for England and how these are expected to be applied.

The Framework replaces many of the existing Planning Policy documents including Planning Policy Guidance 24: Planning and Noise that gave guidance on the control of noise to sensitive developments which may be affected by noise and vice versa. The NPPF provides a framework within which local people and their council can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

With regards to noise the Framework states that 'Planning policies and decisions should aim to:

- avoid noise from giving rise to significant adverse impacts[27] on health and quality of life as a result of new development;
- mitigate and reduce to a minimum other adverse impacts[27] on health and quality of life arising from noise from new development, including through the use of conditions;
- recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established;[28] and
- identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

[27] The NPPF does make reference to The Noise Policy Statement for England, published by Defra in March 2010.

6.1 Noise Policy Statement for England

The aim of the Noise Policy Statement for England (NPSE) is to provide clarity regarding current policies and practices to enable noise management decisions to be made within the wider context, at the most appropriate level, in a cost-effective manner and in a timely fashion. The NPSE applies to all forms of noise including environmental noise, neighbour noise and neighbourhood noise.

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

Noise Policy 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; and
- where possible, contribute to the improvement of health and quality of life

6.2 Interpretation of NPSE

The Noise Policy Statement for England does not provide any specific guidance on noise levels for residential developments therefore it is seen that it is up to the discretion of the Local Planning Authority to decide on what is deemed acceptable.

Based on MACH Acoustics previous experience on similar developments it is proposed that planning be granted providing that the noise control methods provided within Section 7.0 and Section 8.0 of this report are adopted.

7.0 FAÇADE ASSESSMENT

To determine internal noise levels within the proposed dwellings, an indicative façade noise break-in assessment has been undertaken in accordance with the guidance given within BS8233. The calculations are shown within Appendix A. Noise ingress calculations have been based on façade and room dimensions as supplied by Anne Machin Architects.

The Noise Policy Statement for England does not provide guidance on internal noise levels within residential buildings. As a result, the advised levels within BS8233: 2014 'Guidance on sound insulation and noise reduction for buildings' have been adopted. BS8233 states that to achieve adequate sleeping and living conditions, background noise levels should be 30 dB L_{Aeq} or less within bedrooms at night, and 35 dB L_{Aeq} or less within Living rooms during the day. The advised levels are tabulated below.

Activity	Location	0700 - 2300	2300 - 0700
Resting	Living Room	35 dB $L_{Aeq, 16\ Hour}$	
Dining	Dining Room	40 dB $L_{Aeq, 16\ Hour}$	-
Sleeping	Bedroom	35 dB $L_{Aeq, 16\ Hour}$	30 dB $L_{Aeq, 8\ Hour}$

Table 7.1 - BS8233 Internal noise levels

BS 8233: 2014 provides no definitive methodology for assessment of L_{Amax} levels. The standard simply states that a guideline value for the internal level may be set depending on the character of the noise source and number of events per night. Calculations have been based on achieving 45 dB L_{Amax} within bedrooms. It is widely accepted that noise events should not exceed this level more than 10-15 times during the night time period (0700 – 2300).

7.1 Proposed Façade Construction

In order that the requirements of glazing and ventilation elements can be specified, MACH Acoustics have calculated the performance of the proposed façade construction (100mm Block, 100mm cavity, 33kg/m3 Rockwool Insulation, 100mm block) using INSUL noise prediction software. Calculations have been based on the façade construction details supplied by Anne Machin Architects. The predicted sound reduction is provided in Table 8.1 below.

Frequency:	63 Hz	125 Hz	250 Hz	500 Hz	1.0 K Hz	2.0 K Hz	4.0 K Hz
SRI:	59	70	70	82	96	113	126

Table 7.2: Existing Facade - Calculated sound reduction indices

7.2 Glazing and Ventilation Specification

Based on achieving the criteria set out in Table 7.1 above, calculations were carried out to determine the levels of attenuation required by the glazing and ventilation elements.

Calculations show that to achieve an internal acoustic environment in habitable rooms as specified by BS8233: 2104, the building envelope constructions should meet the sound insulation performance values presented in Table 7.3. Appendix A contains graphic representations of the spreadsheets used in the facade calculations.

Note that the glazing and ventilation specification is for guidance only. Similar systems to the one used in MACH Acoustics calculations may achieve the same desired internal noise levels.

Calculations based on providing background ventilation in the form of trickle vents. Acoustic requirements under purge ventilation have not been specified. BS8233 states that open windows may be relied upon for purge ventilation, and places no acoustic restriction on this statement.

	Frequency:	125 Hz	250 Hz	500 Hz	1.0 K Hz	2.0 K Hz	4.0 K Hz
Glazing	SRI:	28	30	39	44	48	56
Trickle Vents	SRI:	33	39	44	49	50	53

Table 7.3 - Minimum sound reduction indices (SRI) for façade elements* Exposure 1

*Data based on SRI values for the following products / constructions:

Glazing – SGG Stadip Silence, 8.4/12/10 double glazing.
Trickle Vent – Renson AK40

8.0 BS 4142 ASSESSMENTS

8.1 Veterinary Centre Plant

Noise levels were measured on site at approximately 1 metre from the veterinary centre plant units. The plant is formed from a combination a two identical smaller units, and 1 larger unit. The maximum plant operation that could be measured is a combination of the large and 1 small unit. Measurements were also obtained of 1 small unit in operation. A logarithmic addition gives the level of all 3 units at 1 metre.

Noise Source	Representative Noise Level (dB)
Plant Noise, 1m from the source – 2 Units	51
Plant Noise, 1m from source – 1 Unit	46
Calculated Noise Level – 3 Units	52

Table 8.1: Specific Noise Level at Source

The distance between the nearest residential receptor (formed as part of the proposed development) is 14 metres. The attenuation of a point source over this distance is 11 dBA. Taking this in to account, an assessment of the veterinary centre plant is provided below.

Assessment Period	Assessment Background Level (L_{A90})	Specific Noise Level (L_{Aeq})	Acoustic Feature Correction	Rating Level at the Receptor	Assessment Outcome
07:00 – 23:00	47 dB	41 dB	0	41 dB	- 6

Table 8.2: Veterinary Plant – BS4142 Assessment

Noise emissions from the veterinary centre plant are compliant with the provisions of BS4142: 2014 for residential dwellings formed as part of the proposed developed. Screening has not been accounted for, which would further reduce the rating level.

8.2 Plant Associated with Proposed Commercial Units

At this stage the nature of plant associated with the proposed commercial units is unknown. In order to ensure compliance with the requirements of the local authority, MACH Testing propose the following maximum rating level for all plant associated with the proposed development.

Assessment Period	Assessment Background Noise Level (L_{A90})	Maximum Rating Level
07:00 – 23:00	47 dB	47 dB $L_{Aeq\ 60\ MIN}$
23:00 – 07:00	39 dB	34 dB $L_{Aeq\ 15\ MIN}$

Table 8.3: Commercial Plant – Maximum Rating Levels

The local authority may request targets specific to this development. This should be checked prior to development of any plant specification. MACH Testing have suggested a contribution not exceeding background noise levels during the day, and 5 dB below background noise levels during the night.

9.0 SUMMARY

MACH Acoustics have been appointed by Anne Machin Architects to carry out an environmental noise survey and subsequent assessment for the proposed residential development at 74 Church Road, Barnes. Proposals are for a mixed use development consisting of 5 commercial units and 6 flats.

To determine internal noise levels within the proposed dwellings, an indicative façade noise break-in assessment has been undertaken in accordance with the method given within BS8233 for both day and night time noise levels. Calculations were based façade and room dimensions as supplied by Anne Machin Architects. Section 7.0 above indicates that to comply with the internal noise level targets specified within BS8233: 2014, façade elements should comply with the minimum sound reduction indices specified in Table 7.3.

Plant noise assessments have been conducted in line with BS4142: 2014. Plant associated with the veterinary centre is seen to be compliant with BS4142 at the worst affected residential dwelling, formed as part of the proposed development. Suggested maximum rating levels for plant associated with the proposed commercial units have been provided. These targets should be verified against the requirements of the local authority, once the relevant planning conditions have been made available.

APPENDIX A – FAÇADE BREAK-IN CALCULATIONS

A1 EXPOSURE LEVEL 1

BS8233 Facade Noise Break In Calculation		125	250	500	1000	2000	4000	dB(A)
Noise Level at Façade		61.1	59.1	58.4	54.6	49.1	40.7	**60**
Calculation of environmental noise break-in to hotel rooms								
3dB Safety (Calculation of enviromental noise break-in)	3 dB	3.0	3.0	3.0	3.0	3.0	3.0	
L2 = L0 - R + 10*log(S/A) + 3dB (Freefield version)								
Facade level type	Lff	0.0	0.0	0.0	0.0	0.0	0.0	
Free field level								
Calculated A = 0.161V/RT								
Volume =	69 m3							
RT	0.5 s	0.5	0.5	0.5	0.5	0.5	0.5	
A (absorption in sabins)		22.2	22.2	22.2	22.2	22.2	22.2	
10*log(S/A)		3.1	3.1	0.0	3.1	3.1	3.1	
FAÇADE Elements								
Total Façade Area	**45.6 m2**							
100mm Block, 100mm cavity, 33kg/m3 Roockwool Insul	39 m2	70	70	82	96	113	126	84
10Log((Si/Stot)10^(-R/10))		-71	-71	-83	-97	-114	-127	
Predicted noise level in building Lff+tl+10log(A0/A)+K		-3.5	-5.5	-21.3	-36.0	-58.5	-79.9	-11.5
Double - 8.4/12/10 - SGG Stadip Silence	7 m2	28	30	39	44	48	56	
10Log((Si/Stot)10^(-R/10))		-36	-38	-47	-52	-56	-64	
Predicted noise level in building Lff+tl+10log(A0/A)+K		31.1	27.1	14.3	8.6	-0.9	-17.3	20.9
Trickle Vent (n = 0 ignores trickle vents)	n = 1							
Renson AK40	Dne-10Log(n)	33	39	44	49	50	53	
	Ao/A	-39	-46	-51	-55	-57	-60	
Predicted noise level through trickle vent Lff-Dne+10log(A0/A)+K		27.8	19.5	10.5	5.3	-1.4	-12.8	15.9

		125	250	500	1000	2000	4000	dB(A)
Combined Noise Levels (1+2+3+4+5+6) - All Elements including Vents/Open Windows		**32.8**	**27.8**	**15.9**	**10.7**	**4.0**	**0.3**	**22**
Target	NR Difference	-22	-19	-25	-27	-31	-33	**35**
	NR pass / fail	*Pass*	*Pass*	*Pass*	*Pass*	*Pass*	*Pass*	**Pass**

Figure A1: Day time façade noise break-in $L_{Aeq,\ 16\ Hour}$

BS8233 Facade Noise Break In Calculation		125	250	500	1000	2000	4000	dB(A)
Noise Level at Façade		58.8	55.2	53.8	52.1	48.6	37.1	**57**
Calculation of environmental noise break-in to hotel rooms								
3dB Safety (Calculation of enviromental noise break-in)	3 dB	3.0	3.0	3.0	3.0	3.0	3.0	
L2 = L0 - R + 10*log(S/A) + 3dB (Freefield version)								
Facade level type	Lff	0.0	0.0	0.0	0.0	0.0	0.0	
Free field level								
Calculated A = 0.161V/RT								
Volume =	33 m3							
RT	0.5 s	0.5	0.5	0.5	0.5	0.5	0.5	
A (absorption in sabins)		10.6	10.6	10.6	10.6	10.6	10.6	
10*log(S/A)		4.0	4.0	0.0	4.0	4.0	4.0	
FAÇADE Elements								
Total Façade Area	**26.9 m2**							
100mm Block, 100mm cavity, 33kg/m3 Roockwool Insul	23 m2	70	70	82	96	113	126	
10Log((Si/Stot)10^(-R/10))		-71	-71	-83	-97	-114	-127	
Predicted noise level in building Lff+tl+10log(A0/A)+K		-4.9	-8.5	-25.9	-37.6	-58.1	-82.6	-14.2
Double - 8.4/12/10 - SGG Stadip Silence	4 m2	28	30	39	44	48	56	
10Log((Si/Stot)10^(-R/10))		-36	-38	-47	-52	-56	-64	
Predicted noise level in building Lff+tl+10log(A0/A)+K		29.6	24.0	9.5	6.9	-0.6	-20.1	18.2
Trickle Vent (n = 0 ignores trickle vents)	n = 1							
Renson AK40	Dne-10Log(n)	33	39	44	49	50	53	
	Ao/A	-37	-43	-49	-53	-54	-57	
Predicted noise level through trickle vent Lff-Dne+10log(A0/A)+K		28.7	18.8	8.2	6.0	1.3	-13.2	16.0

		125	250	500	1000	2000	4000	dB(A)
Combined Noise Levels (1+2+3+4+5+6) - All Elements including Vents/Open Windows		**32.2**	**25.1**	**12.2**	**9.9**	**5.1**	**0.2**	**20**
Target	NR Difference	-23	-22	-29	-28	-30	-33	**30**
	NR pass / fail	*Pass*	*Pass*	*Pass*	*Pass*	*Pass*	*Pass*	**Pass**

Figure A2: Night time façade noise break-in $L_{Aeq,\ 8\ Hour}$

BS8233 Facade Noise Break In Calculation		125	250	500	1000	2000	4000	dB(A)
Noise Level at Façade		83.8	79.5	77.3	79.3	81.9	71.8	**86**
Calculation of environmental noise break-in to hotel rooms								
3dB Safety (Calculation of enviromental noise break-in)	3 dB	3.0	3.0	3.0	3.0	3.0	3.0	
L2 = L0 - R + 10*log(S/A) + 3dB (Freefield version)								
Facade level type	Lff	0.0	0.0	0.0	0.0	0.0	0.0	
Free field level								
Calculated A = 0.161V/RT								
Volume =	27 m3							
RT	0.5 s	0.5	0.5	0.5	0.5	0.5	0.5	
A (absorption in sabins)		8.6	8.6	8.6	8.6	8.6	8.6	
10*log(S/A)		2.5	2.5	0.0	2.5	2.5	2.5	
FAÇADE Elements								
Total Façade Area	**15.4 m2**							
100mm Block, 100mm cavity, 33kg/m3 Roockwool Insul	13 m2	70	70	82	96	113	126	
10Log((Si/Stot)10^(-R/10))		-71	-71	-83	-97	-114	-127	
Predicted noise level in building Lff+tl+10log(A0/A)+K		18.7	14.4	-2.3	-11.8	-26.2	-49.3	8.9
Double - 8.4/12/10 - SGG Stadip Silence	2 m2	28	30	39	44	48	56	
10Log((Si/Stot)10^(-R/10))		-37	-39	-48	-53	-57	-65	
Predicted noise level in building Lff+tl+10log(A0/A)+K		52.5	46.2	32.4	32.0	30.6	12.5	41.5
Trickle Vent (n = 0 ignores trickle vents)	n = 1							
Renson AK40	Dne-10Log(n)	33	39	44	49	50	53	
	Ao/A	-35	-41	-46	-51	-52	-55	
Predicted noise level through trickle vent Lff-Dne+10log(A0/A)+K		54.7	44.1	34.1	34.2	35.6	22.5	43.0

		125	250	500	1000	2000	4000	dB(A)
Combined Noise Levels (1+2+3+4+5+6) - All Elements including Vents/Open Windows		**56.7**	**48.3**	**36.4**	**36.2**	**36.8**	**22.9**	**45**
Target	NR Difference	2	1	-5	-2	2	-10	**45**
	NR pass / fail			*Pass*	*Pass*		*Pass*	**Pass**

Figure A3: Night time façade noise break-in L_{Amax}