

Red Kangaroo Bridgewater Close Reading

Environmental Noise Survey and Noise Impact Assessment Report

23580/NIA1

18 November 2016

For:
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Document Control

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1.0 Introduction

It is proposed to change the use of an existing industrial unit at 8 Bridgewater Close, Reading into an indoor trampoline park. The site has a number of adjacencies of differing use including a hotel, residential houses and industrial units.

Hann Tucker Associates have therefore been commissioned to undertake an environmental noise survey and noise impact assessment to assess the likely noise impact on the adjacent noise sensitive receivers.

This report presents the survey methodology and findings.

2.0 Objectives

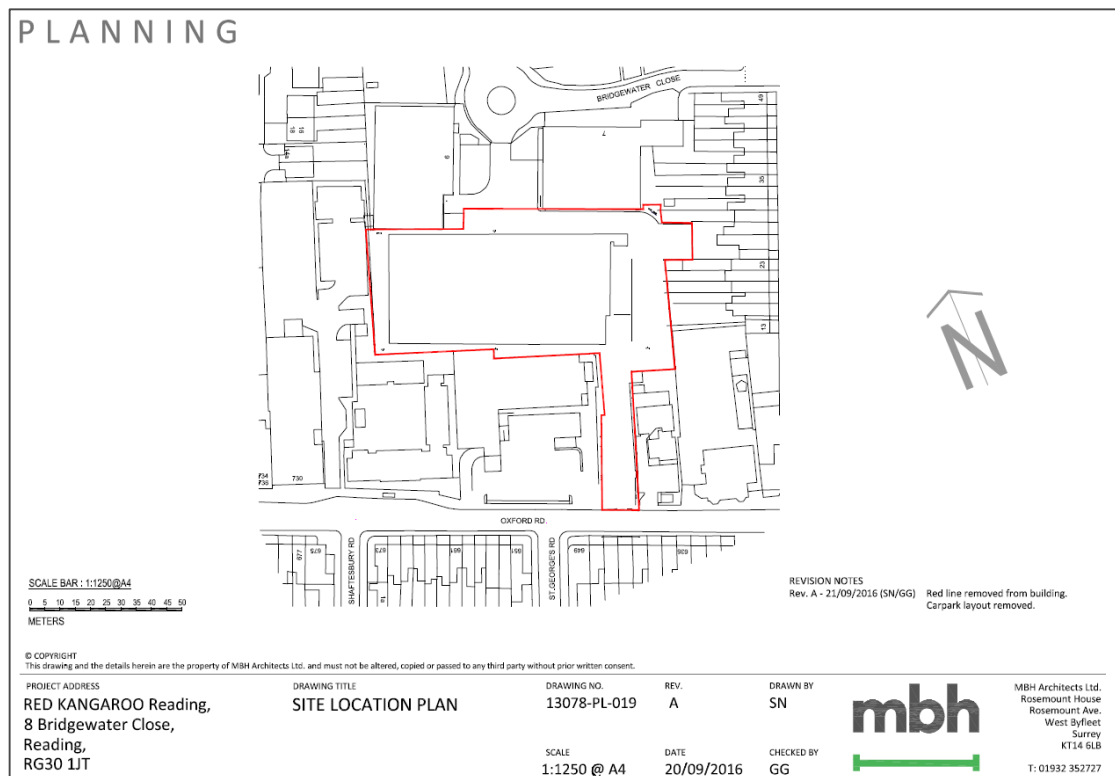
To establish, by means of detailed 5 day fully automated environmental noise monitoring, the existing A-weighted (dBA) L_{90} , L_{eq} and L_{max} environmental noise levels at selected accessible street level positions.

To assess the likely noise impact of the proposed development.

3.0 Site Description

3.1 Location

The site is located at 8 Bridgewater Close, Reading and falls within Reading Council's jurisdiction. See following Location Map.



Location Map (MBH Architects)

3.2 Description

The site is located at 8 Bridgewater Close, Reading. To the north are other industrial units, to the east and south west are residential properties and directly to the south is a hotel. The dominant noise sources around the site were deemed to be road traffic noise. The site boundary is highlighted in red on the above site plan. The existing site comprises a vacant industrial unit which was used for go-karting.

4.0 Acoustic Terminology

For an explanation of the acoustic terminology used in this report please refer to Appendix A enclosed.

5.0 Methodology

The survey was undertaken by Firas Farhan, BSc(Hons), MIOA.

5.1 Procedure

Fully automated environmental noise monitoring was undertaken from approximately 14.00 hours on Thursday 15th September 2016 to 14:00 hours on Tuesday 20 September 2016.



Due to the nature of the survey, i.e. unmanned, it is not possible to accurately comment on the weather conditions throughout the entire survey period. However at the beginning and end of the survey period the wind conditions were light and the sky was generally overcast. We understand that generally throughout the survey period the weather conditions were similar to this. These conditions are considered suitable for recording representative measurements.

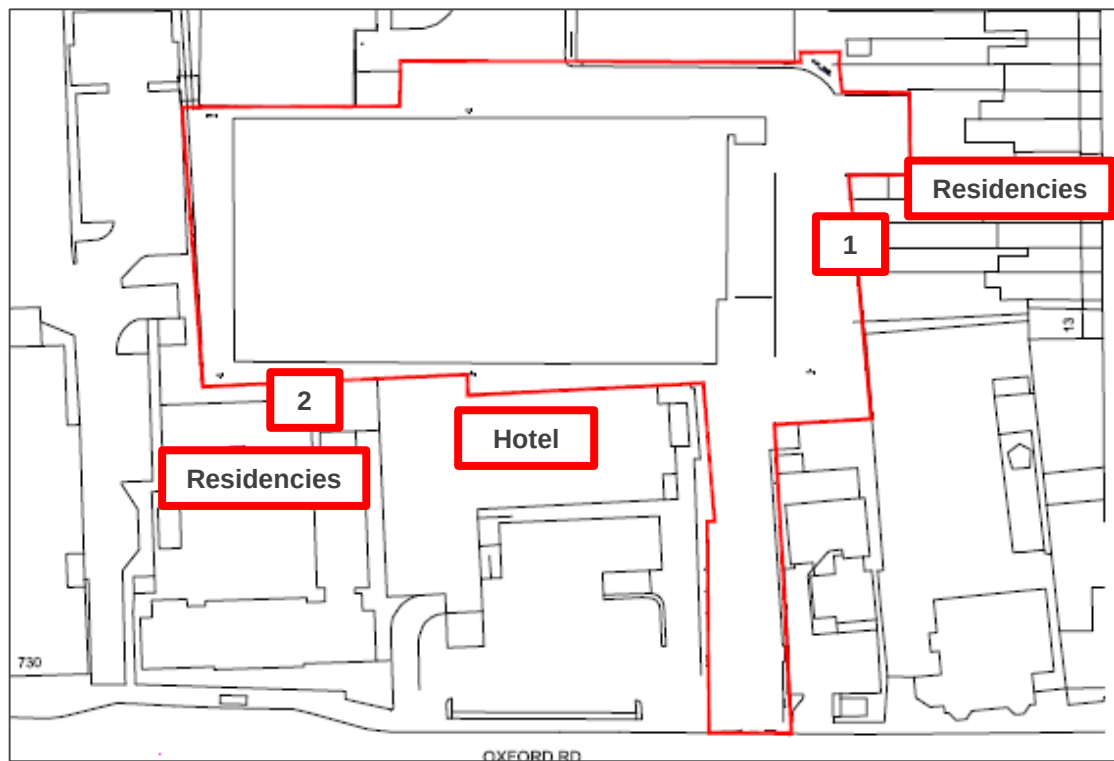
Measurements were taken continuously of the A-weighted (dBA) L_{90} , L_{eq} and L_{max} sound pressure levels over 15 minute periods.

5.2 Measurement Positions

The noise level measurements were undertaken at 2No. positions around the development site. The measurement positions are described in the table below.

Position No	Description
1	The sound level meter was located east of the site. The microphone was attached to a pole approximately 2m above ground level and away from any reflecting surfaces, overlooking back gardens of properties on Alma Street.
2	The sound level meter was located south of the site. The microphone was attached to a pole approximately 2m above ground level and approximately 1m from the façade, residential properties on Oxford Road.

The approximate positions of the sound levels meters are shown in the following plan:



Approximate Positions of the Sound Level Meters (MBH Architects)

5.3 Instrumentation

The instrumentation used during the survey is presented in the Table below:

Position	Description	Manufacturer	Type	Serial Number	Calibration
1	Type 1 Data Logging Sound Level Meter	Larson Davis	824	3155	HT calibration on 19/07/2016
	Type 1 ½" Condenser Microphone	Larson Davis	377B02	107427	HT calibration on 19/07/2016
2	Type 1 Data Logging Sound Level Meter	Larson Davis	824	3157	HT calibration on 18/07/2016
	Type 1 ½" Condenser Microphone	Brüel and Kjær	4189	2470594	HT calibration on 18/07/2016
-	Type 1 Calibrator	Larson Davis	CAL200	3082	LD calibration on 09/06/2016

Each sound level meter, including the extension cable, was calibrated prior to and on completion of the survey. No significant changes were found to have occurred (no more than 0.1 dB).



Each sound level meter was located in an environmental case with the microphone connected to the sound level meter via an extension cable. Each microphone was fitted with a windshield.

6.0 Results

6.1 Results of survey

The results have been plotted on Time History Graphs 21146/TH1 to 21146/TH2 enclosed presenting the 15 minute A-weighted (dBA) L_{90} , L_{eq} and L_{max} levels at each measurement position throughout the duration of the survey.

The lowest measured period daytime (09:00 – 23:00) noise levels (15 mins) at each position are presented in the following table:

Day	Position 1 L_{A90}	Position 2 L_{A90}
Thursday*	58	39
Friday	53	45
Saturday	50	41
Sunday	53	40
Monday	50	39
Tuesday*	57	39

*Part Day Only

6.2 Discussion Of Noise Climate

Due to the nature of the survey, i.e. unmanned, it is not possible to accurately describe the dominant noise sources, or specific noise events throughout the entire survey period. However at the beginning and end of the survey period the dominant noise sources were noted to be road traffic noise.

7.0 Trampoline Park Internal Noise Levels

We attended the Freedog Indoor Trampoline Park in Bristol on Saturday 12th November 2016. A Saturday was chosen for our tests as Saturdays are generally their busiest day of the week. A standard open entry morning session had already commenced when we arrived. We were informed that 100-120 people were using the facility (excluding spectators) at the time of our measurements. The background music system was turned on and off whilst we were there. The results of the survey are detailed in the following table.



Time Period	Location	Noise Sources	63	125	250	500	1k	2k	4k	8k	L _{eq} dBA
2 minutes	1 st Floor Walkway	Patrons	67.1	63.4	60.7	67.6	70	67.7	60.7	47	73.4
2 minutes	1 st Floor Walkway	Patrons + Music	69	75	68	70.6	72	68.2	61.5	52	75.2
2 minutes	Ground Floor	Patrons + Music	69.2	74.2	66.5	69.4	71.1	67.7	63	52.4	74.6

The overall dBA noise levels measured with the music system turned on and off did not significantly differ, however the low frequency noise levels (at 125Hz-250Hz) were clearly much higher when the music system was in operation.

8.0 Planning Policy/Guidance

8.1 National Planning Policy Framework (NPPF)

The following paragraph is from the NPPF:

“123.Planning policies and decisions should aim to:

- avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;
- mitigate and reduce to a minimum other adverse impacts 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; 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.”

8.2 National Planning Practice Guidance

The following table is produced from the National Planning Practice Guidance based upon the Noise Policy Statement for England.



Perception	Examples of Outcomes	Increasing Effect Level	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 hard, e.g. auditory and not auditory	Unacceptable adverse effect	Prevent

8.3 Subjective Human Perception to Change

The noise impact can be compared with the following criteria, which relate the resultant change in noise level to the subject impression thereof and the human response thereto.

Change in Sound Level dB(A)	Interpretation	
	Subjective Impression	Human Response to change in noise level
< 2.9	Imperceptible change in loudness	Insignificant
3.0 to 4.9	Perceptible change in loudness	Noticeable
5.0 to 9.9	Up to a doubling or halving of loudness	Significant
10.0 to 15.9	More than a doubling or halving of loudness	Substantial
16.0 to 19.9	Up to a quadrupling or quartering of loudness	Substantial
20.0 or more	More than a quadrupling or quartering of loudness	Very Substantial



8.4 Internal Noise Criteria

BS 8233: 2014 “Guidance on sound insulation and noise reduction for buildings”

British Standard 8233: 2014 states that it is desirable that internal ambient noise levels do not exceed the following guideline values:

Activity	Location	Desirable Internal Ambient Criteria	
		07:00 – 23:00	23:00 to 07:00
Resting	Living Rooms	35 dB LAeq,16hour	-
Dining	Dining Room/Area	40 dB LAeq,16hour	-
Sleeping (Daytime Resting)	Bedroom	35 dB LAeq,16hour	30 dB LAeq,8hour

British Standard 8233: 2014 also states in relation to the sound insulation level of a building façade that “*If partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15dB*” i.e. a façade with an open window would be reduced to a sound reduction of approximately 15dBA.

8.5 Plant Noise Emission Criteria

To Be Confirmed - subject to confirmation of requirement from the Local Authority.

9.0 Noise Impact Assessment

9.1 Proposed Building Design

The existing building has brick walls with windows on the northern elevation.

The roof is formed from insulated metal cladding with strip lights.

The proposed internal layout places the reception / briefing area towards the northern side of the building which faces the existing industrial units. The trampoline / activity areas will take up the remaining internal space.

The fit-out proposal includes the following acoustic design features:

- Roller shutter doors to be internally boarded (2x15mm dense plasterboard).
- Southern half of roof internally lined with plasterboard (1x12.5mm dense plasterboard)
- Attenuated ventilation openings



9.2 Operational Information

We understand the proposed hours of operation are as follows:

Monday to Saturday - 09:00 - 23:00 hours

Sunday - 09:00 – 22:00 hours

The proposed maximum number of patrons at any one time is 120.

9.3 Internal Noise Breakout From Trampoline Park Activity

We have assessed the likely internal noise breakout level from the proposed indoor trampoline park activity to three receptor points:

- Adjacent Hotel (it is however noted that a hotel use provides temporary sleeping accommodation and should therefore not be treated the same as a residential premises)
- Nearest Residential Premises (south west)
- Residential Premises (east)

We have based our noise break-out calculations on the noise levels measured within the Freedog Indoor Trampoline Park for Patrons + Music Noise. We have assumed the measured noise levels relate to the lower end of the range (100 – 120) that we were advised were using the facility. A correction has therefore been added to each of our calculations to take into the account the maximum number of people at the proposed indoor trampoline site in Reading.

9.3.1 Noise Assessment To The Adjacent Hotel

We have assessed the trampoline park noise emissions to the nearest hotel on Oxford Road, approximately 3 metres to the south.

It was not possible to undertake an accurate sound test across the building fabric to determine the likely operational noise level reduction so our calculations are based on the available sound reduction data representative of the advised constructions.

We have used computer software (Insul Sound Insulation Prediction Software V8.0.9) to calculate the likely sound insulation levels of the composite constructions.



Noise Through The Roof

We have calculated the likely contribution from noise through the roof to the adjacent hotel located on Oxford Road. We have considered the roof in 2 sections, the southern side (with plasterboard insulation) and the northern side.

We have used the following equation for Inside to Outside sound reduction:

$$L_{p(out)} = L_{p(inside)} - 6 - 8 - R - 20\log_{10}r + 10\log_{10}A$$

R = composite sound reduction of roof

r = distance from radiating part of roof to residency

A = area of radiating roof (length of Section x width)

southern half	Sound Pressure Level								dBA
	@ Octave Band Centre Frequency (Hz)								
	63	125	250	500	1000	2000	4000	8000	
Lp(Inside)	69	75	68	70.6	72	68.2	61.5	52	75.2
-6	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	
-8	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	
-R	-14.0	-15.0	-32.0	-42.0	-45.0	-40.0	-45.0	-45.0	
-20Log10r (8m)	-18.1	-18.1	-18.1	-18.1	-18.1	-18.1	-18.1	-18.1	
+10Log10A	30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8	
Directivity	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
100 to 120 patron correction	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	
screening	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Result	56.0	61.0	37.0	29.6	28.0	29.2	17.5	8.0	45.5

northern half	Sound Pressure Level								
	@ Octave Band Centre Frequency (Hz)								
	63	125	250	500	1000	2000	4000	8000	
Lp(Inside)	69	75	68	70.6	72	68.2	61.5	52	73.4
-6	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	
-8	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	
-R	-12.0	-15.0	-19.0	-23.0	-24.0	-22.0	-40.0	-40.0	
-20Log10r (23m)	-27.2	-27.2	-27.2	-27.2	-27.2	-27.2	-27.2	-27.2	
+10Log10A	30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8	
Directivity	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	
100 to 120 patron correction	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	
screening	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Result	39.4	42.4	31.4	30.0	30.4	28.6	3.9	-5.6	35.0



The calculated noise level at the adjacent hotel due to trampoline park activity noise passing through the warehouse roof is 45.9dBA.

Noise Through The Southern Wall

We have calculated the likely contribution from noise through the southern wall to the adjacent hotel on Oxford Road.

We have used the following equation for Inside to Outside sound reduction:

$$L_{p(out)} = L_{p(inside)} - 6 - 8 - R - 20\log_{10}r + 10\log_{10}A$$

R = sound reduction of wall

r = distance from radiating part of wall to residency (assumed 3m in calculations)

A = area of radiating wall (length x height)

	Sound Pressure Level								dBA
	@ Octave Band Centre Frequency (Hz)								
	63	125	250	500	1000	2000	4000	8000	
Lp(Inside)	69.0	75.0	68.0	70.6	72.0	68.2	61.5	52.0	75.2
-6	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	
-8	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	
-R	-36.0	-38.0	-34.0	-40.0	-45.0	-45.0	-45.0	-45.0	
-20Log10r (3m)	-9.5	-9.5	-9.5	-9.5	-9.5	-9.5	-9.5	-9.5	
+10Log10A	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	
Directivity	5.5	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
100 to 120 patron correction	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	
screening	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Result	38.8	43.3	40.3	36.9	33.3	29.5	22.8	13.3	39.0

The calculated noise level at the adjacent hotel due to trampoline park activity noise passing through the warehouse wall is 39.0dBA.

The calculated total noise level at the adjacent hotel on Oxford Road from noise transmitting from the proposed indoor trampoline facility is 46.7dBA.

The lowest L_{90} (15 min) background noise level at this approximate location was 43dBA. The calculated trampoline park activity noise is approximately 3.7dBA above the lowest measured background noise level which would be a perceptible change in loudness (see Section 8.3).



However, if we calculate the likely internal noise level in an overlooking room with an open window (see Section 8.4), an internal noise level of 31.7dBA is calculated which complies with the 35 dB $L_{Aeq,16\text{hour}}$ criteria. It should also be noted that the adjacent hotel rooms have air conditioning so the requirement to open the windows is likely to be very limited.

In addition, the background noise levels were based upon the unit being vacant, therefore this should be taken into account.

9.3.2 Noise Assessment To Nearest Residential Premises (South West)

We have assessed the trampoline park noise emissions to the nearest residential premises on Oxford Road, approximately 5 metres to the south (western end of site) of the warehouse building.

It was not possible to undertake an accurate sound test across the building fabric to determine the likely operational noise level reduction so our calculations are based on the available sound reduction data representative of the advised constructions.

We have used computer software (Insul Sound Insulation Prediction Software V8.0.9) to calculate the likely sound insulation levels of the composite constructions.

Noise Through The Roof

We have calculated the likely contribution from noise through the roof to the nearest residential premises located on Oxford Road. We have considered the roof in 2 sections, the southern side (with plasterboard insulation) and the northern side.

We have used the following equation for Inside to Outside sound reduction:

$$L_{p(out)} = L_{p(inside)} - 6 - 8 - R - 20\log_{10}r + 10\log_{10}A$$

R = composite sound reduction of roof
 r = distance from radiating part of roof to residency
 A = area of radiating roof (length of Section x width)



southern half	Sound Pressure Level								
	@ Octave Band Centre Frequency (Hz)								
	63	125	250	500	1000	2000	4000	8000	dBA
Lp(Inside)	69	75	68	70.6	72	68.2	61.5	52	75.2
-6	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	
-8	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	
-R	-14.0	-15.0	-32.0	-42.0	-45.0	-40.0	-45.0	-45.0	
-20Log10r (10m)	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	
+10Log10A	30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8	
Directivity	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
100 to 120 patron correction	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	
screening	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Result	52.6	57.6	33.6	26.2	24.6	25.8	14.1	4.6	42.1

northern half	Sound Pressure Level								
	@ Octave Band Centre Frequency (Hz)								
	63	125	250	500	1000	2000	4000	8000	dBA
Lp(Inside)	69	75	68	70.6	72	68.2	61.5	52	75.2
-6	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	
-8	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	
-R	-12.0	-15.0	-19.0	-23.0	-24.0	-22.0	-40.0	-40.0	
-20Log10r (25m)	-28.0	-28.0	-28.0	-28.0	-28.0	-28.0	-28.0	-28.0	
+10Log10A	30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8	
Directivity	-9.5	-9.5	-9.5	-9.5	-9.5	-9.5	-9.5	-9.5	
100 to 120 patron correction	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	
screening	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	
Result	32.1	35.1	24.1	22.7	23.1	21.3	-3.4	-12.9	27.7

The calculated noise level at the nearest residential premises due to trampoline park activity noise passing through the warehouse roof is 42.3dBA.

Noise Through The Southern Wall

We have calculated the likely contribution from noise through the southern wall to the adjacent hotel on Oxford Road.

We have used the following equation for Inside to Outside sound reduction:

$$L_{p(out)} = L_{p(inside)} - 6 - 8 - R - 20\log_{10}r + 10\log_{10}A$$

R = sound reduction of wall

r = distance from radiating part of wall to residency (assumed 5m in calculations)

A = area of radiating wall (length x height)



	Sound Pressure Level								dBA
	@ Octave Band Centre Frequency (Hz)								
	63	125	250	500	1000	2000	4000	8000	
Lp(Inside)	69.0	75.0	68.0	70.6	72.0	68.2	61.5	52.0	75.2
-6	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	
-8	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	
-R	-36.0	-38.0	-34.0	-40.0	-45.0	-45.0	-45.0	-45.0	
-20Log10r (5m)	-14.0	-14.0	-14.0	-14.0	-14.0	-14.0	-14.0	-14.0	
+10Log10A	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	
Directivity	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
100 to 120 patron correction	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	
screening	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Result	33.3	37.3	34.3	30.9	27.3	23.5	16.8	7.3	33.0

The calculated noise level at the nearest residential premises due to trampoline park activity noise passing through the warehouse wall is 33.0dBA.

The calculated total noise level at the nearest residential premises on Oxford Road from noise transmitting from the proposed indoor trampoline facility is 42.8dBA.

The lowest L_{90} (15 min) background noise level at this approximate location was 43dBA. The calculated trampoline park activity noise is approximately 0.2dBA below the lowest measured background noise level. This calculated noise level would relate to an imperceptible change in loudness (see Section 8.3).

In addition, the background noise levels were based upon the unit being vacant, therefore this should be taken into account.

9.3.3 Noise Assessment To Residential Premises (East – Alma Street)

We have assessed the trampoline park noise emissions to the nearest residential premises on Alma Street, approximately 30 metres to the east.

It was not possible to undertake an accurate sound test across the building fabric to determine the likely operational noise level reduction so our calculations are based on the available sound reduction data representative of the advised constructions.

We have used computer software (Insul Sound Insulation Prediction Software V8.0.9) to calculate the likely sound insulation levels of the composite constructions.



Noise Through The Roof

We have calculated the likely contribution from noise through the roof to the nearest residential premises located on Alma Street. We have considered the roof in 2 sections, the southern side (with plasterboard insulation) and the northern side.

We have used the following equation for Inside to Outside sound reduction:

$$L_{p(out)} = L_{p(inside)} - 6 - 8 - R - 20\log_{10}r + 10\log_{10}A$$

R = composite sound reduction of roof
r = distance from radiating part of roof to residency
A = area of radiating roof (length of Section x width)

southern half	Sound Pressure Level								dBA
	@ Octave Band Centre Frequency (Hz)								
	63	125	250	500	1000	2000	4000	8000	
Lp(Inside)	69	75	68	70.6	72	68.2	61.5	52	75.2
-6	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	
-8	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	
-R	-14.0	-15.0	-32.0	-42.0	-45.0	-40.0	-45.0	-45.0	
-20Log10r (35m)	-30.9	-30.9	-30.9	-30.9	-30.9	-30.9	-30.9	-30.9	
+10Log10A	30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8	
Directivity	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	
100 to 120 patron correction	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	
screening	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Result	34.7	39.7	15.7	8.3	6.7	7.9	-3.8	-13.3	24.2

northern half	Sound Pressure Level								
	@ Octave Band Centre Frequency (Hz)								
	63	125	250	500	1000	2000	4000	8000	
Lp(Inside)	69	75	68	70.6	72	68.2	61.5	52	75.2
-6	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	
-8	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	
-R	-12.0	-15.0	-19.0	-23.0	-24.0	-22.0	-40.0	-40.0	
-20Log10r (35m)	-30.9	-30.9	-30.9	-30.9	-30.9	-30.9	-30.9	-30.9	
+10Log10A	30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8	
Directivity	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	
100 to 120 patron correction	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	
screening	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Result	36.7	39.7	28.7	27.3	27.7	25.9	1.2	-8.3	32.3



The calculated noise level at the nearest residential premises on Alma Street due to trampoline park activity noise passing through the warehouse roof is 32.9dBA.

Noise Through The Eastern Wall

We have calculated the likely contribution from noise through the eastern wall to the nearest residential premises on Alma Street.

We have used the following equation for Inside to Outside sound reduction:

$$L_{p(out)} = L_{p(inside)} - 6 - 8 - R - 20\log_{10}r + 10\log_{10}A$$

R = sound reduction of wall

r = distance from radiating part of wall to residency (assumed 30m in calculations)

A = area of radiating wall (length x height)

	Sound Pressure Level								
	@ Octave Band Centre Frequency (Hz)								
	63	125	250	500	1000	2000	4000	8000	dBA
Lp(Inside)	69.0	75.0	68.0	70.6	72.0	68.2	61.5	52.0	75.2
-6	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	
-8	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	
-R	-36.0	-38.0	-34.0	-40.0	-45.0	-45.0	-45.0	-45.0	
-20Log10r (30m)	-29.5	-29.5	-29.5	-29.5	-29.5	-29.5	-29.5	-29.5	
+10Log10A	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	
Directivity	5.5	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
100 to 120 patron correction	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	
Screening	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Result	17.6	22.1	19.1	15.7	12.1	8.3	1.6	-7.9	17.8

The calculated noise level at the nearest residential premises on Alma Street due to trampoline park activity noise passing through the warehouse wall is 17.8dBA.

The calculated total noise level at the nearest residential premises on Alma Street from noise transmitting from the proposed indoor trampoline facility is 33.0dBA.

The lowest L90 (15 min) background noise level at this approximate location was 39dBA. The calculated trampoline park activity noise is approximately 6dBA below the lowest measured background noise level.



9.4 Car Park Noise Assessment

We have calculated the likely contribution from carpark noise to the nearby residential properties on Alma Street based on hourly vehicle movement data provided by the transport consultant.

We have assumed a solid (imperforate) site boundary fence providing line of sight screening between the car park and the residencies. We have not included for car park noise to the hotel or residencies on Oxford Road as they are fairly well screened by the existing building. The following tables present our calculated noise level emissions to the residencies to the east of the site for different days of the week.

Weekday				
Time	Background Noise Survey Data 1hr LA90 (dBA)	Car Park Noise (Boundary Line of Sight Acoustic Fence) to Residency dBA	Resultant Noise Level at Nearest Residency (background + development Noise) dBA	Increase of Background Noise (dBA)
08:00 - 09:00	44.5	30.2	44.7	0.2
09:00 - 10:00	45.3	30.2	45.4	0.1
10:00 - 11:00	45.3	30.2	45.4	0.1
11:00 - 12:00	44.9	33.2	45.2	0.3
12:00 - 13:00	44.7	33.2	45.0	0.3
13:00 - 14:00	45.3	33.2	45.5	0.3
14:00 - 15:00	44.1	34.4	44.6	0.4
15:00 - 16:00	44.0	36.5	44.7	0.7
16:00 - 17:00	44.1	37.4	45.0	0.8
17:00 - 18:00	44.9	36.9	45.5	0.6
18:00 - 17:00	47.3	36.9	47.7	0.4
19:00 - 20:00	44.3	37.4	45.1	0.8
20:00 - 21:00	43.6	36.2	44.3	0.7
21:00 - 22:00	42.1	36.2	43.1	1.0
22:00 - 23:00	39.9	36.2	41.4	1.5



Friday				
Time	Background Noise Survey Data 1hr LA90 (dBA)	Car Park Noise (<u>Boundary Line of Sight Acoustic Fence</u>) to Residency dBA	Resultant Noise Level at Nearest Residency (background + development Noise) dBA	Increase of Background Noise (dBA)
08:00 - 09:00	49.2	28.4	49.2	0.0
09:00 - 10:00	50.0	28.4	50.0	0.0
10:00 - 11:00	49.9	32.4	50.0	0.1
11:00 - 12:00	49.1	32.4	49.2	0.1
12:00 - 13:00	50.2	31.4	50.2	0.1
13:00 - 14:00	48.3	31.4	48.4	0.1
14:00 - 15:00	48.6	32.4	48.7	0.1
15:00 - 16:00	49.4	35.8	49.5	0.2
16:00 - 17:00	50.2	37.7	50.5	0.2
17:00 - 18:00	48.8	38.2	49.1	0.4
18:00 - 17:00	49.0	39.7	49.5	0.5
19:00 - 20:00	48.2	40.7	48.9	0.7
20:00 - 21:00	47.7	40.6	48.5	0.8
21:00 - 22:00	46.4	37.9	46.9	0.6
22:00 - 23:00	46.2	37.9	46.8	0.6

Saturday				
Time	Background Noise Survey Data 1hr LA90 (dBA)	Car Park Noise (<u>Boundary Line of Sight Acoustic Fence</u>) to Residency dBA	Resultant Noise Level at Nearest Residency (background + development Noise) dBA	Increase of Background Noise (dBA)
08:00 - 09:00	48.3	32.4	48.4	0.1
09:00 - 10:00	48.6	32.4	48.7	0.1
10:00 - 11:00	49.2	41.0	49.8	0.6
11:00 - 12:00	48.8	43.2	49.9	1.1
12:00 - 13:00	49.5	43.2	50.5	0.9
13:00 - 14:00	49.7	41.0	50.2	0.6
14:00 - 15:00	48.9	38.4	49.3	0.4
15:00 - 16:00	48.7	41.0	49.4	0.7
16:00 - 17:00	47.8	40.3	48.5	0.7
17:00 - 18:00	47.5	37.2	47.9	0.4
18:00 - 17:00	45.3	37.2	46.0	0.6
19:00 - 20:00	44.4	41.5	46.2	1.8
20:00 - 21:00	44.1	43.2	46.7	2.6
21:00 - 22:00	41.7	43.2	45.6	3.8
22:00 - 23:00	41.5	25.4	41.6	0.1



Sunday				
Time	Background Noise Survey Data 1hr LA90 (dBA)	Car Park Noise (<u>Boundary Line of Sight Acoustic Fence</u>) to Residency dBA	Resultant Noise Level at Nearest Residency (background + development Noise) dBA	Increase of Background Noise (dBA)
08:00 - 09:00	38.4	31.4	39.2	0.8
09:00 - 10:00	41.2	31.4	41.7	0.4
10:00 - 11:00	43.5	39.0	44.8	1.3
11:00 - 12:00	43.2	41.6	45.5	2.3
12:00 - 13:00	43.5	42.0	45.8	2.3
13:00 - 14:00	43.5	40.3	45.2	1.7
14:00 - 15:00	42.2	39.7	44.2	1.9
15:00 - 16:00	42.6	41.6	45.2	2.6
16:00 - 17:00	43.6	42.0	45.9	2.3
17:00 - 18:00	43.4	41.3	45.5	2.1
18:00 - 17:00	43.7	40.3	45.3	1.6
19:00 - 20:00	42.4	39.7	44.3	1.9
20:00 - 21:00	40.8	38.2	42.7	1.9
21:00 - 22:00	40.5	38.2	42.5	2.0
22:00 - 23:00	40.0	25.4	40.1	0.1

The calculated increases in hourly background noise levels are all (apart from 1) less than 2.9dBA which with reference to Section 8.3 is an imperceptible change in loudness. The only calculated increase above 2.9dBA is on Saturday between 21:00-22:00 when the exceedance has been calculated to be 3.8dBA which is deemed perceptible but not significant.

As before, it should be borne in mind that the background noise survey is based on a vacant unit. If the unit were in operation one could reasonably expect the background noise level to be higher.

9.5 Plant Noise Assessment

Plant noise will need to be assessed once a detailed strategy has been established and suitable criteria proposed and agreed.



10.0 Conclusions

A detailed unmanned environmental noise survey has been undertaken in order to establish the currently prevailing street level environmental noise climate around the site.

An internal noise assessment has been undertaken at an existing indoors trampoline park to establish likely internal noise levels at the proposed indoor trampoline park in Reading.

The internal noise breakout impact assessment indicates that the calculated change in noise levels are likely to be imperceptible at the adjacent residential premises. The calculated internal noise breakout level to the hotel to the south of the site indicates compliance with relevant internal noise criteria in the adjacent hotel, even when the hotel windows are open.

The car park noise impact assessment indicates that the calculated change in noise levels are likely to be imperceptible at the residencies facing the car park in all but one hour we have assessed. However, the calculated noise impact within this one hour is deemed perceptible but not significant.

The proposals are therefore acceptable on noise grounds having regard to the requirements of national planning policy.



Appendix A

The acoustic terms used in this report are defined as follows:

dB Decibel - Used as a measurement of sound level. Decibels are not an absolute unit of measurement but an expression of ratio between two quantities expressed in logarithmic form. The relationships between Decibel levels do not work in the same way that non-logarithmic (linear) numbers work (e.g. 30dB + 30dB = 33dB, not 60dB).

dBA The human ear is more susceptible to mid-frequency noise than the high and low frequencies. The 'A'-weighting scale approximates this response and allows sound levels to be expressed as an overall single figure value in dBA. The _A subscript is applied to an acoustical parameter to indicate the stated noise level is A-weighted

It should be noted that levels in dBA do not have a linear relationship to each other; for similar noises, a change in noise level of 10dBA represents a doubling or halving of subjective loudness. A change of 3dBA is just perceptible.

L_{90,T} L₉₀ is the noise level exceeded for 90% of the period *T* (i.e. the quietest 10% of the measurement) and is often used to describe the background noise level.

L_{eq,T} L_{eq,T} is the equivalent continuous sound pressure level. It is an average of the total sound energy measured over a specified time period, *T*.

L_{max} L_{max} is the maximum sound pressure level recorded over the period stated. L_{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L_{eq} noise level.

L_p Sound Pressure Level (SPL) is the sound pressure relative to a standard reference pressure of 2×10^{-5} Pa. This level varies for a given source according to a number of factors (including but not limited to: distance from the source; positioning; screening and meteorological effects).

L_w Sound Power Level (SWL) is the total amount of sound energy inherent in a particular sound source, independent of its environment. It is a logarithmic measure of the sound power in comparison to a specified reference level (usually 10^{-12} W).