



THE GINGERBREAD HOUSE DAY NURSERY LTD

**5 SELBOURNE PLACE, SELBOURNE ROAD,
LITTLEHAMPTON, WEST SUSSEX**

NOISE ASSESSMENT

TECHNICAL REPORT: RFE-193-17-02

DATE: MARCH 2018



**PROJECT TITLE: 5 SELBOURNE PLACE, SELBOURNE ROAD,
LITTLEHAMPTON, WEST SUSSEX**

REPORT REF: RFE-193-17-02

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	For and on behalf of RF Environmental Ltd			

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5 SELBOURNE PLACE, SELBOURNE ROAD, LITTLEHAMPTON NOISE ASSESSMENT

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1.0 INTRODUCTION

1.1 RF Environmental Ltd (RFE) was commissioned by The Gingerbread House Day Nursery Ltd in February 2018 to produce an acoustic report for the operation of a day nursery and beach school at 5 Selbourne Place, Selbourne Road, Littlehampton, West Sussex.

1.2 It is understood that planning permission has been granted for the *'change of use from a dwelling (C3 dwellinghouse) to a day nursery and beach school (D1 Non residential institutions) with off street parking.'*

1.3 A number of conditions have been attached to the permission, with the following being pertinent to this assessment:

'Prior to use of the property hereby approved an acoustic report is to be submitted and agreed with the Local Planning Authority to predict the effect of this business on noise levels at the nearest residential facade. This will include the effect of the use of the south facing garden as a children's play area. The report will detail whatever suitable mitigation measures as may be necessary. The submitted details will also calculate the required level of sound attenuation to be provided between the application property and the adjoining residential property (Selbourne House) and the method of achieving this to accord with the requirements of BS8233:2014, Guidance on Sound Insulation and Noise Reduction for Buildings. The mitigation measure so approved shall be implemented prior to first use and retained in perpetuity unless otherwise agreed.'

Reason: To safeguard the amenities of nearby residents in accordance with Arun District Local Plan policies GEN7 and GEN32.

1.4 The scope of the assessment is to consider the potential noise impact from the use of the rear play area and assess the requirement for any mitigation measures and secondly, to consider the requirement for any additional internal mitigation, to protect the occupants of the adjoining dwelling against the transfer of internal noise.

1.5 The findings of the noise assessment and the introduction of a noise management plan (NMP) are reported herein.

1.6 The NMP has been prepared to provide an effective means for managing noise generated during outside activities. The plan is a dynamic document and should be subject to continual review in accordance with the terms set out.

1.7 Details of the site and are discussed in Section 2. The assessment criteria relevant to developments of this kind are presented in Section 3. The environmental noise survey is presented in Section 4 while the noise assessment of the external play area is carried out in Section 5. Consideration of internal noise transfer is presented in Section 6. The management and control measures are set out in Section 7 and finally, these sections are summarised in Section 8.



2.0 SITE DETAILS

Site Description

- 2.1 The Friendly Fish Day Nursery and Beach School will be located at 5 Selbourne Place, Selbourne Road, Littlehampton.
- 2.2 The property is a semi-detached premise, split over 4 floors. The site lies in a predominantly residential area, approximately 300m to the north of the local beach and 500m east of the river Arun. The adjoining property (Selbourne House) on the eastern side, is a residential property which is currently used by a charity to provide care and support for people with learning disabilities. The external garden to the rear of the property backs on to a local road, with further residential dwellings beyond.
- 2.3 There are also a number of existing commercial premises in the vicinity, including a restaurant/private club immediately to the west of the site.
- 2.4 The existing ambient noise was governed by local road traffic on Irving Road, bird song and seagulls.
- 2.5 A aerial view of the site is presented in Figure A1 of Appendix A.

Proposed Development

- 2.6 The day nursery will cater for up to 65 children between the ages of 0-5 years old. The current operating hours for the childcare are 08:00 to 18:00 Monday to Friday, with no overnight or weekend care.
- 2.7 Staff numbers will ensure that the ratio of adult supervisors to children meets Ofsted requirements.
- 2.8 Each room in the house will cater for a different age group. To ensure any noise transfer is minimised as far as reasonably practicable, the property will be zoned to allow quieter rooms, such as sleep rooms, against the party wall, while dining rooms will be positioned away from the party wall. The proposed room uses are presented in Figure A2 of Appendix A.

3.0 ASSESSMENT CRITERIA

British Standard 8233:2014

- 3.1 BS 8233:2014 Guidance on sound insulation and noise reduction for buildings [1] gives recommendations for the control of noise in and around buildings. The Standard suggests appropriate criteria and limits for different situations to guide the design of new or refurbished buildings undergoing a change of use.
- 3.2 Desirable upper noise levels inside residential habitable rooms are specified in the Standard and are reproduced below in Table 3.1.

Activity	Room	Ambient Indoor Noise Level 07:00 to 23:00 hrs, dB $L_{Aeq,10h}$	Ambient Indoor Noise Level 23:00 to 07:00 hrs, dB $L_{Aeq,10h}$
Resting	Living Room	35	-
Dining	Dining room/ area	40	-
Sleeping (daytime resting)	Bedroom	35	30

TABLE 3.1: BS8233 INDOOR AMBIENT NOISE LEVELS FOR DWELLING

World Health Organisation

- 3.3 Guideline values for community noise in specific environments are presented in the WHO's Guidelines for Community Noise [2] document. The guideline values pertinent to this noise assessment are presented in Table 3.2.

Specific Environment	Critical Health Effect(s)	dB $L_{Aeq,16h}$	Time Base hours	dB $L_{Amax,16h}$
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
Dwelling indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	-
Inside bedrooms	Sleep disturbance, night-time	30	8	45

TABLE 3.2: WHO GUIDELINE NOISE VALUES

4.0 ENVIRONMENTAL NOISE SURVEY

Continuous Baseline Noise Survey

- 4.1 Unattended continuous monitoring of existing noise levels was undertaken at the monitoring location shown as LT1 on Figure A1 of Appendix A. The equipment used during the survey is presented in Table 4.1 below.

Manufacturer	Model No.	Description	Serial No.	Calibration Due Date
Larson Davis	LxT	Sound Level Meter	0004968	April 2018
Larson Davis	LxTPRM1L	Microphone Preamplifier	042703	April 2018
Larson Davis	337B02	½" Electret microphone	161390	April 2018
Larson Davis	CAL200	Calibrator	12981	April 2018

TABLE 4.1: SOUND MONITORING EQUIPMENT

- 4.2 The sound level meter was powered by dry cell batteries and stored inside a weatherproof security box.
- 4.3 Measurements were obtained using the 'F' time weighting and A-weighting frequency network. The equipment was calibrated before and after the survey to generate a calibration level of 114.0 dB at 1 kHz.
- 4.4 15-minute measurements of $L_{Amax,F}$ and $L_{Aeq,15min}$ noise levels were obtained at this monitoring location between 14:19 hrs Tuesday 6th March and 14:34hrs Friday 8th March 2018, with the microphone set at approximately 1.5 metres above local ground level. A photograph of the monitoring equipment can be seen in Figure A3 of Appendix A.

The dominant noise sources observed during site visits are discussed in section 2.

Weather Conditions

- 4.5 Weather conditions during the site visits are presented below in Table 4.2.

Site Visit	Date and Time	Noted Weather
Setup	06/03/2018 14:19hrs	No Rain, 5/8 cloud cover, 8°C, windspeed <1m/s
Collection	08/03/2018 14:34 hrs	No rain, 1/8 cloud cover, sunny, 10°C, windspeed 1 m/s

TABLE 4.2: WEATHER CONDITIONS DURING SITE VISITS

- 4.6 A history of the weather conditions during the continuous survey period has been obtained from an internet source (www.wunderground.com Rustington IRUSTING3), which is the closest weather station to the development site, with rainfall data. Analysis of the data shows some rain fell during the night time periods of the 6th and 7th march 2018, however these periods are not subject to the assessment and

therefore the data has not been removed.

- 4.7 The weather conditions obtained for the survey period are presented in Figure A4 of Appendix A.

Continuous Noise Survey Results

- 4.8 The results of the unattended sound measurement survey are presented graphically in Figure A5 of Appendix A and summarised in Table 4.3 below.

Date	Measured Noise Levels, dB re. 2×10^{-5} Pa.								
	Daytime (07:00 - 19:00)			Evening (19:00 - 23:00)			Night-time (23:00 - 07:00)		
	L_{max}	$L_{Aeq,12hr}$	$L_{Aeq,1hr}$	L_{max}	$L_{Aeq,3hr}$	$L_{Aeq,1hr}$	L_{max}	$L_{Aeq,6hr}$	$L_{Aeq,1hr}$
Tue 06/03/18	64(53-76)	48	40	53(50-62)	40	35	52(40-69)	44	40
Wed 07/03/18	66(58-77)	50	44	55(50-64)	45	42	61(53-70)	52	49
Thu 08/03/18*	64(59-77)	51	48						
Average	65(64-66)	50	44	55(53-55)	45	39	61(52-61)	52	49

TABLE 4.3: SUMMARY OF DAYTIME UNATTENDED NOISE MEASUREMENTS, LT1

*Note: * denotes incomplete period.*

The results of the unattended noise measurement, show that ambient day time $L_{Aeq,12hr}$ sound levels provide an arithmetic average across the survey period of 50dB $L_{Aeq,12hr}$.

5.0 NOISE ASSESSMENT

External Play Area

- 5.1 Predicted noise levels at the closest residential receptor, resulting from use of the outside play area have been estimated, taking into account the decay of sound with distance and the sound reduction resulting from the existing screening around the site.
- 5.2 The noise levels have been calculated based on an assumed continual use of the play area by up to 10 children between 09:00 and 17:00hrs.
- 5.3 The closest noise sensitive receptor is Selbourne House, which is labelled R1 in Figure A1 of Appendix A.

Source Term Noise Levels

- 5.4 Measured data obtained for similar noise assessments undertaken by RFE have been used to derive source noise levels for this assessment. These consist of measurements of two different age groups, 1-2 year olds and 2-5 year olds.
- 5.5 The source noise measurements for the 1-2 year olds were undertaken in a garden area of similar size to the one at 6 Selbourne Place.
- 5.6 The source noise measurements for the 2-5 year olds were undertaken in a small enclosed outside play area. During the measurements, children were moving around the play space, with the average distance between the children and the measurement position noted to be around 1 m. The enclosed space created reverberant acoustic conditions which will not be experienced at Selbourne Place and therefore a -3dB correction has been applied.
- 5.7 Source measurements were undertaken over a continuous 15-minute periods. During the measurements of the 2-5 year olds, 3 to 7 children were observed to be playing and making noise. For the 1-2 year olds, 5 children were observed to be playing. Play activity during the measurements was considered to be representative of a typical level of excitement children of up to the age of 5 years can exhibit during playtime when under the supervision of a nursery worker. A summary of the source noise data is presented in Table 5.1.

Noise Source	Date of Meas.	Run Time	Measured Noise Levels, dB re. 2×10^{-5} Pa.		
			L_{Amax}	$L_{Aeq,15\text{ min}}$	$L_{A90,15\text{ min}}$
1-2 Year Olds	22/01/18	14:22 - 14:37	84.7	58.3	46.9
2-5 Year Olds	26/05/10	10:30 – 10:45	100.5	75.1	53.5

TABLE 5.1: SUMMARY OF NOISE SOURCE-TERM LEVELS OF CHILDREN PLAYING



- 5.8 Based on the noise levels presented in Table 5.1, a source-term noise level of 61 dB $L_{Aeq,T}$ has been derived for the 1-2 year olds and a source-term noise level of 75 dB $L_{Aeq,T}$ has been derived for the 2-5 year olds, for the purposes of this noise assessment. This source noise level has been calculated assuming that an average of 5 children were playing during the measured data in Table 5.1. To account for 10 children playing, a +3dB correction has been made to the measured level, to account for an additional 5 children.

Note: The source term level for the 2-5 year olds includes a -3dB correction to account for the reverberant nature of the original measurement.

Noise Predictions

- 5.9 Predicted façade noise levels have been calculated at the closest receptor. The calculations have been made assuming the source location at the centre of the play area in relation to the receptor, assuming a source height of 1 m above local ground.
- 5.10 The garden is to incorporate a 1.8m high close boarded fence around the perimeter, which should provide a degree of screening of the play area noise for the nearest residential receptor. To account for this screening, a minus 5 dB correction has been included in the calculations where there is a partial line-of-sight between the play area and the receptor location and a minus 10 dB where the barrier completely screens the receptor from the play area.
- 5.11 The facade noise levels at R1 for each scenario, is presented in Table 5.2. These predicted levels assume continuous use of play area over a 1 hour period.

Receptor	Noise Source	Specific Noise from Children Playing, dB	Distance Correction, dB ⁽¹⁾	Screening (barrier) Correction ⁽²⁾	Predicted External Free Field Noise Level, dB	Facade Correction, dB	Predicted Noise Level at Receptor Façade, (LAeq,T)
R1	1-2 Year Olds	61	-20	-5	36	3	39
	2-5 Year Olds	75	-20	-5	50	3	53

TABLE 5.2: ESTIMATE OF FACADE NOISE LEVELS AT THE CLOSEST RESIDENTIAL RECEPTOR (R1)

Note: (1) Assumes an approximate distance of 10m from the centre of the garden to R1 facade. (2) Assumes partial line of sight due to garden fencing.

BS8233:2014 – Internal Areas

- 5.12 It is proposed that the outside space will be in use Monday to Friday hours, between 09:00 and 17:00 hrs. Predicted external and internal receptor noise levels have been calculated at R1 for the two different age group scenarios. The results are presented in Tables 5.3 and 5.4 respectively.
- 5.13 The internal noise levels have been calculated assuming façade sound reductions of 15 dB(A) for a partially open window and 33 dB(A) for a closed double-glazed window, as described in BS8233:2014.

Scenario	Receptor	Typical External Facade Noise Levels, dB ($L_{Aeq,16hr}$)	Predicted Internal Noise Level	
			Window Partially Open, dB ($L_{Aeq,16hr}$)	Window Closed, dB ($L_{Aeq,16hr}$)
1-2 Year Olds	R1	39	24	<10

TABLE 5.3: ASSESSMENT OF EXISTING NOISE LEVELS

Scenario	Receptor	Typical External Facade Noise Levels, dB ($L_{Aeq,16hr}$)	Predicted Internal Noise Level	
			Window Partially Open, dB ($L_{Aeq,16hr}$)	Window Closed, dB ($L_{Aeq,16hr}$)
2-5 Year Olds	R1	53	38	20

TABLE 5.4: ASSESSMENT OF PREDICTED NOISE LEVELS

- 5.14 The results presented in Table 5.3 indicate that with windows open, noise from the use of the outside play area by the 1-2 years olds is not likely to exceed the desirable internal noise level criteria of 35 dB $L_{Aeq,T}$ (Living Room and Bedroom), and 40 dB $L_{Aeq,T}$ (dining room/ area) as set out in BS 8233:2014, at the nearest noise sensitive receptor.
- 5.15 The results presented in Table 5.4 indicate that the use of the outside play area by the 2-5 year olds will exceed the desirable criteria of 35dB $L_{Aeq,T}$ for living rooms and bedrooms by 3dB but will meet the criteria for dining areas, with windows open. The 3dB increase above the desirable criteria may lead to a minor impact but would not be considered significant. The estimated internal level of 38dB $L_{Aeq,T}$ inside living rooms and bedrooms would still provide a reasonable level of amenity, according to BS8233:2014.
- 5.16 With windows closed, the criteria is comfortably achieved for both scenarios.

BS8233:2014 – External Areas

- 5.17 The estimated external noise levels at the closest receptor, from the use of the outside play area are 36 and 50 dB for the 1-2 year olds and the 2-5 year olds respectively. These levels both meet the BS8233 and WHO desirable guideline values for avoiding moderate annoyance in external areas of 50dB $L_{Aeq, 16hours}$. which indicates a good standard of amenity can be observed.

Mitigation Options

- 5.18 The result of the assessment indicate that additional mitigation options should be considered, to ensure the risk of any adverse impact from the use of the outside play area are minimised as far as reasonably practicable. These options are discussed in detail in Section 7.

6.0 INTERNAL NOISE TRANSFER

- 6.1 The planning condition for the control of noise requires the consideration of internal noise transfer, stating:

'The submitted details will also calculate the required level of sound attenuation to be provided between the application property and the adjoining residential property (Selbourne House) and the method of achieving this to accord with the requirements of BS8233:2014, Guidance on Sound Insulation and Noise Reduction for Buildings. The mitigation measure so approved shall be implemented prior to first use and retained in perpetuity unless otherwise agreed.'

- 6.2 The following sound insulation values, as required under Building Regulations 2010, and set out in 'Approved Document E – Resistance to the Passage of Sound [3] (ADE) are the minimum required to provide a reasonable level of protection against sound from other parts of the building and adjoining buildings, for dwelling houses formed by a material change of use.

Requirement E1: Dwelling houses, flats and rooms for residential purposes shall be designed and constructed in such a way that they provide a reasonable resistance to sound.

Airborne Sound: Floors and Stairs - 43 dB DnT,w + Ctr (min value)

- 6.3 However, this value was designed for protection between residential spaces. For protection against commercial space, the guidance document states: *'a higher standard of sound insulation may be required between spaces used for normal domestic purposes and communal and non domestic purposes. In these situations the level of sound insulation will depend on the noise generated by the communal or non-domestic space.'*
- 6.4 The original construction of the party wall is understood to comprise of 220mm brick with plaster on both sides.
- 6.5 Subsequent to the planning consent being granted, internal improvements to the party wall have been undertaken. These consist of the following additions to the wall structure:
- Independent timber stud (minimum distance from wall 100mm);
 - Filled with 50mm rockwall insulation;
 - Completed with single layer of fire rated plasterboard.
- 6.6 This additional sound insulation work has been undertaken in front of the fireplace on the ground floor and on all party walls on the upper floors.
- 6.7 The sound insulation of both constructions has been estimated using INSUL prediction software v 9.0. Full details of the calculations are presented in Figures A6 and A7 of Appendix A.



- 6.8 The results indicate that the sound insulation value of the two wall constructions are:
- Original Brick Construction: 55dB R_w
 - With independent timber stud: 59dB R_w
- 6.9 It is important to note that most acoustic data for separating elements is given as dB R_w . R_w (weighted reduction) is a laboratory test and is not indicative of how the product will perform onsite. However, as a rule of thumb, a 10dB reduction can be made to allow for flanking noise and background noise, to provide a reasonable estimate of the D_{nTw} value.
- 6.10 The above indicates that the original construction is likely to have met the minimum criteria for providing a reasonable resistance to the passage of sound between residential dwellings, however, with the addition of the independent wall, the sound insulation is approximately 6dB in excess of the minimum requirements, which is in keeping with the Approved Documents requirements for commercial premises.
- 6.11 Assuming a sound insulation level between the rooms of 49dB D_{nTw} and a maximum sound level in the receiving room of 35dB $L_{Aeq, T}$, as directed by the planning condition, this would require the noise levels in the source room are not more than 84dB $L_{Aeq, T}$.
- 6.12 This level is well in excess of the predicted worse case noise level generated in the outside play area and therefore is not expected to be reached in the internal rooms of the nursery.



7.0 NOISE MITIGATION AND MANAGEMENT PLAN

- 7.1 The results of the assessment indicate that the improved sound insulation inside the property should ensure that noise generated by children does not lead to adverse impact as a result of airborne noise transfer through the party wall.
- 7.2 However, the use of the garden by 2-5 year olds may lead to an exceedance of the desirable internal noise levels at the closest residential receptor, with window open.
- 7.3 It is important therefore that all attempts to minimise noise as far as reasonably practicable are taken.
- 7.4 The noise controls set out below are presented as a draft version of a noise management plan for the nursery business. The final version of the plan should be completed following further communication with the local authority.

Roles and Responsibilities

Site Manager

- 7.5 The Site Manager (SM) will have overall responsibility for ensuring that the NMP is communicated, understood and implemented by all individuals using the premises. The SM will ensure that the existence of the NMP is publicised around the premises in an appropriate fashion, and that a copy of the NMP is available for inspection at any time within the premises.

Visiting Parents

- 7.6 Parents using the premises will be expected to adhere to the NMP and ensure they keep noise to an absolute minimum at all times when arriving and leaving the property. Car engines will be switched off when parked in the street for drop off and collection of children and the use of car horns will be strictly prohibited.
- 7.7 Parents will not arrive before the allocated drop off time in the mornings.
- 7.8 Cars will not be parked across driveways, or in such a manner as to block or inhibit residents on the street.

Noise Control Measures

- 7.9 The nursery will adopt noise management policies and procedures to control noise emissions from the premises. The control measures are detailed in Table 7.1 below.

Item Number	Noise Management Measures
	General
1	The business will operate ONLY between the hours of 08:00 to 18:00 Monday to Fridays
2	Staff will be present at the property in the ratio required by Ofsted.
	Outside Play Area
3	No more than 10 children will be allowed into the external play area at any one time.
4	The use of the external play area will be limited to between 09:00 and 12:00 and between 13:00 to 17:00 Monday to Friday. Children will not be allowed to access this space outside of these times.
5	Staff will be trained and supported to use the outside area as a place for children to explore and gain experience while learning. This gives children the ability to be physical and adventurous within a small outside space, whilst being monitored and supported by professional staff
6	The outside play area will be designed in a way that minimises noise as far as reasonably practicable. Play activities with the potential to encourage a congregation of children (such as a sand pit) will be positioned towards the far end of the garden to provide as much distance as possible to the nearest noise sensitive receptor.
7	No activities capable of generating high levels of noise, such as banging of drums or wooden blocks, the use of rattles or the playing of instruments shall be allowed in the outside space.
8	Children will be discouraged from shouting and screaming, as far as reasonably practicable, when using the outside space. If a child continues to cause noise disturbance, staff will remove the child from the outside space until they are calm.
9	No amplified music shall be played in the outside area
10	A 2m high close boarded fence will be constructed around the perimeter of the external play area. This fence will be properly maintained at all times.
11	The introduction of a beach school, to include regular visits to the beach will be incorporated into the daily routine to minimise the reliance on the use of the play area for external activities.
	Internal Activities
12	Rooms on the party wall will be used for quiet activities, including sleeping rooms, staff admin offices and quiet learning whenever practicable
	Drop Off and Collections



Item Number	Noise Management Measures
13	Parents will be required to ensure they keep noise to a minimum at all times, when dropping off or collecting their children
14	Parents will not arrive before the allocated drop off time in the mornings
15	Car engines will be switched off when parked on the street when dropping of or collecting
16	The use of car horns will be strictly prohibited
17	Cars will not be parked across driveways or in such a manner as to block or inhibit residents on the street

TABLE 7.1: PROVISIONAL NOISE MANAGEMENT PLAN



8.0 SUMMARY AND CONCLUSIONS

- 8.1 A noise assessment has been undertaken for children's nursery at 5 Selbourne Place, Selbourne Road, Littlehampton.
- 8.2 Unattended noise monitoring has been undertaken to determine the existing ambient noise levels in the absence of any child activity.
- 8.3 The noise levels from the proposed use of the external play area have been estimated at the nearest noise sensitive receptor.
- 8.4 A worst-case assessment of estimated noise levels has indicated that the use of the external play area by 1-2 year old children should not lead to an exceedance of the desirable criteria for internal noise set out in BS8233:2014, however the use by the 2-5 year olds may lead to a slight exceedance. However, the exceedance is not likely to lead to a significant adverse impact and a reasonable level of amenity will still be achieved.
- 8.5 The external noise criteria for the avoidance of moderate annoyance, as set out in the WHO guidelines will also be achieved.
- 8.6 Sound insulation works have been undertaken to the party wall of the property, which have increased the sound insulation to approximately 6dB above the minimum requirements set out in Approved Document E and is therefore in keeping with the guidance documents advice for commercial premises. With this sound insulation in place, the requirement to ensure that the noise levels inside the rooms of the adjoining residential property do not exceed criteria set out in BS8233 will be achieved.
- 8.7 Noise management and control measures have been set out to demonstrate that all reasonably practicable means are being deployed to ensure that the use of the nursery and in particular, the external area, are properly managed and that the noise will be minimised as far as reasonably practicable.
- 8.8 The incorporation of these control measures should ensure that adverse noise impact is avoided at the closest noise sensitive receptors.



9.0 REFERENCES

1. British Standard BS 8233: 2014: *Guidance on Sound Insulation and Noise Reduction for Buildings*.
2. World Health Organisation. *Guidelines for Community Noise*. 1999.
3. Approved Document E: Resistance to the Passage of Sound.

APPENDIX A: FIGURES



FIGURE A1: SITE LOCATION PLAN



FIGURE A3: PHOTO SHOWING UNATTENDED MONITORING EQUIPMENT

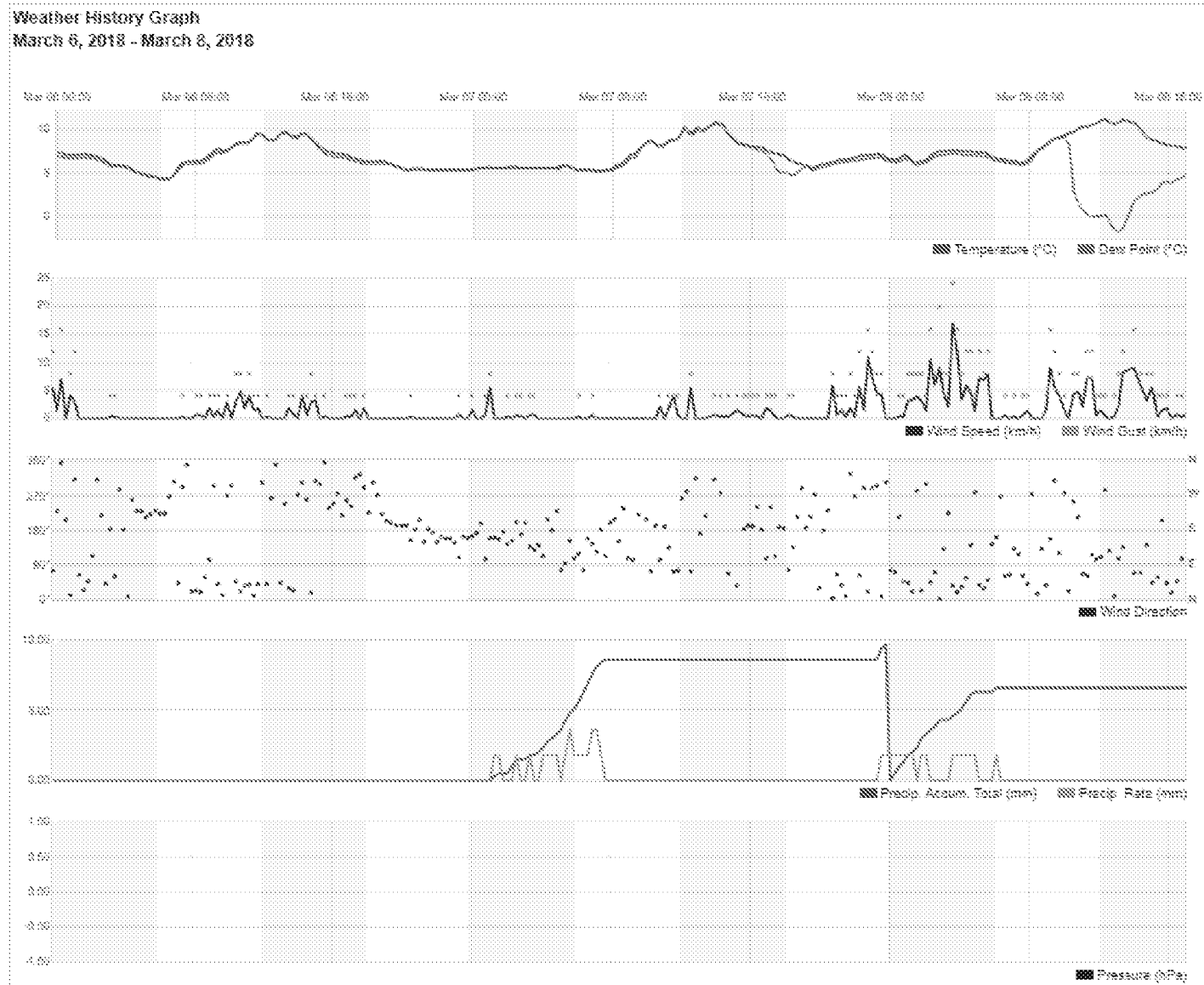


FIGURE A4: SUMMARY OF WEATHER CONDITIONS DURING UNATTENDED MONITORING PERIOD

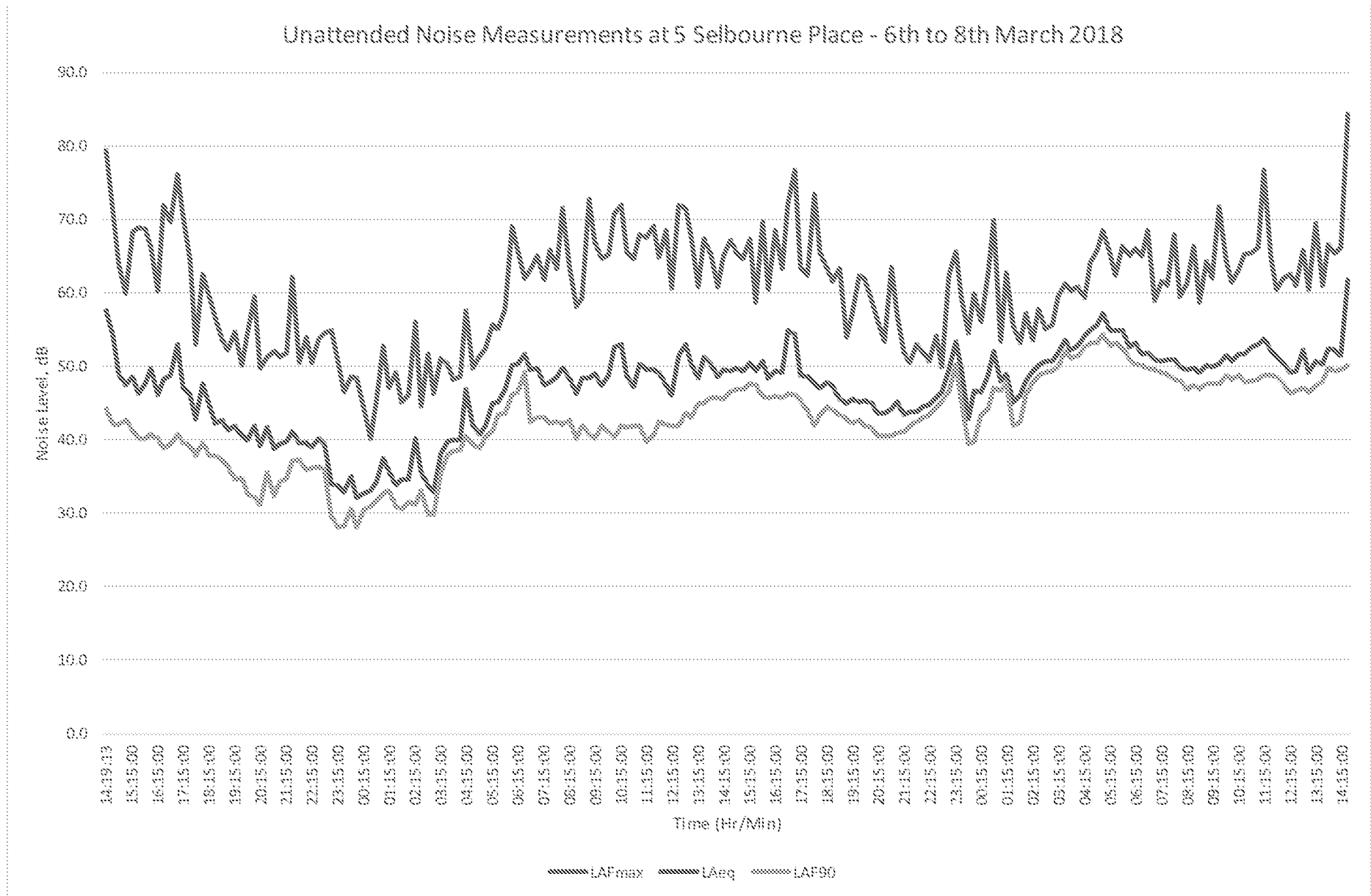


FIGURE A5: UNATTENDED NOISE DATA AT 5 SELBOURNE PLACE – 6TH TO 8TH MARCH 2018

Sound Insulation Prediction (v9.0.5)

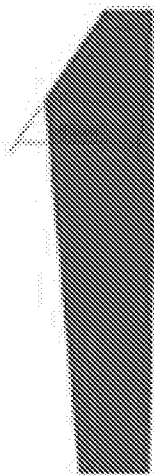
Program copyright Marshall Day Acoustics 2017

Key No: 0001
Job Name:
Job No:
Date: 21/05/2018
File Name:

Initial Owner



Notes:



Rw 55 dB
C -1 dB
Ctr -5 dB

Panel Size = 2.7 m x 4.0 m

Partition surface mass = 100 kg/m²

System description

Panel 1 : 1 x 200.0 mm Plasterboard

freq. (Hz)	TL (dB)	TL (dB)
50	41	
63	41	41
80	42	
100	41	
125	38	39
160	39	
200	42	
250	44	44
315	47	
400	49	
500	52	51
630	54	
800	57	
1000	59	58
1250	60	
1600	62	
2000	63	63
2500	65	
3150	66	
4000	68	68
5000	70	

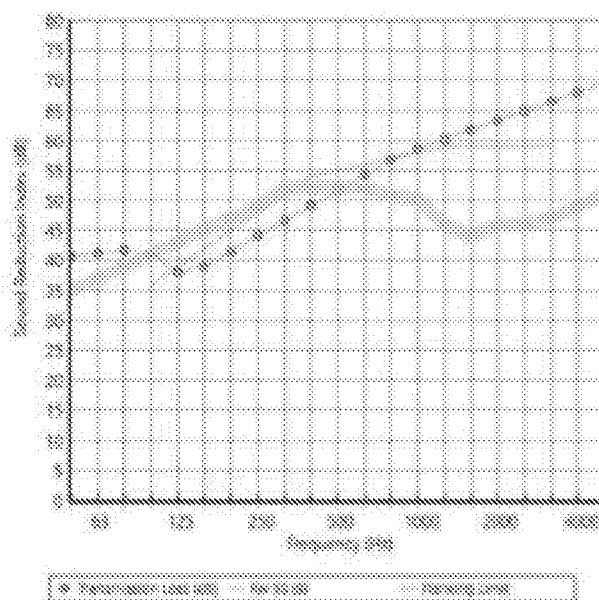


FIGURE A6: INSUL CALCULATION FOR ORIGINAL PARTY WALL CONSTRUCTION

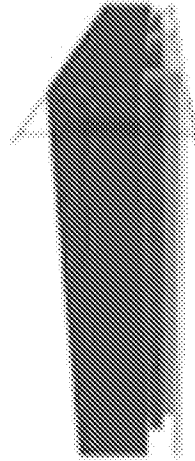
Sound Insulation Prediction (v9.0.5)

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Project No. 0001
 Job Name
 Job No.
 Date: 20/05/2018
 User Name

Construction

Room



Rw 59 dB
 C -2 dB
 Ctr -7 dB

Resulting sound frequency = 125 Hz

Resulting sound frequency = 125 Hz

Resulting sound frequency = 125 Hz

System description

Room 1 : 1 x 1000 mm Partition Wall

Room 2: 1 x 1000 mm Partition Wall
 Room 3: 1 x 1000 mm Partition Wall

freq (Hz)	T1 (dB)	T2 (dB)
50	27	
63	32	32
80	37	
100	38	
125	40	38
160	43	
200	46	
250	48	48
315	51	
400	53	
500	56	55
630	58	
800	61	
1000	63	63
1250	66	
1600	68	
2000	69	69
2500	69	
3150	72	
4000	77	77
5000	81	

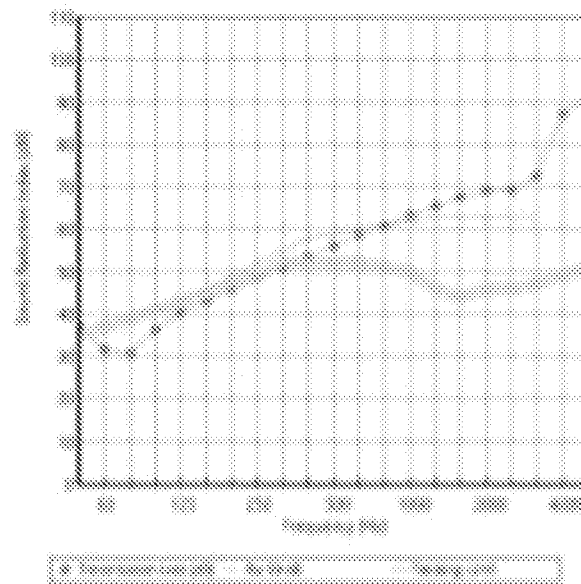


FIGURE A7: INSUL CALCULATION FOR NEW PARTY WALL CONSTRUCTION

APPENDIX B: TABLES

Measurement Date	Time	Measured Noise Levels, dB		
		L _{max}	L _{avg}	L _{min}
Tuesday 6th March 2018	14:19:13	79.5	57.7	44.1
	14:30:00	71.1	54.1	42.0
	14:45:00	63.9	48.9	42.1
	15:00:00	59.9	47.5	42.7
	15:15:00	68.3	48.7	41.3
	15:30:00	68.9	46.3	40.1
	15:45:00	68.7	47.6	40.2
	16:00:00	66.2	49.8	40.7
	16:15:00	60.3	46.2	40.1
	16:30:00	72.0	48.2	38.8
	16:45:00	69.8	48.7	39.3
	17:00:00	76.2	53.0	40.8
	17:15:00	70.4	47.1	39.5
	17:30:00	64.5	46.1	39.2
	17:45:00	53.0	42.9	37.8
	18:00:00	62.7	47.6	39.6
	18:15:00	59.3	44.5	37.8
	18:30:00	56.6	42.2	37.9
	18:45:00	53.5	42.6	37.1
	19:00:00	52.2	41.3	36.4
	19:15:00	54.6	41.9	34.6
	19:30:00	50.1	40.5	34.8
	19:45:00	54.5	40.0	32.6
	20:00:00	59.6	42.0	32.1
	20:15:00	49.7	39.2	31.1
	20:30:00	51.3	41.7	35.5
	20:45:00	52.1	38.8	32.3
	21:00:00	51.2	39.3	34.2
	21:15:00	51.9	39.7	34.7
	21:30:00	62.1	41.1	37.0
	21:45:00	50.4	39.6	37.2
	22:00:00	54.1	39.6	35.9
	22:15:00	50.4	39.1	36.2
	22:30:00	53.8	40.1	36.3
	22:45:00	54.4	39.4	36.0
	23:00:00	54.9	34.0	29.5
	23:15:00	50.3	33.6	28.1
	23:30:00	46.6	32.9	28.3
	23:45:00	48.5	34.9	30.6
Wednesday 7th March 2018	00:00:00	48.4	32.1	28.1
	00:15:00	44.5	32.6	30.4
	00:30:00	40.2	33.1	31.0
	00:45:00	45.1	34.3	31.7
	01:00:00	52.9	37.4	32.7

Measurement Date	Time	Measured Noise Levels, dB		
		Leq,1	Leq,2	Leq,3
	01:15:00	47.0	35.8	33.1
	01:30:00	49.2	33.8	31.0
	01:45:00	45.2	34.5	30.5
	02:00:00	46.1	34.5	31.6
	02:15:00	56.2	40.2	31.1
	02:30:00	44.5	35.5	33.1
	02:45:00	51.7	33.8	29.8
	03:00:00	46.2	32.9	29.8
	03:15:00	51.1	38.0	35.4
	03:30:00	50.4	39.8	38.0
	03:45:00	48.3	39.9	38.5
	04:00:00	48.6	39.9	38.6
	04:15:00	57.6	46.9	40.5
	04:30:00	49.7	41.8	39.3
	04:45:00	51.4	40.8	38.8
	05:00:00	52.4	41.9	40.3
	05:15:00	55.6	44.9	41.1
	05:30:00	55.2	45.2	43.5
	05:45:00	57.7	47.0	43.6
	06:00:00	69.2	50.2	46.1
	06:15:00	65.9	50.2	46.5
	06:30:00	62.1	51.7	49.2
	06:45:00	63.1	49.6	42.4
	07:00:00	65.1	49.8	43.1
	07:15:00	61.9	47.5	43.1
	07:30:00	65.9	47.8	42.3
	07:45:00	63.4	48.6	42.4
	08:00:00	71.5	49.8	42.1
	08:15:00	63.5	48.4	42.7
	08:30:00	58.1	46.2	40.2
	08:45:00	59.3	48.3	41.9
	09:00:00	72.7	48.3	40.7
	09:15:00	67.0	49.1	40.1
	09:30:00	64.7	47.4	41.9
	09:45:00	65.2	48.8	41.2
	10:00:00	70.9	52.6	40.4
	10:15:00	71.9	52.9	41.8
	10:30:00	65.4	48.6	41.7
	10:45:00	64.7	47.3	41.8
	11:00:00	68.0	50.2	41.8
	11:15:00	67.6	49.6	39.7
	11:30:00	69.1	49.6	40.5
	11:45:00	64.9	49.2	42.5
	12:00:00	68.4	47.4	42.1

Measurement Date	Time	Measured Noise Levels, dB		
		L _{max}	L _{eq,1}	L _{avg}
	12:15:00	60.7	46.2	41.8
	12:30:00	71.9	51.5	41.8
	12:45:00	71.6	53.1	43.7
	13:00:00	67.6	50.3	43.0
	13:15:00	60.8	48.4	44.9
	13:30:00	67.4	51.3	45.0
	13:45:00	65.2	50.3	45.8
	14:00:00	60.8	48.6	45.7
	14:15:00	65.1	49.5	45.6
	14:30:00	67.1	49.4	46.4
	14:45:00	65.6	49.8	46.8
	15:00:00	64.6	49.4	46.8
	15:15:00	67.3	50.5	47.7
	15:30:00	58.7	49.3	47.4
	15:45:00	69.6	50.7	46.0
	16:00:00	60.4	48.5	45.7
	16:15:00	68.6	49.4	45.9
	16:30:00	63.4	49.2	45.8
	16:45:00	72.2	55.0	46.2
	17:00:00	76.7	54.4	46.1
	17:15:00	63.5	48.9	45.4
	17:30:00	62.5	48.5	44.0
	17:45:00	73.5	47.7	41.8
	18:00:00	65.5	47.0	43.4
	18:15:00	63.4	47.7	44.6
	18:30:00	61.6	47.2	44.0
	18:45:00	63.3	45.6	43.4
	19:00:00	54.0	45.0	42.8
	19:15:00	57.2	45.5	42.3
	19:30:00	62.4	45.1	42.6
	19:45:00	61.8	45.4	41.8
	20:00:00	59.0	44.9	41.7
	20:15:00	56.2	43.7	40.6
	20:30:00	53.4	43.6	40.6
	20:45:00	63.5	44.2	40.5
	21:00:00	57.1	45.1	41.0
	21:15:00	51.8	43.3	41.1
	21:30:00	50.4	43.8	41.9
	21:45:00	53.0	43.8	42.4
	22:00:00	51.8	44.5	43.1
	22:15:00	50.6	44.7	43.5
	22:30:00	54.2	45.7	44.3
	22:45:00	50.0	46.4	45.3
	23:00:00	62.3	49.6	46.4

Measurement Date	Time	Measured Noise Levels, dB		
		L _{max}	L _{eq,1}	L _{avg}
	23:15:00	65.6	53.4	50.3
	23:30:00	59.3	49.6	45.2
	23:45:00	54.6	42.9	39.3
Thursday 8th March 2018	00:00:00	59.8	46.7	39.7
	00:15:00	56.1	46.4	43.5
	00:30:00	62.6	48.9	44.2
	00:45:00	69.9	52.1	47.1
	01:00:00	53.5	48.0	46.7
	01:15:00	62.8	49.1	47.7
	01:30:00	55.5	45.1	41.8
	01:45:00	53.2	46.1	42.5
	02:00:00	57.3	48.1	46.1
	02:15:00	53.5	49.4	47.8
	02:30:00	57.8	50.2	48.8
	02:45:00	55.1	50.6	49.2
	03:00:00	55.7	50.7	49.3
	03:15:00	59.5	51.9	49.9
	03:30:00	61.2	53.5	52.1
	03:45:00	60.3	52.3	51.0
	04:00:00	60.9	52.8	51.5
	04:15:00	59.3	54.1	52.7
	04:30:00	64.0	54.8	53.1
	04:45:00	65.8	55.6	53.2
	05:00:00	68.6	57.1	54.3
	05:15:00	65.5	55.0	52.8
	05:30:00	62.5	54.9	53.1
	05:45:00	66.4	54.9	52.5
	06:00:00	65.0	52.7	51.0
	06:15:00	66.1	53.1	50.3
	06:30:00	65.0	51.6	50.2
	06:45:00	68.5	51.8	49.7
	07:00:00	58.9	50.9	49.5
	07:15:00	61.7	50.7	49.1
	07:30:00	61.1	50.8	48.9
	07:45:00	68.0	50.8	48.2
	08:00:00	59.5	50.0	48.0
	08:15:00	61.2	49.5	46.9
	08:30:00	66.5	49.8	47.5
	08:45:00	58.8	49.1	46.8
	09:00:00	64.3	50.1	47.6
	09:15:00	62.1	49.9	47.6
	09:30:00	71.9	50.2	47.6
	09:45:00	64.6	51.6	48.7
	10:00:00	61.5	50.7	48.2

Measurement Date	Time	Measured Noise Levels, dB		
		L _{max}	L _{eq,1}	L _{avg}
	10:15:00	63.2	51.7	48.7
	10:30:00	65.2	51.7	47.9
	10:45:00	65.5	52.7	48.1
	11:00:00	66.2	53.0	48.3
	11:15:00	76.7	53.7	48.7
	11:30:00	65.0	52.3	48.8
	11:45:00	60.4	51.3	48.5
	12:00:00	62.0	50.3	47.7
	12:15:00	62.5	49.2	46.2
	12:30:00	61.0	49.3	46.6
	12:45:00	65.9	52.1	47.1
	13:00:00	60.4	49.2	46.4
	13:15:00	69.6	50.7	47.2
	13:30:00	61.0	50.3	48.1
	13:45:00	66.6	52.5	49.7
	14:00:00	65.4	52.1	49.4
	14:15:00	66.2	51.5	49.5
	14:30:00	84.4	61.8	50.1

TABLE B1: NOISE MEASUREMENT DATA 6TH TO 8TH MARCH 2018

APPENDIX C - GLOSSARY OF ACOUSTIC TERMS

Noise

Noise is defined as unwanted sound. The range of audible sound is from 0 to 140 dB. The frequency response of the ear is usually taken to be around 18 Hz (number of oscillations per second) to 18000 Hz. The ear does not respond equally to different frequencies at the same level. It is more sensitive in the mid-frequency range than the lower and higher frequencies and because of this, the low and high frequency components of a sound are reduced in importance by applying a weighting (filtering) circuit to the noise measuring instrument. The weighting which is most widely used and which correlates best with subjective response to noise is the dBA weighting. This is an internationally accepted standard for noise measurements.

For variable sources, such as traffic, a difference of 3 dBA is just distinguishable. In addition, a doubling of traffic flow will increase the overall noise by 3 dBA. The 'loudness' of a noise is a purely subjective parameter, but it is generally accepted that an increase/decrease of 10 dBA corresponds to a doubling/ halving in perceived loudness. Noise is measured on a logarithmic scale in decibels (dB) because of the ears' sensitivity to a wide range of pressure changes. The sound pressure level (SPL) of a signal is denoted by the symbol L_p and defined by the equation $L_p = 10 \log (p/p_0)^2$ where p is the root mean square pressure of the signal and p_0 is the reference sound pressure (2×10^{-5} Pa).

An indication of the range of sound pressure levels commonly found in the environment is given below:

<u>Location</u>	<u>L_{pA} dB(A)</u>
Normal threshold of hearing	-10 to 20
Music halls and theatres	20 to 30
Living rooms and offices	30 to 50
Inside motor vehicles	50 to 70
Industrial premises	70 to 100
Burglar alarms at 1 m	100 to 110
Jet aircraft on take-off	110 to 130
Threshold of pain	130 to 140

External noise levels are rarely steady, but rise and fall according to activities within an area. In attempt to produce a figure that relates this variable noise level to subjective response, a number of noise indices have been developed. These include:

i) The L_{Amax} noise level

This is the maximum noise level recorded over the measurement period.

ii) The L_{Aeq} noise level

This is "equivalent continuous A-weighted sound pressure level, in decibels" and is defined in British Standard BS 7445 [2] as the "value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval, T , has the same

mean square sound pressure as a sound under consideration whose level varies with time”.

It is a unit commonly used to describe construction noise and noise from industrial premises and is the most suitable unit for the description of other forms of environmental noise. In more straightforward terms, it is a measure of energy within the varying noise.

iii) The L_{A10} noise level

This is the noise level that is exceeded for 10% of the measurement period and gives an indication of the noisier levels. It is a unit that has been used over many years for the measurement and assessment of road traffic noise.

iv) The L_{A90} noise level

This is the noise level that is exceeded for 90% of the measurement period and gives an indication of the noise level during the quieter periods. It is often referred to as the background noise level and is used in the assessment of disturbance from industrial noise.

Community response to environmental noise sources is dependent on both acoustic and non-acoustic factors. The acoustic factors include absolute noise level, changes or exceedances of background and ambient levels as well as the characteristics, time, duration and frequency of noise.