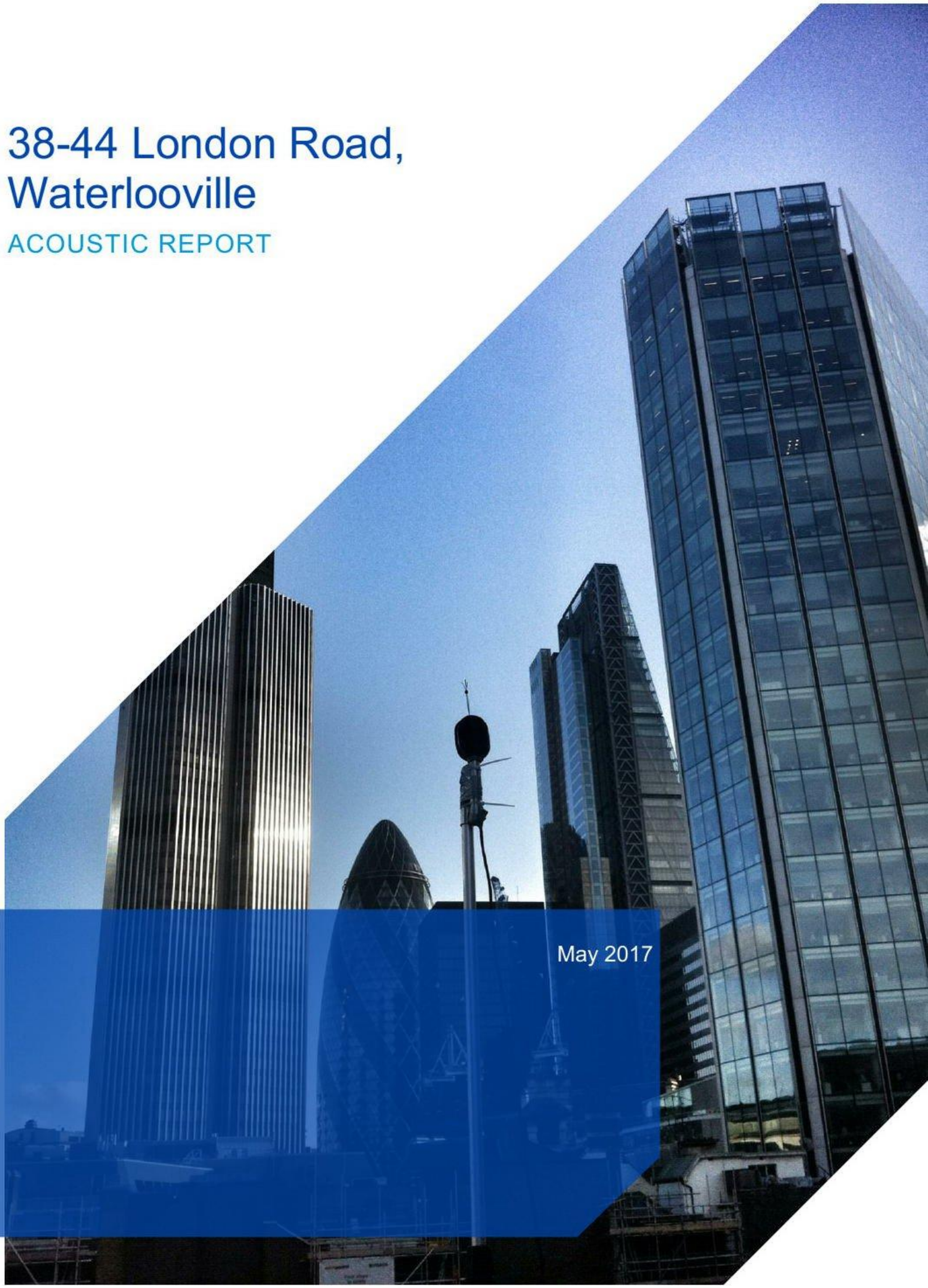
38-44 London Road, Waterlooville

ACOUSTIC REPORT



May 2017

WSP | PARSONS BRINCKERHOFF

38-44 LONDON ROAD, WATERLOOVILLE

ACOUSTIC REPORT

McCarthy & Stone

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1 INTRODUCTION

1.1.1 WSP | Parsons Brinckerhoff has been commissioned by McCarthy & Stone Retirement Lifestyles Limited to undertake a noise survey and noise assessment for the proposed development at 38-44 London Road, Purbrook.

1.1.2 This report presents the results of the baseline noise survey, undertaken to establish the existing noise climate across the site. The survey results have been used to assess the suitability of the site for residential use in accordance with Havant Borough Council's (HBC) requirements and in accordance with relevant criteria.

1.1.3 Mitigation measures have been identified with the aim of providing a suitable internal and external noise environment for future occupants.

1.1.4 A glossary of acoustic terminology is presented in Appendix A.

2 SITE DESCRIPTION

2.1 LOCATION

2.1.1 The site is bordered to the west by London Road (the A3), to the north by Stakes Road, to the east by the Purbrook Centre, and to the south by the beer garden associated with the Woodman public house and commercial units with residential dwellings above. The site is currently occupied by a number of industrial and commercial units including Asphaltic Roofing Supplies, Purbrook Tyres and Purbrook Garage Services.

2.1.2 The site is exposed to a number of noise sources including road traffic on London Road, the Purbrook Centre to the east of the site which has function rooms for hire until midnight, and the Woodman pub and associated beer garden to the south.

2.1.3 As stated above, the site is currently occupied by a number of industrial and commercial units, which themselves generate noise.

2.2 PROPOSED DEVELOPMENT

2.2.1 It is proposed to demolish the existing buildings on site and provide a C-shaped retirement block with a communal garden in the centre and two retail units. The proposed layout is shown in Appendix B.

3 PLANNING POLICY AND GUIDANCE

3.1 LOCAL PLANNING POLICY

HAVANT BOROUGH CORE STRATEGY

3.1.1 The Havant Borough Core Strategy was adopted in March 2011 and is the principal document in the council's Local Plan. It sets out the spatial planning strategy for the area up to 2026 and includes the following relevant policies which make reference to noise and vibration:

- Policy CS16 *High Quality Design*
  - This policy states that planning permission will be granted for development that is designed to a high standard which helps to create places where people want to live, work and relax. All development should demonstrate that its design does not cause unacceptable harm to the amenity of neighbours through smell, the loss of privacy, outlook, noise and overlooking.
- DM7 *Elderly and Specialist Housing Provision*
  - This policy states that within the defined urban areas, development specific to the requirements of the elderly, people with disabilities or other forms of specialised supported housing provision will only be permitted provided that the services that may generate noise and disturbance (such as laundry rooms, kitchens and refuge storage) are located and designed to avoid undue disturbance to the amenities of neighbouring properties.
- DM10 *Pollution*
  - This policy states that development that may cause pollution of water, air or soil or pollution through noise, smell, smoke, fumes, gasses, steam, dust, vibration, light, heat, electromagnetic radiation and other pollutants will only be permitted where all of the criteria listed within the policy can be met. Whilst the policy lists a number of criteria, none reference noise in detail and are therefore not included in this report.

3.1.2 The Core Strategy also points to HBC's Environmental Health Department, and states that it provides specific advice and guidance on water quality, air quality, noise and pollution. As such, the Environmental Health Department was contacted to confirm the approach to this noise assessment and the location of the noise measurement positions.

3.2 CONSULTATION

3.2.1 The Environmental Health Department of HBC was consulted in April 2015 to discuss and agree the approach to the noise assessment and the monitoring positions for the noise survey.

3.2.2 It was agreed that, as there was no secure location close to London Road to leave a sound level meter unattended, a 3-hour measurement would be undertaken in accordance with the shortened measurement procedure in the Calculation of Road Traffic Noise[1] (CRTN). The locations of two unattended measurement positions were also confirmed.

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[1] Department of Transport and Welsh Office (1988) *Calculation of Road Traffic Noise*

3.2.3 It was agreed to assess the suitability of the site for residential use in accordance with the internal and external noise criteria presented in BS 8233:2014 and the World Health Organisation (WHO) *Guidelines for Community Noise*. An outline of the guidance and criteria presented in BS 8233:2014 and the WHO *Guidelines* is presented below.

3.2.4 Should there be any proposed fixed plant associated with the proposed development, a plant noise emission level should be determined in line with the guidance in BS 4142:2014, as it was understood that the detail, type and location of any plant may not be confirmed at this stage.

3.2.5 The Environmental Health Officer at HBC also advised that noise associated with any lift shafts or kitchen extracts would need to be considered to minimise the impact on future residents. It was agreed that this would be considered post-planning during the detailed design stage.

3.3 GUIDANCE

SITE SUITABILITY ASSESSMENT

3.3.1 BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings* and the WHO *Guidelines for Community Noise* both provide quantitative guidance for internal noise levels in and around buildings.

3.3.2 BS 8233:2014 provides appropriate criteria and limits for different situations, including the design of new buildings. The noise level criteria recommended in BS 8233:2014 for residential spaces are summarised in Table 3-1.

Table 3-1 Indoor ambient noise levels for dwellings

ACTIVITY	LOCATION	07:00 - 23:00	23:00 - 07:00
Resting	Living room	35 dB $L_{Aeq,16h}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16h}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16h}$	30 dB $L_{Aeq,8h}$

3.3.3 It should also be noted that BS 8233:2014 states that "*regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$ depending on the character and number of events per night*."

3.3.4 With regards to external amenity areas, BS 8233:2014 recommends that "*it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments*." The standard also states that these guideline values are not always achievable in all circumstances and therefore a compromise between elevated noise levels and the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.

3.3.5 The WHO guidelines consolidate scientific knowledge on the health effects of community noise and provide guidance to environmental health authorities and professionals trying to protect people from the harmful effects of noise in non-industrial environments. The main sources of community noise are identified as road, rail and air traffic, industries, construction and public work and neighbours.

3.3.6 The effects of noise in dwellings are, typically, sleep disturbance, speech interference and annoyance. Relevant guideline values and the time base over which the individual guideline values apply are summarised in Table 3-2.

Table 3-2 WHO guideline values for community noise in specific environments

SPECIFIC ENVIRONMENT	CRITICAL HEALTH EFFECTS	$L_{AEQ,T}$	TIME BASE (HOURS)*	L_{AFMAX}
Outdoor living area	Serious annoyance, daytime and evening	55 dB	16	-
	Moderate annoyance, daytime and evening	50 dB	16	-
Dwellings, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35 dB	16	-
Inside bedrooms	Sleep disturbance, night-time	30 dB	8	45 dB
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45 dB	8	60 dB

* These periods are usually taken to be 07:00 – 23:00 (16-hour day) and 23:00 – 07:00 (8-hour night)

3.3.7 It can be seen from Tables 3-1 and 3-2 above that the internal $L_{Aeq,T}$ criteria for day and night-time periods in BS 8233 and the WHO Guidelines are the same, and these values will be used in this assessment. As BS 8233:2014 does not provide a quantitative guideline value to minimise night-time sleep disturbance, the criterion from the WHO *Guidelines for Community Noise* of 45 dB L_{AFmax} inside bedrooms has been used.

FIXED PLANT ASSESSMENT

3.3.8 BS 4142:2014 *Methods for rating and assessing industrial and commercial sound* describes methods for rating and assessing the following:

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

3.3.9 The methods use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

3.3.10 Sound from any plant associated with the proposed development should be considered in accordance with the requirements of BS 4142:2014 and for both existing and proposed noise-sensitive receptors.

3.3.11 The Standard effectively compares and rates the difference between the specific sound level of the source ($L_{Aeq,T}$) and the typical background sound level ($L_{A90,T}$) in the absence of the specific sound. If appropriate, the specific sound level is corrected, by the application of one or more corrections, for acoustic features such as tonal qualities and/or distinct impulses, to give a 'rating' level ($L_{Ar,Tr}$).

3.3.12 The Standard advises that the time interval ('T') of the background sound measurement should be sufficient to obtain a representative or typical value of the background sound level.

3.3.13 Comparing the rating level with the background sound level, BS 4142 states:

"Typically, the greater this difference, the greater the magnitude of impact.

A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context

A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context

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."

3.3.14 A summary of the likely impacts, based upon the excess of the rating level over the background noise level, is detailed below in Table 3-3.

Table 3-3 Likely impacts based upon the excess of the rating level over the background noise level, as described in BS 4142:2014

EXCESS OF RATING LEVEL OVER BACKGROUND LEVEL	INTIAL ESTIMATE OF THE IMPACT
+10 dB	Likely to be a significant adverse impact
+5 dB	Likely to be an indication
0 dB	An indication of low impact

4 NOISE SURVEY

4.1 NOISE SURVEY METHODOLOGY

4.1.1 A noise survey was undertaken to establish the existing noise levels affecting the site.

4.1.2 Unattended noise measurements were undertaken at two locations from Wednesday 6th May 2015 to Tuesday 12th May 2015. Attended measurements were also undertaken at one location on Tuesday 12th May. A map showing the location of the measurement positions is included as Appendix C and further details are presented below:

- Measurement Position 1
  - This position was located on the eastern boundary of the site, close to the Purbrook Centre at a height of approximately 3m above the ground and in the free-field. The dominant noise sources at this position included noise from the existing roofing firm on the site and traffic on London Road. During the night, the noise trace suggests that this position is also affected by plant noise, which could not be heard during the daytime site visits.
- Measurement Position 2
  - This position was located on the southern boundary of the site, overlooking the beer garden of the Woodman Pub, at a height of approximately 3m above the ground and in the free-field. The noise climate at this position was influenced by the existing joinery business and MOT centre on site itself.
- Measurement Position 3
  - This attended measurement position was located approximately 7m from the kerb of London Road, close to the north west corner of the site. Noise measurements were undertaken over a period of 3 hours, in accordance with the shortened measurement procedure in CRTN. The dominant noise source at this location was traffic on London Road.

4.1.3 The microphones of all the sound level meters were protected with a windshield throughout the measurement survey. The sound level meters were calibrated before and after measurements with no significant drift recorded. An accredited laboratory calibrated the equipment not more than two years prior to the measurements being made, with the exception of the calibrators which had been calibrated not more than one year prior to the survey. The details of the equipment used throughout the survey period are presented in Appendix D.

4.1.4 Weather conditions during the survey were generally conducive to noise monitoring, with the exception of Wednesday 6th May when wind speeds were in excess of $5ms^{-1}$ and there was heavy rainfall. Data from Wednesday have been excluded from this assessment.

4.2 NOISE SURVEY RESULTS

4.2.1 A summary of the time averaged ambient and background noise levels for each daytime (07:00 to 23:00 hours) and night-time (23:00 to 07:00 hours) period, along with the typical maximum noise levels during the night-time (and daytime for Measurement Position 3) are presented in Tables 4.1 - 4.3.

4.2.2 The background noise levels have been derived by selecting the lowest most commonly occurring $L_{A90,15min}$ value. The 'typical' L_{AFmax} values have been derived by determining the 10th highest $L_{AFmax,5s}$ value during the respective period.

4.2.3 Hourly data are presented for Measurement Positions 1 and 2 in graphical and tabular form in Appendix E.

Table 4-1 Summary of measured noise levels, Measurement Position 1, dB

DAY/DATE	DAYTIME		NIGHT-TIME		
	$L_{Aeq,16h}$	Typical $L_{A90,15mins}$	$L_{Aeq,8h}$	Typical $L_{A90,15mins}$	Typical L_{AFMax}
Wednesday 6th May 2015	58*	53*	47	32	63
Thursday 7th May 2015	54	34	45	28	66
Friday 8th May 2015	53	43	48	35	64
Saturday 9th May 2015	54	42	46	28	68
Sunday 10th May 2015	50	37	46	31	61
Monday 11th May 2015	55	39	47	27	64
Tuesday 12th May 2015	57*	45*		-	

* Part periods: Wednesday measurements started at 13:00 and Tuesday measurements ended at 14:00

Table 4-2 Summary of measured noise levels, Measurement Position 2, dB

DAY/DATE	DAYTIME		NIGHT-TIME		
	$L_{Aeq,16h}$	Typical $L_{A90,15mins}$	$L_{Aeq,8h}$	Typical $L_{A90,15mins}$	Typical L_{AFMax}
Wednesday 6th May 2015	57*	44*	46	31	69
Thursday 7th May 2015	55	38	47	26	72
Friday 8th May 2015	54	45	46	35	64
Saturday 9th May 2015	55	43	44	27	66
Sunday 10th May 2015	52	39	44	34	64
Monday 11th May 2015	52	39	43	28	62
Tuesday 12th May 2015	50*	42*		-	

* Part periods: Wednesday measurements started at 13:00 and Tuesday measurements ended at 14:00

Table 4-3 Summary of measured noise levels at Measurement Position 3, dB

DAY/DATE	DAYTIME			
	$L_{Aeq,3h}$	Typical $L_{A90,15mins}$	$L_{A10,3h}$	Typical L_{AFMax}
Tuesday 12th May 2015	66	54	69	82

4.2.4 As there was no secure location to leave the sound level meter unattended close to London Road, a 3 hour attended measurement was undertaken. The guidance within CRTN provides a methodology for calculating the 18-hour L_{A10} value by subtracting 1 dB from the 3-hour L_{A10} measured value.

4.2.5 From this $L_{A10,18h}$ value, the equations within the Transport Research Laboratory *Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping* provide a methodology for calculating the daytime $L_{Aeq,16h}$ and night-time $L_{Aeq,8h}$ values for motorway, and non-motorway roads (as in this situation) for use in the site suitability assessment. Using these equations, the daytime $L_{Aeq,16h}$ value has been calculated to be 66 dB and the night-time $L_{Aeq,8h}$ value has been calculated to be 57 dB.

5 SITE SUITABILITY ASSESSMENT

5.1 INTERNAL AND EXTERNAL NOISE CRITERIA

5.1.1 This section provides an assessment of the suitability of the site for residential use. The internal and external noise criteria which have been adopted for the proposed development, in accordance with HBC's requirements, are outlined in Table 5.1 below.

Table 5-1 Internal and external noise criteria

	DAYTIME	NIGHT-TIME	
	$L_{Aeq,16h}$	$L_{Aeq,8h}$	Typical L_{AFMax}
Internal noise levels	35 dB	30 dB	45 dB
External noise levels	55 dB	-	

5.1.2 The daytime and night-time noise levels at each measurement position over the entire survey period are presented in section 4. A summary of the highest measured or derived noise levels at each measurement position, from full periods only, is presented below for ease of reference. These levels will be used to determine the mitigation measures required to provide an adequate internal and external noise environment for future residents.

Table 5-2 Highest measured/derived noise levels at each measurement positions, dB

MEASUREMENT POSITION	DAYTIME	NIGHT-TIME	
	$L_{Aeq,16h}$	$L_{Aeq,8h}$	Typical L_{AFMax}
1	55	48	68
2	55	47	72
3	66	57	82*

* Daytime typical L_{AFmax} taken to be representative of the worst case for the night-time period

5.2 EXTERNAL BUILDING FABRIC ASSESSMENT

5.2.1 This section presents specifications for the sound insulation of the building façade and recommendations for the ventilation requirements necessary to achieve the internal noise criteria, as outlined in Table 5.1.

5.2.2 It is assumed that the non-glazed elements of the building envelope will provide sufficient sound insulation against external noise sources. Therefore, as the glazing elements are likely to be the acoustic weak of the building façade, it is appropriate to explore the level of protection afforded by the glazing.

GLAZING

5.2.3 The glazing assessment has been based on the worst-case external daytime and night-time noise levels, as presented in Table 5.2, and the masterplan as presented in Appendix B.

5.2.4 In order to achieve the target internal noise criteria (as outlined in Table 5-1) the sound insulation performance of the façade should achieve the following values (R_W+C_{tr}), as presented in Table 5-3

Table 5-3 Sound insulation performance at each measurement positions, dB

MEASUREMENT POSITION	DAYTIME	NIGHT-TIME	
	R_W+C_{tr}	R_W+C_{tr}	R_W+C_{tr}
1	20	18	23
2	20	17	27
3	31	27	37

5.2.5 Based on the required sound insulation performance at Measurement Positions 1 and 2, a standard thermal double glazed unit (for example a 6mm glass/12mm airspace/4mm glass unit or similar) for habitable rooms across the majority of the site will be sufficient to achieve the target internal noise criteria, with the exception of any habitable rooms fronting London Road.

5.2.6 For habitable rooms fronting London Road, it is recommended that the glazing construction comprise a 6mm glass/12mm airspace/10.4mm acoustic glass unit, or similar, in order that the acoustic performance requirement of 37 dB R_W+C_{tr} and the internal noise criteria are achieved.

VENTILATION

5.2.7 It is understood that mechanical ventilation with heat recovery (MVHR) will be included in habitable rooms to minimise the need to open windows. However, windows will remain openable for rapid or purge ventilation, or at the occupant's choice.

5.2.8 The ventilation strategy should include acoustic attenuation to ensure that internal noise levels are not compromised due to the incorporation of the MVHR units.

5.2.9 Based upon the acoustic performance requirements for the glazing and ventilation set out above, internal noise levels within living areas and bedrooms would be expected to achieve the criteria as set out in Table 5.1.

5.3 EXTERNAL AMENITY SPACE ASSESSMENT

5.3.1 It is understood that an external community space is proposed in the centre of the C-shaped building block. To prevent serious annoyance in outdoor living areas during the day and evening, it is desirable that the noise level should not exceed a free-field level of 55 dB $L_{Aeq,16h}$.

5.3.2 With regards to landscaped courtyard in the centre of the proposed development, this is likely to be well screened from London Road by the future C-shaped residential block. It is therefore anticipated to achieve the external noise criterion. Nevertheless, it should be noted that BS 8233 states that this criterion is not always achievable in all circumstances and a development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.

6 FIXED PLANT ASSESSMENT

6.1 EXISTING PLANT IN THE SURROUNDING AREA

6.1.1 The night-time trace of noise levels at Measurement Position 1 suggested that this position was affected by plant noise, which could not be heard during the daytime site visits. The location of this plant was not identified during the initial site visit, and so a night-time site visit was undertaken on Tuesday 19th May 2015. During this site visit, the plant was identified as the external element of a split heating-cooling unit on the western façade of the Purbrook Centre.

6.1.2 It is understood that the façade of the proposed development facing the Purbrook Centre will have no habitable room windows as a corridor runs along the length of the eastern elevation. The nearest habitable room is Unit 33 and the window of this unit faces south. Any noise associated with the Purbrook Centre plant will therefore be screened at the window of Unit 33 by the proposed building itself.

6.1.3 It is also understood that the area along the eastern boundary will not be used as amenity space and therefore does not require assessment.

6.2 FIXED PLANT ASSOCIATED WITH THE PROPOSED DEVELOPMENT

6.2.1 It is possible that the proposed development will have some external building services plant associated with the retail units fronting London Road. As the location, type and orientation of the plant is not known at this stage, it has been agreed with HBC to set noise emission limits for the proposed plant, using the measured noise levels and guidance set out in BS 4142:2014. In accordance with the guidance in BS 4142:2014, it is proposed that the noise emission limits be set no greater than the background noise level.

6.2.2 As the nearest sensitive receptors to any plant associated with the retail units are likely to be the future residents of the proposed development itself, the lowest typical background noise levels have been selected from the three measurement positions. As the operational period of the plant is not yet confirmed, a noise emission limit has been set for both the day and night-time period. This limit would apply at 1m from the façade of the nearest sensitive receptor.

6.2.3 The proposed noise emission limits are presented in Table 6-1 below.

Table 6-1 Proposed noise emission level limits for any fixed plant

CLOSEST RESIDENTIAL PROPERTIES	PROPOSED NOISE EMISSION LIMIT (FREE-FIELD INCIDENT LEVEL) $L_{AR,TR}$	
	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
Future residents of proposed development	34 dB	26 dB

6.2.4 The limits shown above assume that the sound from any fixed plant will not contain any tones or be intermittent, impulsive or sufficient to attract attention. Where the sound associated with the fixed plant does include any of these features, additional penalties will apply in accordance with the guidance presented in BS 4142:2014. A further assessment is likely to be required at the detailed design stage, once the details of any fixed building services plant is known.

7 CONCLUSIONS

7.1.1 WSP | Parsons Brinckerhoff has been commissioned by McCarthy & Stone Retirement Lifestyles Limited to undertake a noise survey and assessment for the proposed development at 38-44 London Road, Purbrook.

7.1.2 A baseline noise survey has been undertaken to establish the existing noise levels affecting the site, which is dominated by road traffic on London Road.

7.1.3 Based on the measured noise levels and the internal noise criteria, adopted in accordance with relevant guidance and HBC's requirements, an assessment of the acoustic performance of the glazed elements of the external building fabric has been undertaken. The ventilation strategy has also been outlined.

7.1.4 For habitable rooms fronting London Road, it is recommended that the glazing construction comprise a 6mm glass/12mm airspace/10.4mm acoustic glass unit, or similar, in order that the acoustic performance requirement of 37 dB R_W+C_{tr} and the internal noise criteria are achieved.

7.1.5 For all other habitable rooms, a standard thermal double glazed unit (for example a 6mm glass/12mm airspace/4mm glass unit) will be sufficient to achieve the target internal noise criteria.

7.1.6 Mechanical ventilation with heat recovery (MVHR) will be included in habitable rooms to minimise the need to open windows. However, windows will remain openable for rapid or purge ventilation, or at the occupant's choice.

7.1.7 An assessment of the external amenity area has also been undertaken. The central courtyard will be screened from London Road by the future C-shaped residential block and therefore it is anticipated that this area will achieve the external noise criterion.

7.1.8 Noise emission limits have been set for any fixed building services plant associated the retail units fronting London Road, as agreed with HBC where sufficient details regarding the plant are not available. The limits have been based on the measured noise levels and the guidance contained within BS 4142:2014.

7.1.9 The limitations to this report are detailed in Appendix F.

Appendix A

GLOSSARY OF ACOUSTIC TERMINOLOGY

ACOUSTIC TERMINOLOGY

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq}, L_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

An indication of the range of sound levels commonly found in the environment is given in the following table.

Table A-1: Typical sound levels found in the environment

SOUND LEVEL	LOCATION
0 dB(A)	Threshold of hearing
20 to 30 dB(A)	Quiet bedroom at night
30 to 40 dB(A)	Living room during the day
40 to 50 dB(A)	Typical office
50 to 60 dB(A)	Inside a car
60 to 70 dB(A)	Typical high street
70 to 90 dB(A)	Inside factory
100 to 110 dB(A)	Burglar alarm at 1m away
110 to 130 dB(A)	Jet aircraft on take off
140 dB(A)	Threshold of pain

Table A-2: Terminology relating to noise

TERMINOLOGY	DESCRIPTION
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa (20×10^{-6} Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10} (s_1 / s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m.
Façade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast/Slow Time Weighting	Averaging times used in sound level meters.
Octave Band	A range of frequencies whose upper limit is twice the frequency of the lower limit.

Appendix B

PROPOSED LAYOUT

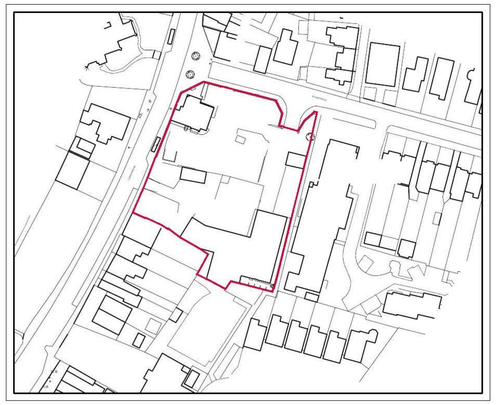
GENERAL NOTES:

1. This drawing is to be read in conjunction with all relevant architects, structural engineers, mechanical & electrical engineers and specialists drawings / specifications.
2. Any discrepancies in dimensions or details between the various drawings should be reported immediately.
3. All dimensions are in millimetres and all levels are in metres.
4. Do not scale from this drawing, if in doubt ASK

Rev.	Description	Date	Drn	Ch'd
A	Preliminary issue	05.05.17	RL	EG
B	Minor amendments due to client comment	16.05.17	RL	EG

LEGEND

- 1 Bedroom Units (23 no.)
- 2 Bedroom Units (19 no.)
- Retail Units (2 no.)
- 37 no. Parking Spaces



SITE LOCATION PLAN SCALE 1:1250

McCarthy & Stone
Later Life. Greater Life

kenn scaddan associates
architects
CONCEPT HOUSE, 35 KINGSTON CRESCENT, NORTH END, PORTSMOUTH, HAMPSHIRE, PO2 8AA
t - 023 9267 3618 f - 023 9267 9819 www.ksaltd.co.uk info@ksaltd.co.uk

PROJECT
38-44 LONDON ROAD, PURBROOK

DRAWING TITLE
Site Plan & Ground Floor Plan

Date	Drawn by	Scale		Rev.
May 2017	RL	1:200	A1	B

Drawing No.
SO-2168-03-AC-100

architecture planning design project management

Appendix C

NOISE MEASUREMENT POSITIONS

Date Modified: 15/05/2015 14:10

Drawn By: UKSXW049

WSP | PARSONS BRINCKERHOFF

TITLE:

38-44 London Road, Purbrook

FIGURE No:

Appendix C - Noise Survey Measurement Positions

File: Created using iGIS, WSP's Online Mapping System

Appendix D

NOISE SURVEY EQUIPMENT

NOISE SURVEY EQUIPMENT

Table A-3: Equipment details

MEASUREMENT LOCATION	DESCRIPTION	MANUFACTURER AND TYPE NUMBER	SERIAL NUMBER	CALIBRATION DUE DATE
1	Sound Level Meter	01 dB CUBE	10630	08 September 2016
	Pre-amplifier	Acoem PRE 22	10627	
	Microphone	GRAS 40CD	162008	
	Calibrator	01 dB-Metravib CAL 21	34344461	02 July 2015
2	Sound Level Meter	01dB-METRAVIB Solo Master	65242	09 July 2016
	Pre-amplifier	01dB-Stell PRE 21 S	16781	
	Microphone	Microtech Gefell GmbH MCE212	153334	
	Calibrator	01dB-Stell Cal 21	35242306	23 March 2016
3	Sound Level Meter	01dB-METRAVIB Solo Master	65811	23 October 2015
	Pre-amplifier	01dB-Stell PRE 21 S	16485	
	Microphone	Microtech Gefell GmbH MCE212	166394	
	Calibrator	01dB-Metravib Cal 21	34634224	09 January 2016

Appendix E

NOISE SURVEY RESULTS

HOURLY NOISE MEASUREMENT DATA – MEASUREMENT POSITION 1

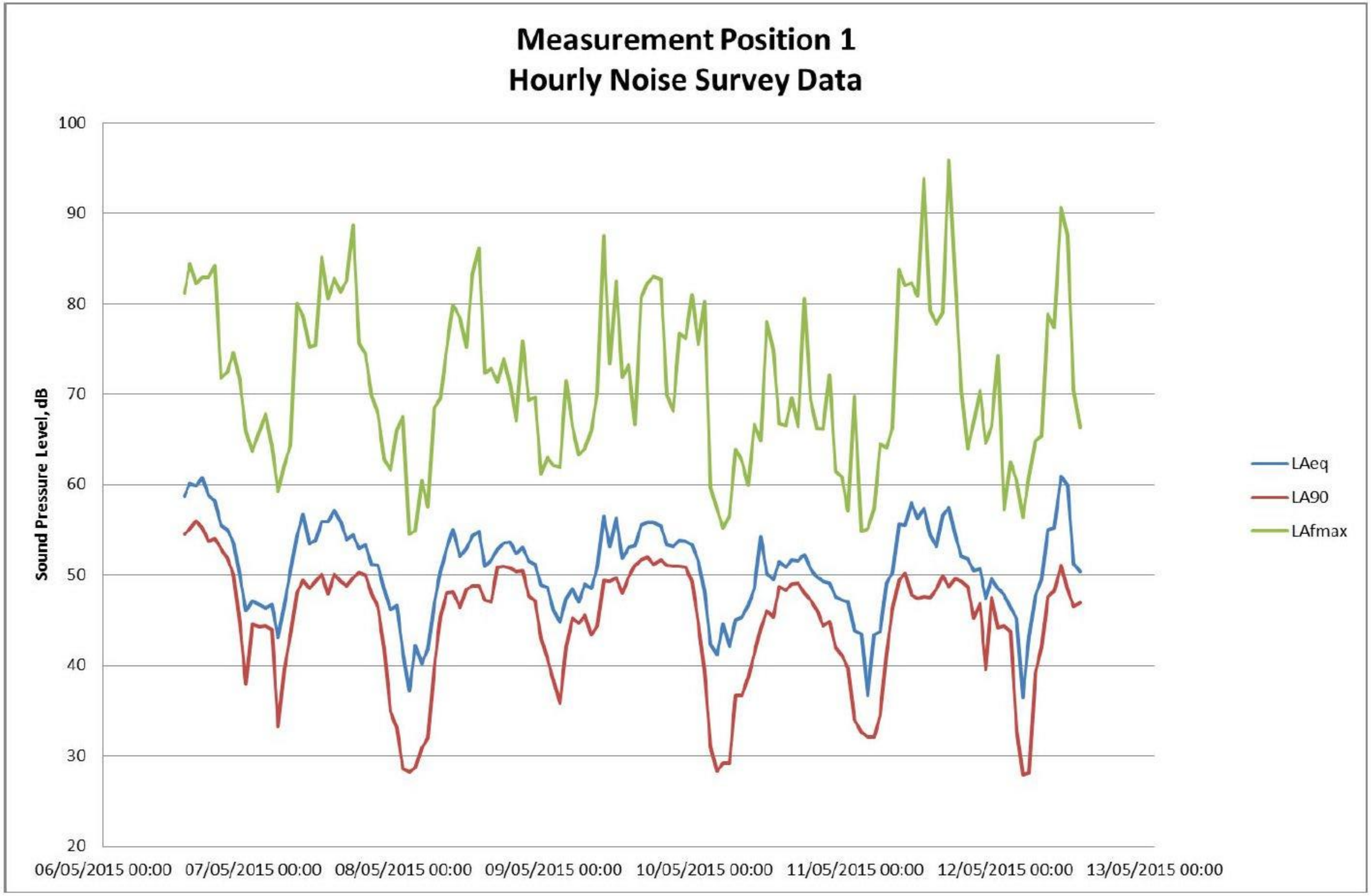
Table A-4: Measurement Position 1 – Hourly Noise Data, dB

DATE AND TIME	$L_{AEQ,1H}$	$L_{A90,1H}$	$L_{AFMAX,1H}$
06/05/2015 13:00	58.7	54.5	81.2
06/05/2015 14:00	60.1	55.1	84.4
06/05/2015 15:00	59.8	56.0	82.2
06/05/2015 16:00	60.7	55.2	82.9
06/05/2015 17:00	58.8	53.7	82.9
06/05/2015 18:00	58.2	54.0	84.2
06/05/2015 19:00	55.5	52.9	71.8
06/05/2015 20:00	55.0	51.8	72.4
06/05/2015 21:00	53.6	50.1	74.6
06/05/2015 22:00	50.0	44.7	71.6
06/05/2015 23:00	46.0	37.9	65.8
07/05/2015 00:00	47.1	44.5	63.7
07/05/2015 01:00	46.7	44.3	65.8
07/05/2015 02:00	46.3	44.4	67.8
07/05/2015 03:00	46.7	44.0	64.3
07/05/2015 04:00	43.1	33.2	59.2
07/05/2015 05:00	46.7	39.6	62.2
07/05/2015 06:00	50.5	43.4	64.4
07/05/2015 07:00	54.3	48.0	80.0
07/05/2015 08:00	56.7	49.4	78.7
07/05/2015 09:00	53.4	48.5	75.2
07/05/2015 10:00	53.8	49.3	75.4
07/05/2015 11:00	55.9	50.1	85.2
07/05/2015 12:00	55.9	47.9	80.5
07/05/2015 13:00	57.2	50.1	82.8
07/05/2015 14:00	55.9	49.3	81.3
07/05/2015 15:00	53.9	48.8	82.6
07/05/2015 16:00	54.4	49.7	88.7
07/05/2015 17:00	52.9	50.3	75.6
07/05/2015 18:00	53.3	50.0	74.4
07/05/2015 19:00	51.2	47.9	69.8
07/05/2015 20:00	51.1	46.4	67.8
07/05/2015 21:00	48.4	41.8	62.8
07/05/2015 22:00	46.1	34.9	61.6
07/05/2015 23:00	46.6	33.1	66.0
08/05/2015 00:00	41.5	28.6	67.5

DATE AND TIME	$L_{AEQ,1H}$	$L_{A90,1H}$	$L_{AFMAX,1H}$
08/05/2015 01:00	37.2	28.2	54.5
08/05/2015 02:00	42.2	28.7	54.9
08/05/2015 03:00	40.2	30.8	60.4
08/05/2015 04:00	41.8	31.9	57.6
08/05/2015 05:00	46.8	39.7	68.5
08/05/2015 06:00	50.4	45.3	69.5
08/05/2015 07:00	52.9	48.0	75.0
08/05/2015 08:00	55.0	48.1	79.8
08/05/2015 09:00	52.0	46.4	78.5
08/05/2015 10:00	52.9	48.4	75.2
08/05/2015 11:00	54.3	48.8	83.3
08/05/2015 12:00	54.8	48.8	86.1
08/05/2015 13:00	51.0	47.2	72.3
08/05/2015 14:00	51.6	47.0	72.8
08/05/2015 15:00	52.8	50.9	71.4
08/05/2015 16:00	53.5	51.0	73.9
08/05/2015 17:00	53.6	50.8	71.2
08/05/2015 18:00	52.3	50.4	67.0
08/05/2015 19:00	53.0	50.5	75.9
08/05/2015 20:00	51.5	47.7	69.3
08/05/2015 21:00	51.2	47.1	69.7
08/05/2015 22:00	48.9	43.0	61.2
08/05/2015 23:00	48.6	40.7	63.0
09/05/2015 00:00	46.0	38.2	62.1
09/05/2015 01:00	44.7	35.8	61.9
09/05/2015 02:00	47.4	42.1	71.5
09/05/2015 03:00	48.5	45.2	66.4
09/05/2015 04:00	47.0	44.6	63.3
09/05/2015 05:00	49.0	45.5	64.0
09/05/2015 06:00	48.5	43.4	65.9
09/05/2015 07:00	50.9	44.4	70.2
09/05/2015 08:00	56.5	49.4	87.5
09/05/2015 09:00	53.1	49.3	73.3
09/05/2015 10:00	56.3	49.7	82.5
09/05/2015 11:00	51.8	48.0	71.9
09/05/2015 12:00	53.0	49.8	73.2
09/05/2015 13:00	53.2	51.1	66.6
09/05/2015 14:00	55.5	51.6	80.6

DATE AND TIME	$L_{AEQ,1H}$	$L_{A90,1H}$	$L_{AFMAX,1H}$
09/05/2015 15:00	55.8	51.9	82.3
09/05/2015 16:00	55.8	51.2	83.0
09/05/2015 17:00	55.4	51.6	82.7
09/05/2015 18:00	53.3	51.1	69.9
09/05/2015 19:00	53.1	51.0	68.1
09/05/2015 20:00	53.8	51.0	76.7
09/05/2015 21:00	53.7	50.9	76.2
09/05/2015 22:00	53.3	49.3	81.0
09/05/2015 23:00	51.5	44.7	75.5
10/05/2015 00:00	48.2	39.3	80.2
10/05/2015 01:00	42.3	30.9	59.6
10/05/2015 02:00	41.2	28.3	57.3
10/05/2015 03:00	44.5	29.2	55.2
10/05/2015 04:00	42.1	29.2	56.6
10/05/2015 05:00	45.0	36.7	63.9
10/05/2015 06:00	45.3	36.7	62.6
10/05/2015 07:00	46.6	38.6	59.9
10/05/2015 08:00	48.5	41.3	66.6
10/05/2015 09:00	54.2	44.1	64.9
10/05/2015 10:00	50.2	46.0	78.0
10/05/2015 11:00	49.5	45.3	74.9
10/05/2015 12:00	51.4	48.7	66.7
10/05/2015 13:00	50.9	48.3	66.5
10/05/2015 14:00	51.6	49.0	69.6
10/05/2015 15:00	51.5	49.1	66.4
10/05/2015 16:00	52.2	48.0	80.5
10/05/2015 17:00	50.7	47.2	69.4
10/05/2015 18:00	49.8	46.1	66.2
10/05/2015 19:00	49.3	44.4	66.1
10/05/2015 20:00	49.1	44.8	72.1
10/05/2015 21:00	47.6	42.0	61.5
10/05/2015 22:00	47.2	41.1	60.8
10/05/2015 23:00	47.0	39.7	57.1
11/05/2015 00:00	43.9	34.0	69.8
11/05/2015 01:00	43.5	32.6	54.8
11/05/2015 02:00	36.7	32.0	55.1
11/05/2015 03:00	43.4	32.0	57.3
11/05/2015 04:00	43.8	34.5	64.5

DATE AND TIME	$L_{AEQ,1H}$	$L_{A90,1H}$	$L_{AFMAX,1H}$
11/05/2015 05:00	49.1	41.3	64.1
11/05/2015 06:00	50.3	46.3	66.3
11/05/2015 07:00	55.6	49.4	83.8
11/05/2015 08:00	55.5	50.2	82.0
11/05/2015 09:00	58.0	47.8	82.3
11/05/2015 10:00	56.3	47.4	80.8
11/05/2015 11:00	57.4	47.6	93.8
11/05/2015 12:00	54.4	47.5	79.2
11/05/2015 13:00	53.1	48.4	77.8
11/05/2015 14:00	56.6	49.9	79.0
11/05/2015 15:00	57.5	48.7	95.9
11/05/2015 16:00	54.4	49.6	82.6
11/05/2015 17:00	52.0	49.3	70.5
11/05/2015 18:00	51.7	48.7	64.0
11/05/2015 19:00	50.5	45.2	66.9
11/05/2015 20:00	50.7	46.8	70.4
11/05/2015 21:00	47.4	39.5	64.6
11/05/2015 22:00	49.6	47.5	66.4
11/05/2015 23:00	48.5	44.2	74.2
12/05/2015 00:00	47.8	44.4	57.2
12/05/2015 01:00	46.4	43.8	62.5
12/05/2015 02:00	45.1	32.9	60.4
12/05/2015 03:00	36.5	27.9	56.4
12/05/2015 04:00	43.2	28.1	60.9
12/05/2015 05:00	47.7	39.1	64.9
12/05/2015 06:00	49.5	42.0	65.3
12/05/2015 07:00	55.0	47.6	78.9
12/05/2015 08:00	55.2	48.2	77.4
12/05/2015 09:00	60.9	51.1	90.6
12/05/2015 10:00	59.9	48.4	87.5
12/05/2015 11:00	51.3	46.5	70.5
12/05/2015 12:00	50.4	46.9	66.3


Measurement Position 1
Hourly Noise Survey Data
Sound Pressure Level, dB
100
90
80
70
60
50
40
30
20
06/05/2015 00:00
07/05/2015 00:00
08/05/2015 00:00
09/05/2015 00:00
10/05/2015 00:00
11/05/2015 00:00
12/05/2015 00:00
13/05/2015 00:00
LAeq
LA90
LAfmax

HOURLY NOISE MEASUREMENT DATA – MEASUREMENT POSITION 2

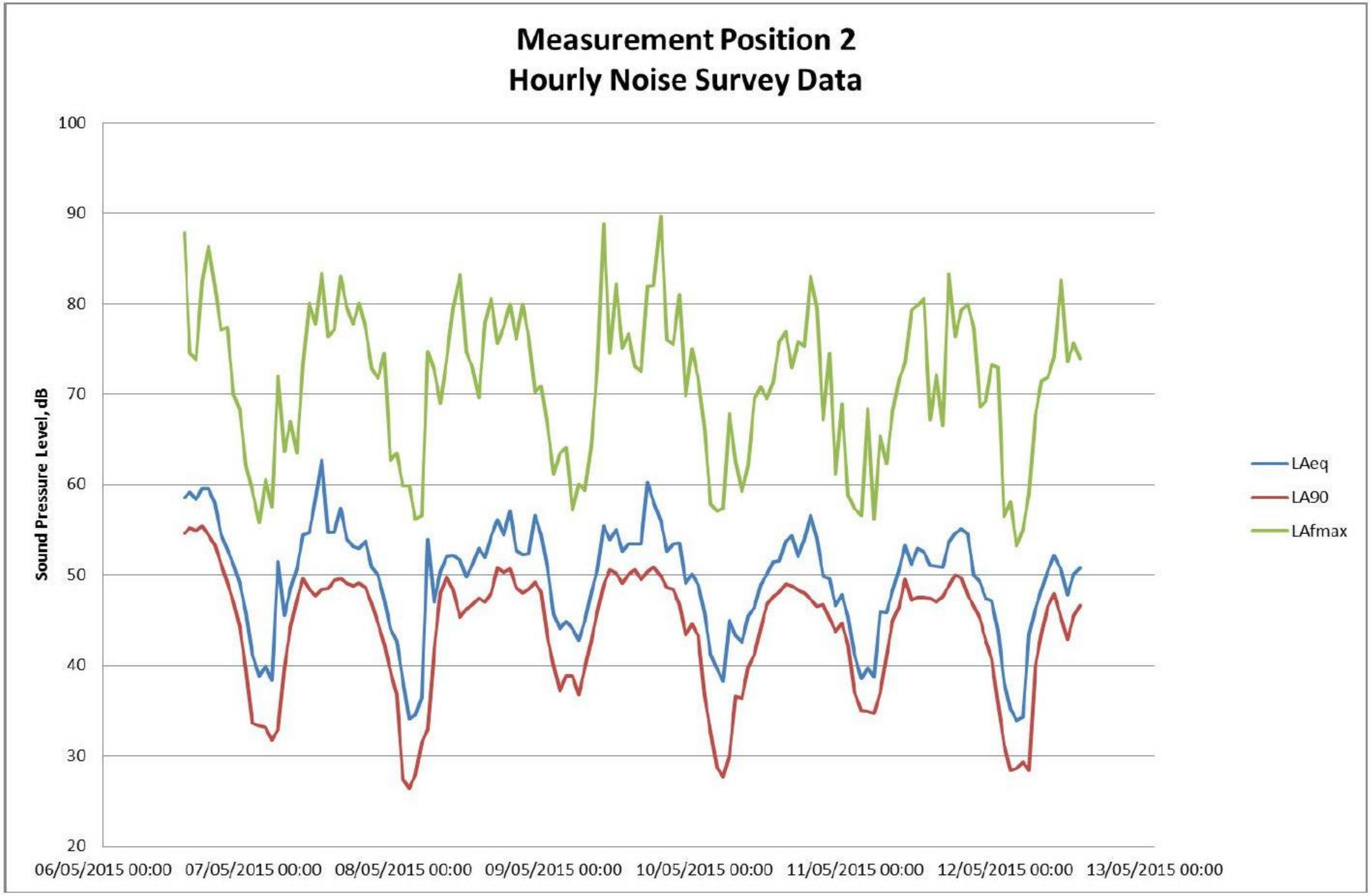
Table A-4: Measurement Position 2 – Hourly Noise Data, dB

DATE AND TIME	$L_{AEQ,1H}$	$L_{A90,1H}$	$L_{AFMAX,1H}$
06/05/2015 13:00	58.5	54.6	87.8
06/05/2015 14:00	59.1	55.2	74.5
06/05/2015 15:00	58.3	54.9	73.8
06/05/2015 16:00	59.5	55.4	82.5
06/05/2015 17:00	59.5	54.4	86.3
06/05/2015 18:00	58.0	53.3	82.0
06/05/2015 19:00	54.5	51.3	77.1
06/05/2015 20:00	52.8	49.2	77.4
06/05/2015 21:00	51.2	47.0	70.0
06/05/2015 22:00	49.1	44.3	68.3
06/05/2015 23:00	45.8	39.5	62.1
07/05/2015 00:00	41.2	33.6	59.3
07/05/2015 01:00	38.8	33.3	55.8
07/05/2015 02:00	39.9	33.1	60.5
07/05/2015 03:00	38.3	31.7	57.6
07/05/2015 04:00	51.4	32.9	72.0
07/05/2015 05:00	45.5	39.7	63.7
07/05/2015 06:00	48.5	44.3	66.9
07/05/2015 07:00	50.7	47.2	63.5
07/05/2015 08:00	54.4	49.6	73.3
07/05/2015 09:00	54.7	48.4	80.0
07/05/2015 10:00	58.4	47.7	77.8
07/05/2015 11:00	62.7	48.4	83.4
07/05/2015 12:00	54.7	48.5	76.4
07/05/2015 13:00	54.7	49.4	77.1
07/05/2015 14:00	57.4	49.6	83.0
07/05/2015 15:00	54.0	49.1	79.6
07/05/2015 16:00	53.1	48.8	77.8
07/05/2015 17:00	52.9	49.1	80.0
07/05/2015 18:00	53.7	48.6	77.4
07/05/2015 19:00	50.9	46.8	72.8
07/05/2015 20:00	50.0	44.6	71.8
07/05/2015 21:00	47.3	42.4	74.5
07/05/2015 22:00	44.1	39.3	62.7
07/05/2015 23:00	42.7	36.8	63.5
08/05/2015 00:00	38.3	27.4	59.8

DATE AND TIME	$L_{AEQ,1H}$	$L_{A90,1H}$	$L_{AFMAX,1H}$
08/05/2015 01:00	34.1	26.4	59.8
08/05/2015 02:00	34.5	27.9	56.2
08/05/2015 03:00	36.5	31.4	56.6
08/05/2015 04:00	53.9	32.9	74.7
08/05/2015 05:00	47.0	41.8	72.6
08/05/2015 06:00	50.4	48.0	69.0
08/05/2015 07:00	52.0	49.8	73.8
08/05/2015 08:00	52.1	48.4	79.4
08/05/2015 09:00	51.6	45.3	83.2
08/05/2015 10:00	49.8	46.2	74.6
08/05/2015 11:00	51.2	46.7	72.9
08/05/2015 12:00	52.9	47.4	69.6
08/05/2015 13:00	51.9	47.0	77.9
08/05/2015 14:00	54.3	48.0	80.5
08/05/2015 15:00	56.1	50.8	75.6
08/05/2015 16:00	54.4	50.3	77.5
08/05/2015 17:00	57.1	50.7	79.9
08/05/2015 18:00	52.7	48.6	76.1
08/05/2015 19:00	52.2	48.0	79.9
08/05/2015 20:00	52.3	48.4	76.3
08/05/2015 21:00	56.6	49.2	70.3
08/05/2015 22:00	54.4	48.1	70.9
08/05/2015 23:00	50.8	43.1	66.5
09/05/2015 00:00	45.6	39.9	61.2
09/05/2015 01:00	44.1	37.2	63.5
09/05/2015 02:00	44.8	38.8	64.1
09/05/2015 03:00	44.1	38.8	57.2
09/05/2015 04:00	42.8	36.8	60.0
09/05/2015 05:00	44.9	39.7	59.3
09/05/2015 06:00	48.0	42.7	64.3
09/05/2015 07:00	50.6	45.9	73.0
09/05/2015 08:00	55.4	48.9	88.8
09/05/2015 09:00	53.9	50.6	74.5
09/05/2015 10:00	55.0	50.2	82.2
09/05/2015 11:00	52.6	49.1	75.1
09/05/2015 12:00	53.4	50.1	76.7
09/05/2015 13:00	53.4	50.6	73.0
09/05/2015 14:00	53.4	49.5	72.5

DATE AND TIME	$L_{AEQ,1H}$	$L_{A90,1H}$	$L_{AFMAX,1H}$
09/05/2015 15:00	60.2	50.4	81.9
09/05/2015 16:00	58.1	50.9	82.0
09/05/2015 17:00	56.0	49.9	89.7
09/05/2015 18:00	52.6	48.6	76.0
09/05/2015 19:00	53.4	48.4	75.5
09/05/2015 20:00	53.5	46.7	81.0
09/05/2015 21:00	49.1	43.4	69.8
09/05/2015 22:00	50.1	44.5	75.0
09/05/2015 23:00	48.9	43.3	71.7
10/05/2015 00:00	45.8	36.7	66.2
10/05/2015 01:00	41.2	32.6	57.9
10/05/2015 02:00	39.6	28.7	57.1
10/05/2015 03:00	38.2	27.7	57.4
10/05/2015 04:00	44.9	30.1	67.8
10/05/2015 05:00	43.3	36.6	62.5
10/05/2015 06:00	42.6	36.4	59.2
10/05/2015 07:00	45.4	39.8	62.1
10/05/2015 08:00	46.4	41.2	69.5
10/05/2015 09:00	48.9	44.1	70.8
10/05/2015 10:00	50.1	46.7	69.5
10/05/2015 11:00	51.4	47.6	71.4
10/05/2015 12:00	51.5	48.1	75.8
10/05/2015 13:00	53.7	49.0	76.9
10/05/2015 14:00	54.3	48.8	72.9
10/05/2015 15:00	52.0	48.3	75.8
10/05/2015 16:00	53.9	48.0	75.3
10/05/2015 17:00	56.6	47.3	83.0
10/05/2015 18:00	54.0	46.5	79.5
10/05/2015 19:00	49.9	46.7	67.1
10/05/2015 20:00	49.6	45.2	74.5
10/05/2015 21:00	46.6	43.8	61.2
10/05/2015 22:00	47.8	44.6	68.9
10/05/2015 23:00	45.3	42.3	58.8
11/05/2015 00:00	41.2	37.1	57.4
11/05/2015 01:00	38.5	35.0	56.6
11/05/2015 02:00	39.7	34.9	68.4
11/05/2015 03:00	38.7	34.7	56.2
11/05/2015 04:00	45.9	37.0	65.3

DATE AND TIME	$L_{AEQ,1H}$	$L_{A90,1H}$	$L_{AFMAX,1H}$
11/05/2015 05:00	45.8	41.0	62.3
11/05/2015 06:00	48.3	44.9	68.1
11/05/2015 07:00	50.6	46.4	71.6
11/05/2015 08:00	53.2	49.5	73.4
11/05/2015 09:00	51.2	47.2	79.2
11/05/2015 10:00	52.9	47.5	79.8
11/05/2015 11:00	52.5	47.5	80.5
11/05/2015 12:00	51.1	47.4	67.1
11/05/2015 13:00	51.0	47.0	72.1
11/05/2015 14:00	50.9	47.6	66.5
11/05/2015 15:00	53.6	48.8	83.3
11/05/2015 16:00	54.6	50.0	76.4
11/05/2015 17:00	55.1	49.7	79.2
11/05/2015 18:00	54.5	47.8	79.9
11/05/2015 19:00	50.0	46.5	77.4
11/05/2015 20:00	49.2	45.1	68.6
11/05/2015 21:00	47.4	42.8	69.2
11/05/2015 22:00	47.1	40.7	73.2
11/05/2015 23:00	43.9	35.9	72.9
12/05/2015 00:00	38.1	31.2	56.5
12/05/2015 01:00	35.2	28.4	58.1
12/05/2015 02:00	33.9	28.6	53.2
12/05/2015 03:00	34.3	29.3	55.0
12/05/2015 04:00	43.5	28.4	59.0
12/05/2015 05:00	46.2	39.9	67.6
12/05/2015 06:00	48.4	43.6	71.5
12/05/2015 07:00	50.5	46.5	71.9
12/05/2015 08:00	52.1	47.9	74.1
12/05/2015 09:00	50.6	45.2	82.6
12/05/2015 10:00	47.8	42.9	73.6
12/05/2015 11:00	50.1	45.4	75.6
12/05/2015 12:00	50.8	46.6	73.9


Measurement Position 2
Hourly Noise Survey Data
Sound Pressure Level, dB
100
90
80
70
60
50
40
30
20
06/05/2015 00:00
07/05/2015 00:00
08/05/2015 00:00
09/05/2015 00:00
10/05/2015 00:00
11/05/2015 00:00
12/05/2015 00:00
13/05/2015 00:00
LAeq
LA90
LAfmax

Appendix F

LIMITATIONS TO THIS REPORT

LIMITATIONS

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